Combined Management Report*

* The management report of Merck KGaA has been combined with the Group management report and published in the 2022 Merck Annual Report as well as in the annual financial statements of Merck KGaA. The management report also contains the combined non-financial (Group) statement of Merck KGaA, which we issue pursuant to sections 289b–289e and 315b–315c HGB. The 2022 Annual Report is an additional, non-official publication, which does not comply with the requirements of the European Single Electronic Format (ESEF). The official annual financial report for fiscal 2022, prepared in accordance with the ESEF format, has been filed with the electronic German company register (elektronisches Unternehmensregister) and is available on the website of the German company register.
This combined management report contains certain financial indicators such as operating result (EBIT), EBITDA, EBITDA pre, net financial debt and earnings per share pre, which are not defined by International Financial Reporting Standards (IFRS). These financial indicators should not be taken into account in order to assess the performance of Merck in isolation or used as an alternative to the financial indicators presented in the consolidated financial statements and determined in accordance with IFRSs.
The figures presented in this combined management report have been rounded. This may lead to individual values not adding up to the totals presented.
The Statement of Corporate Governance according to section 15d HGB in conjunction with section 289f (1) sentence 2 HGB is available at **https://www.merckgroup.com/en/investors/corporate-governance/reports.html**.
It is our aim to ensure that our communication is inclusive and so we strive to use language that is both non-discriminatory and easy to read. This report attempts to use gender-neutral language, which may not yet be consistent in all instances. Even if masculine forms are used, all genders are explicitly meant.

[1] German Commercial Code

Fundamental Information about the Group

Merck

We are Merck, a science and technology company. We are pioneers of human progress, driven by our curiosity.

We have a unique setup, with different disciplines under one roof. Our Life Science business sector provides the tools, high-grade chemicals, and consumables that accelerate scientific breakthroughs and enable the biopharmaceutical industry to ensure that medicines are safe and effective for a global population.

With a broad and deep portfolio of more than 300,000 products and an industry-leading e-commerce platform, we are focused on impacting life and health with science. In our Healthcare business sector, we advance innovation through our pipeline; enable life-changing therapies for serious illnesses; treat more than 90 million patients worldwide with cardiovascular, diabetes and thyroid disorders every day; and help many couples to realize their wish to have a child. In our Electronics business sector, we are the company behind the companies, advancing digital living. Our semiconductor and display solutions can be found in almost every electronic device. Thus, we are changing the way information is processed, releasing the potential of data and opening up possibilities for positively influencing the way we live. In addition, our specialists also explore visionary new solutions at the intersection of our three diversified business sectors.

Established in 1668, our exceptional track record shows we continuously reinvent ourselves and think long-term. This mindset is rooted in responsibility, care, and respect: for our work, our people, our customers, patients, society, and our planet. We want to become the global 21st century science and technology pioneer, working toward an ambitious future: sustainable progress for humankind.

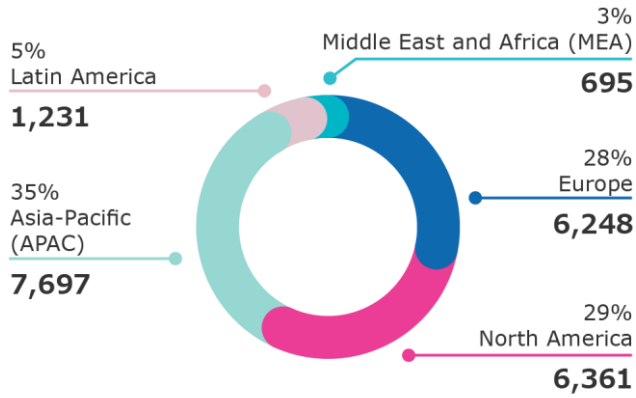
We hold the global rights to the Merck name and brand. The only exceptions are Canada and the United States. In these countries, we operate as MilliporeSigma in the Life Science business, as EMD Serono in the Healthcare business, and as EMD Electronics in the Electronics business.

Apart from our three business sectors, our financial reporting presents five regions: Europe, North America, Asia-Pacific, Latin America, the Middle East and Africa. As of December 31, 2022, we had 64,243 employees worldwide[1]. The figure as of December 31, 2021, was 60,348 employees. We have summarized further details on our employee structure and important aspects such as Diversity, Equity, and Inclusion in the "**Non-Financial Statement**."

[1] Merck also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by Merck and therefore may deviate from figures in the financial section of this report.

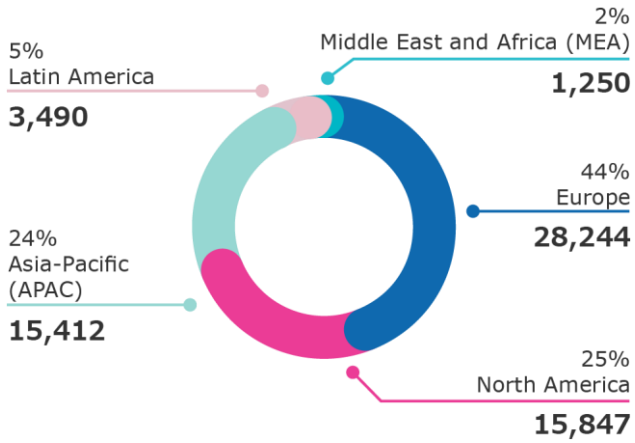
Merck Group

Net sales by region – FY 2022
€ million/in % of net sales



Merck Group

Employees by region as of December 31, 2022
Number/in %



Life Science

We are a leading global provider of tools, chemicals, and equipment to academic labs, biotech and pharmaceutical manufacturers, and the industrial sector. Together with our customers, our purpose is to impact life and health with science. With a strong focus on innovation, we are committed to delivering the products, services, and digital platforms to create a sustainable future for generations to come.

Across our Life Science business sector, we collaborate with the global scientific community to deliver breakthrough innovations supported by a broad and deep portfolio of more than 300,000 products. In early 2022, we announced the reorganization of the sector, with several organizational changes and a new operating model to support Life Science's long-term growth strategy and to better serve our global customers' evolving needs.

The changes comprised the following: the existing Contract Development and Manufacturing Organization (CDMO) and Contract Testing (CTO) services were split from the Process Solutions business and consolidated into one global, fully integrated Life Science Services organization for traditional and novel modalities, including monoclonal antibodies, high-potency active pharmaceutical ingredients (HPAPIs), as well as antibody-drug conjugates and viral and gene therapies including mRNA. In addition to manufacturing, Life Science Services includes sales and marketing, research and development, and supply chain operations. In the fall of 2022, we launched a new brand encompassing our integrated services offering Millipore® CTDMO (Contract Testing, Development and Manufacturing Organization) Services to support clients with fully-integrated services from pre-clinical phases to commercial production. Millipore® CTDMO Services operates facilities throughout Europe, the United States, and Asia. Our Contract Testing Services remain under the BioReliance® brand.

The Process Solutions business will continue its focus on delivering our leading product offering for pharmaceutical development and manufacturing, including filtration devices, chromatography resins, single-use assemblies and systems, processing chemicals, and excipients.

The Research Solutions and Applied Solutions business units were combined into one organization called Science and Lab Solutions. This business unit serves the pharma and biotech, industrial and testing, academic and government, and diagnostics sectors, providing customers a more seamless experience and access to a broad portfolio including reagents, consumables, devices, instruments, software, and services for scientific discovery, in addition to lab water instruments, consumables and services, microbiology and biomonitoring products, test assays, analytical reagents, and flow cytometry kits and instruments.

Also announced was the newly created position of Chief Technology Officer, reporting to the Life Science business sector CEO. This leader is responsible for shaping the technology roadmap and long-term R&D strategy, systematically exploring emerging opportunities that lead to breakthrough innovations. Functions such as Integrated Supply Chain and Operations, the Transformation Office, Strategy, Business Development and Sustainability, Quality and Regulatory, and other Group functions remain unchanged.

A key goal for the Life Science business sector is to support customers that manufacture drugs, from small to large innovator companies, and bring safe and effective life-enhancing therapies and vaccines to millions of patients worldwide. To that end, we continued to leverage strategic opportunities to enhance our capabilities and expand our products and services offering.

In 2022, Life Science generated 47% of Group sales and 51% of EBITDA pre (excluding Corporate and Other).

Process Solutions*

In April, we announced the acquisition of the MAST® (Modular Automated Sampling Technology) platform from Lonza. The MAST® platform, now part of our BioContinuum™ Platform, is a leading automated, aseptic bioreactor sampling system developed in Bend, Oregon, USA. With this acquisition, we add automated sampling to our bioprocessing portfolio, enabling us to become the first provider of a fully integrated ecosystem for advanced process technologies.

In August, we launched the VirusExpress® 293 Adeno-Associated Virus (AAV) Production Platform, making us one of the first CDMOs and technology developers to provide a complete viral vector manufacturing offering including AAV, Lentiviral, CDMO, CTO, and process development. This new platform enables biopharmaceutical companies to increase the speed of clinical manufacturing while reducing process development time and costs. It is an extension of our VirusExpress® offering, which can reduce process development time by up to 40%, based on our experience as a CDMO. In the same month, we also launched Pellicon® capsule manifolds for single-use tangential flow filtration (TFF) production. Uniquely designed for faster installation and safer handling of filtration areas, Pellicon® Capsule manifolds offer ease-of-use for scale-up from clinical to small-volume production of biomolecules.

In December, we acquired Massachusetts-based Erbi Biosystems, a developer of the two milliliter (mL) micro-bioreactor platform technology known as the Breez™. The deal strengthens our upstream portfolio by enabling scalable cell-based perfusion bioreactor processes from 2 ml to 2,000 L with rapid lab-scale process development. It also offers future development opportunities in novel modality applications.

Life Science Services*

In January, we strengthened our CDMO services across the mRNA value chain with the acquisition of Exelead. Exelead specializes in complex injectable formulations, including Lipid Nanoparticle-based drug delivery technology. We plan to invest more than € 500 million in the technology scale-up of Exelead over the next ten years. This will further enable us to capture the significant potential of the fast-growing market for mRNA therapies by providing leading CDMO services to our customers.

In June, we doubled our high-potent active pharmaceutical ingredients production capacity with the expansion of our facility in Verona, near Madison, Wisconsin, USA. This new € 59 million, 6,500 square meter facility brings 50 new jobs to the area.

In October, we announced the opening of a new commercial facility to support our new Millipore® CTDMO Services offering at our site in Martillac, France. The 2,700 square meter facility will support our clients as they work with our global CTDMO network, including templates for drug development, manufacturing, and commercialization, to accelerate molecules to market.

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In November, we entered into a collaboration with Biotheus, a China-based biotech company focused on developing treatments for cancer and autoimmune diseases. This collaboration will help accelerate the drug submission and approval process for the biopharmaceutical industry in China using our first-to-market Blazar® Rodent Panel for virus testing, reducing animal testing through molecular-based technology and biosafety turnaround time by up to 80%.

Science and Lab Solutions*

In February, we collaborated with Waters Corporation to build and expand an Extractables and Leachables (E&L) Reference Library to include ion mobility measurements. The library will enable analytical labs to identify potential extractables and leachable compounds in their samples by using Waters' ion mobility-enabled liquid chromatography-mass spectrometry (LC-MS) instruments and then confirm the identity and quantity using our Supelco® reference materials. The library is cross-linked to our Life Science business sector's online product catalog to provide users access to reference materials to confirm their results.

We also expanded our ZooMAb® recombinant monoclonal antibodies product portfolio with 72 new products and added 23 new products to the ColorWheel® flow cytometry antibodies and dyes portfolio. ZooMAb is the first-ever antibody to receive the ACT label designation and received the lowest environmental impact factor (EIF) scores in the chemicals and reagents category.

In the Life Science business sector, our dedication to the customer experience extends from the lab to our primary e-commerce platform, sigmaaldrich.com, which connects tens of millions of visitors in nearly every country around the world with the products, services, and technical expertise needed to advance their discovery, research, and development further and faster. We have accelerated our rate of eCommerce innovation by improving our site speed, expanding our product document library, and making it easier for customers to find what they need with new, differentiating user experiences.

Investments to expand capabilities and production*

In April, we announced a € 100 million investment for our first Asia-Pacific Mobius® Single-Use Manufacturing Center in Wuxi, China. This investment supports the fast-growing biotech innovation sector in China and is realized in close collaboration with the Administrative Management Committee of the Wuxi National High-Tech Industrial Development Zone to jointly cultivate and enhance the life science ecosystem in the Wuxi area and throughout China.

In May, we announced an investment of approximately € 440 million to increase membrane manufacturing capacity in Carrigtwohill and build a new manufacturing facility at Blarney Business Park, both in Cork, Ireland. The investment, the largest in a single site ever for the Life Science business sector, will create more than 370 permanent jobs by the end of 2027.

In July, we broke ground at our site in Sheboygan, Wisconsin, USA, for our first lateral flow membrane production facility in the United States. Lateral flow membranes are vital in rapid diagnostic test kits for various applications, ranging from Covid-19 to other infectious diseases. The new facility is supported by a € 121 million contract award from the U.S. Department of Defense on behalf of the U.S. Department of Health and Human Services. The Sheboygan location further supports our competitive advantage by providing improved supply security and reduced lead times for global customers.

In September, we announced an investment of more than € 130 million to strengthen our manufacturing capabilities for single-use assemblies, a key technology for the production of Covid-19 vaccines and other lifesaving therapies, in Molsheim, France. The investment is the largest ever in the 50-year history of the site and will create more than 800 jobs by the end of 2028.

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Also in September, we opened a new viral clearance (VC) laboratory as part of the first building phase of our new € 29 million Shanghai-based China Biologics Testing Center. The 5,000 square meter center, the first of its kind for our company in China, is designed to meet the double-digit demand for VC testing services in the country. Customers will now be able to locally conduct viral clearance studies from pre-clinical development to commercialization, a critical step in drug development required by regulatory agencies to complete clinical trials necessary to move to commercial manufacturing. The second phase of the center's facilities will open in late 2023 and offer cell line characterization and lot release testing services.

In November, we announced a € 290 million investment in a new facility to support the increasing demand for biosafety testing services at our Rockville, Maryland, USA, site. The new 23,000 square meter facility will consolidate the multi-building campus into one facility that will open in 2024 to significantly increase our biosafety testing capacity, creating over 500 new jobs in the region. This is the largest testing investment in company history.

From pandemic to endemic*

As the Covid-19 pandemic devolves into an endemic, we continue providing customers with products and solutions that empower scientists to study long-term effects, detect and characterize viruses, and develop and manufacture vaccines and therapies. We have supported more than 35 testing solutions across RT-PCR, antigen, and antibody diagnostics for both high-throughput centralized and distributed point-of-care settings; more than 80 different vaccine programs, consisting of several platforms that include DNA, Inactivated, Live Attenuated Virus, Viral Vector, Protein Subunit and mRNA; and more than 50 monoclonal antibodies, plasma-derived products, and antiviral treatments.

Healthcare

Healthcare discovers, develops, manufactures, and markets innovative pharmaceutical and biological prescription drugs to treat cancer, multiple sclerosis (MS), infertility, growth disorders, and certain cardiovascular and metabolic diseases. Healthcare operates across four therapeutic areas with a clear ambition to become a global specialty innovator: Neurology and Immunology, Oncology, Fertility, and Cardiology Metabolism & Endocrinology. Our R&D pipeline positions us with a clear focus on strengthening our leadership positions in oncology, neurology, and immunology.

Since the start of the Covid-19 pandemic, we have been continuously making every effort to proactively handle the situation and minimize the impact of the pandemic and also of any challenges from the external context on the supply of our medicines locally and globally. To this end, we are using three main levers: the thorough implementation and further development of our business continuity plans across our network, the active management of our stocks, and the assessment of alternative transportation routes to reach our customers and patients.

In 2022, Healthcare generated 35% of Group sales and 33% of EBITDA pre (excluding Corporate and Other). Europe and North America generated 54% of Healthcare's net sales in 2022. In recent years, we have steadily expanded our presence in growth markets. In 2022, Asia-Pacific and Latin America accounted for 39% of sales.

Oncology*

Erbitux® (cetuximab) is the best-selling drug in terms of revenue in the portfolio of our Biopharma business, is our flagship product in oncology, reaching € 1 billion in sales in 2022. Treating more than 1 million patients since authorization, the product is a standard of care for patients with epidermal growth factor receptor (EGFR)-expressing, RAS wild-type metastatic colorectal cancer (mCRC), as well as both recurrent and/or metastatic and locally advanced squamous cell carcinoma of the head and neck (SCCHN). We continue to advance our

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broad lifecycle management strategy, as well, with more than 200 active clinical trials involving Erbitux® including 17 Phase III studies, some of which have registrational purpose.

Together with Pfizer Inc., we have made significant progress in transforming the standard of care globally for patients with locally advanced or metastatic urothelial carcinoma (UC) as we continue to secure additional regulatory approvals and reimbursement decisions for our anti-PD-L1 antibody Bavencio® (avelumab) (for further details see "**Research and Development**"). As a key growth driver of our Biopharma business, Bavencio® is now approved as a first-line maintenance treatment for advanced UC in 63 countries and has become a standard of care in the treatment of this disease, based on the results of the JAVELIN Bladder 100 trial, the only Phase III study of an immunotherapy to demonstrate a significant overall survival benefit in the first-line setting. In combination with Inlyta, Bavencio® is also approved in the first-line treatment of advanced renal cell carcinoma, and it is considered a standard of care as monotherapy in metastatic Merkel cell carcinoma, a rare form of skin cancer.

We have also continued to expand the availability of Tepmetko® (tepotinib), our oral MET inhibitor designed to inhibit the oncogenic MET receptor signaling caused by *MET* (gene) alterations, with additional regulatory approvals. In February 2022, the European Commission approved Tepmetko® as monotherapy for the treatment of adult patients with advanced non-small cell lung cancer (NSCLC) harboring alterations leading to mesenchymal-epithelial transition factor gene exon *MET*ex 14 skipping, who require systemic therapy following prior treatment with immunotherapy and/or platinum-based chemotherapy.

With this approval, Tepmetko® became the first and only oral MET inhibitor to be approved in the European Economic Area for treating adult patients with advanced NSCLC harboring alterations leading to *MET*ex14 skipping, who require systemic therapy following prior treatment. Tepmetko® is now available in a number of countries globally.

With xevinapant, our potentially first-in-class IAP (Inhibitor of Apoptosis Protein) inhibitor, we are building on our long-standing leadership in the treatment of squamous cell carcinoma of the head and neck (SCCHN). Five-year results from the 96-patient Phase II study presented at the European Society of Medical Oncology (ESMO) Annual Meeting in September 2022 showed that adding xevinapant to chemoradiotherapy (CRT) markedly improved long-term efficacy outcomes in patients with unresected locally advanced SCCHN. This data reinforces the transformative potential of xevinapant over standard of care in the curative setting (for further details see "**Research and Development**"). We have advanced our global Phase III development program this year, with TrilynX and XRay Vision now recruiting patients.

We made continued progress in our pipeline in 2022, as we advanced the first antibody-drug conjugate (ADC) developed in our labs, the anti-CEACAM5 ADC M9140, into Phase I.

Beyond our ADC platform, our broad portfolio of small-molecule DNA Damage Response (DDR) inhibitors represents multiple development paths as monotherapy or in combination with other DDR inhibitors, immunotherapy, chemotherapy, or radiotherapy.

In 2022, we advanced the development of our potentially best-in-class, potent and selective inhibitor of ataxia telangiectasia and Rad3-related (ATR), M1774. Following completion of the monotherapy dose-escalation part of the DDRiver Solid Tumors 301 study, a monotherapy dose for M1774 has been confirmed for further evaluation in Phase Ib (for further details see "**Research and Development**").

On June 3, 2022, we announced that, following an interim analysis of the ongoing global Phase II DDRiver SCLC 250 trial of berzosertib in combination with topotecan in patients with relapsed, platinum-resistant small cell lung cancer (SCLC), we decided to discontinue the study due to low probability of meeting the pre-defined objective of this trial (for further details see "**Research and Development**").

To further support our focused research and development efforts in the area of DDR inhibition, in September 2022 we entered a collaboration agreement with licensing option with Nerviano Medical Sciences S.r.l. for the next-generation highly selective and brain-penetrant PARP1 (poly (ADP-ribose) polymerase) inhibitor NMS-293 (for further details see "**Research and Development**"). The option to license this molecule provides us with the optionality to develop a next-generation PARP inhibitor in combination with our early pipeline of DDR inhibitors and DNA-damaging ADCs.

Neurology & Immunology*

We have a long-standing legacy in neurology and immunology, including more than two decades of experience in multiple sclerosis (MS). We are committed to people living with neuroinflammatory and immune-mediated diseases by focusing on finding solutions addressing unmet medical needs. Our current MS portfolio includes two approved products for the treatment of relapsing MS (RMS) – Rebif® (interferon beta-1a) and Mavenclad® (cladribine tablets). In addition, we are pioneering the therapeutic usage of Bruton's tyrosine kinase inhibition for MS through the discovery and development of evobrutinib, which targets both inflammatory activity in the central nervous system and immune cells in the periphery to address the underlying causes of ongoing disease progression. Evobrutinib is an investigational highly-selective, oral, CNS-penetrant BTK inhibitor with the potential to become a best-in-class treatment option for people living with RMS. Evobrutinib is in Phase III development for RMS.

Mavenclad® is approved in 88 countries worldwide, including those of the European Union, Switzerland, Australia, Canada, and the United States, for various forms of highly active RMS.

It is a short-course oral therapy for the treatment of adults with various forms of highly active RMS. Rebif®, a disease-modifying drug used to treat RMS, is and remains a well-established therapy. It has been a standard treatment in RMS for more than 20 years and has more than 1.8 million patient-years of therapy since approval.

In addition to our commitment to MS, we also have a pipeline focusing on discovering new therapies that have potential in other neuroinflammatory and immune-mediated diseases, including systemic lupus erythematosus (SLE) and cutaneous lupus erythematosus (CLE).

Enpatoran, a highly specific potential first-in-class immune modulator blocking the activation of Toll-like receptor (TLR)7 and TLR8, is being developed as a potential new oral therapy for systemic lupus erythematosus (SLE) and cutaneous lupus erythematosus (CLE). It aims to overcome limitations of available lupus therapies by providing selective inhibition of lupus-relevant disease drivers, which may increase efficacy while preserving immunity against infections. In March 2022, we announced that our first randomized patient was enrolled in our Phase II (WILLOW) study. We remain on track with recruitment of additional patients.

In January 2022, we entered into an out-licensing agreement for sprifermin with TrialSpark/High Line Bio, New York, USA. Sprifermin, a recombinant form of human fibroblast growth factor 18, is currently being investigated in patients with osteoarthritis.

Fertility*

As the global market leader in fertility drugs and treatments, our fertility franchise is an important contributor to our Healthcare business. According to updated data, more than five million babies have been born worldwide with the help of GONAL-f®, a leading therapeutic within our fertility portfolio.

Infertility continues to represent an increasing challenge globally due to demographic changes and ongoing lifestyle adjustments like delayed childbearing. In 2022, our fertility business grew and recorded significant progress across our fertility portfolio from launches to congress presentations and data studies.

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Our GONAL-f® 150 IU pen contains the active substance follitropin alfa, a copy of the natural hormone FSH. Treatment with GONAL-f® results in more follicles, oocytes, and embryos than urinary gonadotropins, increasing the chance of pregnancy and live birth. In 2022, GONAL-f® 150 IU pen was further launched in several European and APAC (Asia Pacific) countries, including France, the Baltic countries, Indonesia, Malaysia, and Singapore. Further launches are expected in Europe, APAC, and MEAR (Middle East, Africa, Turkey, Russia, and the Commonwealth of Independent States) regions in 2023, and in Japan in 2024.

Our Pergoveris® pen is the first product with a combination of recombinant human follicle-stimulating hormone (r-hFSH) and recombinant human luteinizing hormone (r-hLH) in a ready-to-use liquid version, eliminating the need for mixing. This makes it a suitable treatment option for women with severe FSH and LH deficiency. In 2022, the Pergoveris® pen was successfully launched in Saudi Arabia and Argentina, among others. It is now available in 51 countries. Launches around the globe will continue in order to provide patients with access to this therapeutic.

Cardiology Metabolism & Endocrinology*

Every day, more than 90 million patients around the world use our trusted Cardiology Metabolism & Endocrinology (CM&E) medications. Concor®, Euthyrox®, Glucophage®, and Saizen® are CM&E brands and contribute to making CM&E the largest business franchise of the Healthcare business sector in terms of sales, with strong growth in all major therapeutic areas of focus, contributing significantly to our overall profitability.

Concor®/Concor Cor®, containing bisoprolol, is a beta-blocker for treating hypertension and cardiovascular diseases such as coronary heart diseases and chronic heart failure. In addition to Concor®/Concor Cor®, the Concor® family offers fixed-dose combinations such as Concor Plus®/Lodoz® (bisoprolol with hydrochlorothiazide).

Euthyrox®, with the active ingredient levothyroxine, is the worldwide market leader for the treatment of hypothyroidism, a disease with high prevalence but still low diagnosis rates in most emerging markets.

Glucophage®, containing the active ingredient metformin, is the drug of choice for first-line treatment of type 2 diabetes available in more than 100 countries. During 2021, multiple health authorities worldwide continued to approve Glucophage® in prediabetes when intensive lifestyle changes have failed. This indication for Glucophage® is now registered in 89 countries. Overall, considering the high prevalence of prediabetes and diabetes, we continue seeing great potential for Glucophage®.

Saizen®, with its active ingredient somatropin, is our main endocrinology product and is indicated for the treatment of growth hormone deficiency in children and adults. Saizen® can be delivered with the Easypod® electromechanical injection device, the only growth hormone injection device able to wirelessly transfer data such as injection times, dates, and doses to the web-based software system Easypod® Connect, making it easier for healthcare practitioners and patients to manage adherence and helping to reach their treatment goals. Aluetta® (the new Saizen® pen) is now available in 28 countries with the objective of expanding the reach of Saizen®, offering additional options for healthcare practitioners and patients and expanding our devices portfolio.

In endocrinology, we differentiate ourselves from competitors through leadership in the eHealth space, both by building evidence and by leveraging the meaningful use of technology to provide new solutions for patient engagement, partnership with healthcare practitioners and better payer value proposition.

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Electronics

Electronics starts with us. We are the company behind the companies, advancing digital living. Our main focus is on materials and solutions for the electronics market. We realigned our portfolio toward the accelerated digitization and the growth of data. This drives the need for more and higher sophisticated semiconductor chips and displays. Today, we are optimally positioned to leverage our key strengths: With a well-balanced and broad technology portfolio of materials and equipment, industry leading R&D and a global production network close to our customers, we have become one of the most relevant suppliers of materials and solutions for the semiconductor and display industries – and are on track to further expand our position. In addition, our decorative and functional solutions for innovative surfaces of all kinds make life more colorful. The business sector consists of three business units: Semiconductor Solutions, Display Solutions, and Surface Solutions.

In recent years, we successfully developed into a leading player in the global electronic materials market. In 2021, we introduced our growth program “Level Up” and announced our plans to invest significantly more than € 3 billion in innovation and capacities until the end of 2025.

Electronics accounted for 18% of Group sales in 2022, and its share of EBITDA pre (excluding Corporate and Other) was 16%. The EBITDA pre margin was 29.7% of net sales.

Semiconductor Solutions*

Semiconductor Solutions is at the heart of Electronics and is enabling the digital transformation in communications, mobility, and healthcare. The overall semiconductor market is seeing strong growth with the rising adoption of digital technologies driven by recovering automotive markets and increasing smartphone demand amid wider availability of 5G networks. As almost every electronic device uses one of our products, we are advancing virtually every aspect of digital living. We are developing solutions for smaller, faster, and more powerful devices. Semiconductor Solutions is the largest business unit in terms of sales within Electronics and offers materials, delivery systems, and services for the semiconductor industry.

The Semiconductor Materials business supplies products for every major production step in wafer processing, including doping, patterning, deposition, planarization, etching, and cleaning. Specialty cleans, photoresists, and conductive pastes for semiconductor packaging round off the portfolio. Intermolecular is our center for complex material solutions in Electronics, located in San Jose, California, USA. There, we explore, test, and develop combinations of advanced materials for next-generation electronics. Compared to conventional methods, our approach provides significant time savings in the material development process, faster learning cycles, and detailed findings on new material combinations to provide a unique service for customers.

We recently completed the acquisition of the chemical business of Mecaro Co. Ltd., a publicly listed company based in Korea. The combination of Mecaro’s thin films technology competencies and our global footprint will provide our customers with additional value. The acquisition will support our capacity expansion plans and the execution of our Level Up investments in Korea.

Delivery Systems & Services develops and deploys reliable delivery equipment to ensure the safe and responsible handling of gases and liquid materials with the highest quality and safety standards for electronic manufacturers. We are increasing the global manufacturing capacity of our state-of-the-art specialty gas, liquid chemical, and slurry delivery equipment to meet the growing demand in memory and foundry. In October 2022, we inaugurated our new DS&S site in Kaohsiung, Taiwan, which will more than double the current regional supply and serve Taiwanese as well as global customers. The facility will complement the existing thin film materials R&D and production site, bringing together key expertise for integrated semiconductor manufacturing solutions. We also continued to make progress in ramping up our manufacturing capacity in the United States with our new facility in Chandler, Arizona, USA, which will begin operations in the first half of 2023. These new factories will supplement our ability to support customers’ increasing demand and boost our overall global footprint of manufacturing facilities around the globe. At many customer sites, semiconductor technologies and equipment are operated and maintained by our MEGASYS® Total Gas and Chemical Services

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team. As part of a global operations infrastructure, we are a premier supplier of semiconductor fab and sub-fab services to the worldwide electronics industry.

Display Solutions*

Our Display Solutions business unit includes the businesses Liquid Crystals (LC), Organic Light-Emitting Diodes (OLED), Photoresists, Smart Antenna and Liquid Crystal Glazing. With the proliferation of multiple applications and display trends, the display industry's technological requirements are significantly expanding. We support our display customers in developing novel display technologies and product concepts for applications, while also addressing new requirements that have emerged from the Covid-19 pandemic. We are active in a broad range of display materials, including LCs, OLED, and Display Patterning Materials (DPM).

To meet the increasing demand for high-purity OLED materials in Asia, we completed our OLED manufacturing capacity expansion project in Korea in June 2022. We have invested around € 20 million to install sublimation equipment and OLED vacuum deposition units at our OLED Application Center (OAC) in Poseung, Korea. This investment is also expected to ease the supply chain disruptions caused by Covid-19 and build supply agility and resilience for our customers. By bringing production closer to customers, we are also demonstrating our commitment to a more sustainable future. We aim to reduce our product carbon footprint by choosing the shortest supply routes, expanding capacity for circular material flows and adopting the latest production technologies.

In Liquid Crystals, we continue to see very dynamic market developments. Covid-19 has accelerated the market shift toward China and increased competition. We maintained our position as a technology leader with our XtraBright™ products, winning new projects for large-area displays as well as high-resolution mobile devices. Our OLED and photoresist materials are used in multiple free-form display products. Our low-temperature processable positive tone photoresists are widely used to pattern on-cell touch sensors. These sensors enable a thinner display structure, which is crucial for foldable devices.

Our Liquid Crystal Glazing business is receiving an increasing number of commercial orders as real estate investors regard eyrise® s350 instant solar shading as one of the key elements to deliver on their ESG (Environment, Social, Governance) objectives. One of the largest real estate investors in Switzerland is currently installing eyrise® on all facades of its signature project in the center of Zurich.

In 2022, our customer Kymeta announced a cooperation with OneWeb, a Low Earth Orbit (LEO) satellite communications company. Our LC-based licriOn™ technology is leading the way to various mobility applications of the future. LicriOn™ enables extensive connectivity access, even in remote areas where fast internet connections are unavailable or unaffordable today.

Surface Solutions*

In our Surface Solutions business, we provide our customers with solutions that help them to create innovative surfaces of all kinds. Our materials enable more beautiful, more resistant, and more effective product designs. Our main focus is on proactive solution development in close cooperation with our customers as well as expanding our portfolio through innovation in all areas. The core markets for Surface Solutions are automotive coatings, cosmetics, and, to a smaller extent, industrial applications. We are serving these markets with functional and decorative solutions. With a broad portfolio of active ingredients, we enable cosmetics manufacturers to enrich their skin care products with moisturizing, protecting, and anti-aging effects. Moreover, our functional solutions serve many innovative applications, from dirt-repellent and easy-care surfaces to laser markings of plastic parts and cables.

Surface Solutions is successfully implementing its strategic transformation. After substantial investments in expanding our production capacities in 2021, we are now further investing in digitalizing and modernizing our effect pigment production plants around the globe. In September, we opened the first fully automated unit for the digital color measurement of our pigment products in Gernsheim, Germany. The investment of nearly € 10 million is just one example of how we are further advancing the digitalization of our production processes. In the past two years, Surface Solutions was adversely impacted by the Covid-19 crisis. Despite the current challenging economic environment, the business is back on a successful organic growth track.

* The contents of this chapter or section are voluntary and therefore not audited. However, our auditor has read the text critically.

Strategy*

Strategy fundamentals

We are curious minds dedicated to human progress. We believe that scientific exploration and responsible entrepreneurship are key to technological advances that benefit us all. Our values – courage, achievement, responsibility, respect, integrity, and transparency – guide us in every step we take and in every decision we make. As a company, we have a strong foundation. These fundamentals have been defined by the Merck family. We always take them into consideration when discussing and deciding on our Enterprise strategy.

- We follow a risk diversification strategy with three distinct business sectors, and we avoid overexposure to any single customer, industry, or geography. We ensure resilience against business disruption and deep crises.
- With our science and technology focus, we want to be leaders in our fields of expertise and markets, always pushing the boundaries to find new solutions and drive innovation. We aim to create value for our business and for society.
- We continue to operate under our current ownership with the Merck family as the majority owner.
- We deliver sustainable value, and we want to maintain an attractive financial profile (for example, a strong credit rating) while assessing and considering the ESG (environmental, social, governance) impact of our growth ambition.
- Mergers and acquisitions (M&A) are an important driver of our long-term value creation strategy with a focus on innovation-driven technology.

Enterprise strategy

Our ambition

Our ambition is to become the global 21st century science and technology pioneer. To achieve this, we will continue to focus on our “Big 3” businesses: Process Solutions and Life Science Services, new Healthcare products, and Semiconductor Solutions. Until 2025, these businesses are expected to generate approximately 80% of the targeted sales growth, and more than 50% of total sales by 2025.

Despite the current turbulent environment, which is a stress test for our business model and strategy, we remain fully on track to reach our mid-term growth target of € 25 billion in sales by 2025. We confirm our mid-term forecast for the business sectors: In the Life Science business sector, organic sales will grow 7% to 10% per year on average, driven by the strong development of the core business. Consequently, the forecast would be achieved even amid a complete absence of pandemic-related demand. The Healthcare business sector will show average annual organic sales growth in the mid-single-digit percentage range. In addition to positive contributions of the established portfolio products, growth is expected to come from new medicines and potential market launches including evobrutinib (multiple sclerosis) and xevinapant (head and neck cancer). In the Electronics business sector, our expected mid-term organic sales growth will amount to 3% to 6% per year on average driven by the strong above market performance of Semiconductor Solutions and our comprehensive portfolio in this field.

Our highly resilient business sectors are the foundation for our bold plans to accelerate efficient growth and seize organic and inorganic opportunities.

We attribute our high capacity for resilience to several factors, notably:

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- Good financial position: strong balance sheet, sufficient cash reserves and moderate fixed cost exposure
- High degree of diversification in the three business sectors amid low cyclicality
- Robust supply networks due to increasing localization
- Lower dependency on single regions thanks to diversified footprint
- Strong focus on sustainability as an integral part of the company strategy, linked with clear sustainability goals.

Up until 2025, we expect to grow sales organically by at least 6% on average per year, equating to an increase of more than € 1 billion annually. To this end, we are making targeted investments worldwide to expand our regional capacities, such as the expansions of our Life Science manufacturing sites in Rockville, USA, in Molsheim, France and in Wuxi, China, as well as the construction of our Translational Science Center and Launch & Technology Center for our Healthcare business sector in Darmstadt, Germany. In Electronics – as part of our Level Up program – we are investing in our highly attractive growth markets such as semiconductors by expanding our global production and innovation footprint in close proximity to our customers.

In addition to our organic growth objectives, we plan further in-licensing and bolt-on acquisitions. For example, we announced the closing of the transaction to acquire the chemicals business of Mecaro, a Korean supplier to the semiconductor industry. Another recent example is the collaboration agreement including licensing option with Nerviano Medical Sciences S.r.L. (NMS) for the development of a novel oncology drug. In addition, as of 2023, we will once again consider potential larger-scale acquisitions as an option. Our inorganic growth initiatives will fit our strategic direction, with high priority being given to the Big 3 businesses.

Looking forward, we further identify transformative technologies to be pivotal enablers for our growth and innovation ambition. Therefore, we will look into novel technologies beyond our core products and markets while keeping in strategic proximity to our business sectors to leverage our existing assets and capabilities.

Our Group Science & Technology Office is leading the implementation of our combined strategy for innovation and "Data & Digital," fostering innovation in as well as across our business sectors through seeding and integrating transformative technology trends while harnessing the power of cutting-edge data and digital capacities. To enable our businesses and accelerate innovation through data we are deploying a company-wide harmonized Data and Analytics Operating Model and Ecosystem. This allows us to derive actionable insights from data, support informed decision-making, and scale related activities across the company to solve business challenges with machine learning and artificial intelligence. Data culture is foundational for our digital transformation. Through dedicated data upskilling activities, we are strengthening the ability of our workforce to identify, understand, create, model, analyze, interpret, communicate, and argue with data.

Business strategies

Life Science

Our Life Science business sector is a global leader in the ~€ 200 billion ex Covid life sciences industry. We continue to consistently deliver profitable growth in this market that is growing ~5 to 7% CAGR. While our strategy has not changed – strengthen our core business and expand in high-growth segments – our priorities now reflect changes in the external environment, with an even sharper focus on our strategy, further enabled by digitalization, innovation, and enhanced capabilities. In February 2022, we announced a new organizational structure focusing on the customer and portfolio, across three distinct business units: Process Solutions dedicated to consumables and instruments, Life Science Services delivering pharmaceutical testing, manufacturing, and development services, and Science and Lab Solutions unifying offerings for the research and applied markets.

Process Solutions is focused on innovation in process development, building a robust supply network, and expanding capacity to capture accelerating market growth. Customers and governments increasingly view bioprocess consumables as a strategic resource and prefer regional suppliers. Our plan calls for a shift from manufacturing centers of excellence to increasingly in-region, for-region production. We will continue to invest heavily in new capacity for key portfolios including single-use, filtration and cell culture media. This will improve customer service levels and increase our resilience. In addition, innovation remains critical. Our deep expertise in monoclonal antibodies (mAbs) and proteins provides a launchpad to offer fit-for-purpose products for the efficient manufacturing of novel modalities, such as viral vectors, and mRNA and cell therapies, which are all growing rapidly.

Science and Lab Solutions unites our strong positions across diverse lab and testing segments, including academia, pharmaceutical R&D and diagnostics, among others. This exposure provides exceptional resilience and predictable, profitable growth. Our strategic focus here is to ensure our long-term competitiveness as customer needs evolve. We are poised to continue our legacy of innovation for the lab, adding digital features and greener alternatives to our expansive product portfolio, and enhancing omnichannel engagement, by providing a seamless customer experience through all purchasing channels, from our sales representatives to our leading eCommerce platform.

We have already unified our service offerings under the Life Science Services business to build our presence in the attractive and growing contract testing, development, and manufacturing organization (CTDMO) segment. Here we have a strong foundation, with more than 25 years of CDMO expertise, a global footprint, and capabilities across the value chain. Our vision is to move from an emerging, multi-modality CDMO and CTO to a full-service and focused, multi-modality CTDMO. To enable this in the near term, we will focus on streamlined sales and a robust customer pipeline, ultimately increasing global scale and reach.

Across Life Science, we are also raising our ambition in the Asia-Pacific (APAC) region. As noted, our plans include establishing additional in-region, for-region infrastructure. At the same time, we will enhance our support level across the APAC region, sharing our technological expertise with customers to become a true partner in this fast-growing market.

Our Life Science business sector is poised to deliver sustained growth in a dynamic market through supply regionalization, a differentiated customer experience, and accelerated innovation – all aimed at shaping the future and fulfilling our purpose to impact life and health with science.

Healthcare

Global megatrends such as growing and aging populations as well as better access to healthcare continue to drive the need for our products. At the same time, the Covid-19 pandemic has accelerated many anticipated industry trends within the healthcare sector such as changes in market dynamics, ongoing healthcare reform, and increased digitalization. In recent months, the macroeconomic and geopolitical external environment has become more volatile, considering, for example, rising inflation or the war in Ukraine. To meet these demands and respond appropriately to the dynamics of our markets, we have significantly transformed our Healthcare business sector in recent years with the objective of delivering focused leadership and sustaining above-market growth through a diversified portfolio that is resilient to long-term volatility.

Following our successes over the past years, we continue to drive pipeline projects with the aim of bringing groundbreaking medicines to patients, maximizing our existing portfolio, and continuing our expansion in growth markets. We are resolute in our ambition to become a global specialty innovator, with a high-growth future in Oncology, Neurology and Immunology, and Fertility – areas where significant unmet medical needs exist and where we can bring meaningful value to patients. We build this ambition on top of a strong foundation and will continue to grow Cardiovascular, Metabolism & Endocrinology sustainably and profitably. We pursue this ambition with a focused leadership approach, concentrating investments on decorrelated opportunities in our pipeline and across therapeutic areas, regions, and payer types.

The first pillar of our strategy is to reinforce our global footprint, bringing the innovation of our pipeline to patients and growing our presence – in the United States and in China, for example. The emerging markets and China are expected to be the largest growth drivers for many of our established products in the future. Managing the balance between delivering innovative new medicines with first-in-class and/or best-in class potential while leveraging our strengths in other markets and ensuring the profitable growth of the existing business will be one of the strategic imperatives. Numerous examples in our existing business offer significant opportunities to bring value to patients, and considering their growth potential, maximizing their business potential will remain important.

The second pillar of our strategy is the focus on specialty medicine franchises. Here, we expect the oncology, neurology, immunology, and fertility markets to remain highly attractive in terms of size, growth prospects, and profitability. Within each specialty franchise, our approach is to develop deep internal expertise and insight, from internal research to commercialization, augmented by external talent sourcing and strategic partnering. In order to optimize the value and focus of our pipeline, we continuously monitor and assess the potential of our pipeline candidates, based on clinical data, strategic fit and financial criteria, to determine the best way forward.

The third strategic pillar is innovation: We aim to develop potential first-in-class, and best-in-class therapies and to build a portfolio in each of our franchises. We have streamlined our pipeline and expanded our innovation capabilities with strong investigational drug candidates and technologies. In order to maximize the output of our R&D investments and increase our chances of success in discovering and developing new therapies, we focus our expertise on specific franchises and are exploiting synergies in disease mechanisms and biological pathways. We are investing in digital technologies and novel modalities such as antibody drug conjugates to drive pipeline growth.

Electronics

Within the last years, the Electronics business sector has transformed into an innovation leader within the electronics industry targeting the most critical materials segments of the semiconductor wafer processing as well as OLED and LC display panels. Our diversified portfolio delivers profitable growth and stable attractive cash flows. We partner with key thought leaders around the world to enable the next generation of electronic devices.

The acceleration of digitization, and its visualization, is fueled by an exponential growth of data and a lasting need for electronics, especially semiconductor chips across all industrial sectors. Highly impactful technology trends like artificial intelligence (AI), 5G networks, big data, and Internet of Things (IoT) require more powerful chips and advanced OLED display platforms. In the mid and long term, this growth is expected to continue through the next decade, as semiconductors have become a critical component in many industries. Unprecedented investments, in the hundreds of billions of euros, are being announced for new chip manufacturing capacity across the world. To produce ever more powerful and energy-efficient chips, innovation in novel materials is essential.

To benefit from the strong electronics industry growth, our plan is to expand our capacities and our capabilities. We have announced investments of significantly more than € 3 billion into innovation and capacities by 2025 aligned to the businesses and regions we serve. These investments are an essential part of our sector’s Level Up growth program, which kicked off at the end of 2021.

We are progressing well in our Level Up program, which focuses on four, mutually reinforcing key priorities: Scale, Technology, Portfolio and Capabilities. With Scale and Technology, we support the ongoing capacity expansion that is happening globally in our focus industries, investing in our footprint in close proximity to our customers while boosting R&D and innovation. Under the priority area Portfolio, Electronics seeks to exploit attractive, external growth opportunities via acquisitions. Furthermore, Level Up is accelerating important internal initiatives under the Capabilities priority. Among other things, it is further leveraging data analytics capabilities and investing even further into the safety realm.

After substantial investments in expanding our production capacities in Surface Solutions, we remain confident to successfully implement its strategic transformation.

Sustainability strategy

Leveraging science and technology

For us, sustainable entrepreneurship and profitable growth go hand in hand. Only by creating value for society can we remain competitive and achieve human progress through our innovations and high-quality products. Responsible action is an integral part of our company culture. This also includes respecting the interests of our employees, customers, investors, and society. Safety and ethics matter just as much to us as business success. We mitigate ethical, economic, environmental, and social risks as far as possible. From the early stages of development through to disposal, we keep an eye on the entire life cycle of a product. We apply strict sustainability standards to our procurement activities. During product manufacture, we strive to keep the environmental impact as low as possible, which is why safe production techniques, high environmental standards and strict quality management are of course so important to us. And with our sustainable products, we also help the companies that we supply to achieve their sustainability goals.

Sustainability is an essential element of our enterprise strategy. We have set ourselves three strategic sustainability goals: In 2030, we will achieve progress for more than one billion people through sustainable science and technology. By 2030, we will integrate sustainability into all our value chains. By 2040, we will be climate neutral and reduce our resource consumption. With these goals, we are helping to achieve the UN Sustainable Development Goals (SDGs). In order to achieve our sustainability goals, we have defined seven focus areas: sustainable innovations and technologies for our customers, impact of our technologies and products on health and well-being, sustainability culture and values, sustainability and transparency in the supply chain, securing our social license to operate in all regions, climate change and emissions, and water and resource intensity.

Implementing the sustainability strategy

In 2022, we focused on creating the right conditions for achieving our sustainability goals. All three business sectors derived sustainability strategies from the overarching company strategy and started executing them.

On the basis of 14 key indicators, which we defined back in 2021, we record and assess our progress towards achieving our sustainability goals. In 2022, we implemented various digital working tools that we believe will allow us to gain greater transparency with regard to our achievements.

In the year under review, we specified that also when assessing potential acquisitions, we would always include sustainability aspects. This will be the case even more so in the future, also when it comes to capital allocation and investment decisions as well as research and development. To assess the potential impacts of our products throughout their entire life cycle, we use a scorecard developed in-house. We introduced this scorecard for all three of our business sectors in 2022. Moreover, we added a sustainability factor to tour Long-Term Incentive Plan (LTIP) in 2022. Details on how this sustainability factor is calculated can be found in the **Compensation Report**.

We are now in the process of transforming the company and are integrating sustainability into the innovation process and all parts of the value chain. It is our aim to decouple the growth of our businesses from negative environmental impacts.

More information on sustainability topics can be found in the **Non-Financial Statement**, which is also part of the management report.

Strategic finance and dividend policy

We pursue a conservative financial policy characterized by the following:

Financial flexibility and a conservative funding strategy

We ensure that we meet our obligations at all times and adhere to a conservative and proactive funding strategy that involves the use of various financial instruments. Our diversified and profitable businesses form the basis for our strong and sustainable cash flow generation capacity. Moreover, we have several funding resources in place. A formerly EUR 2.0 billion syndicated loan facility has been increased to an amount of EUR 2.5 billion in Q4 2022 and now in place until 2027 to cover unexpected cash needs. This credit line is a backup facility that should only be used in exceptional situations.

Merck also agreed upon several bilateral loan facilities. In addition, we have a commercial paper program with a volume of € 2 billion at our disposal. Within the scope of this program, we can issue short-term commercial paper with a maturity of up to one year.

Additionally, as a general rule, the bond market represents a key element. The most recent bond issuance took place in June 2022 (€ 1.0 billion euro bonds) and September 2020 (€ 1.0 billion hybrid bond). The use of various instruments provides a broad financing basis and addresses different investor groups.

Maintaining long-term and reliable business relations with a core group of banks

We mainly work with a well-diversified, financially stable, and reliable group of banks. Due to our long-term business approach, bank relationships typically last for many years and are characterized by professionalism and trust. The banking group consists of banks with strong capabilities and expertise in various products and geographical regions. We regard these banks as strategic partners and involve them in important financing transactions accordingly.

Strong investment-grade rating

The rating of our creditworthiness by external rating agencies is an important indicator of financial stability. A strong investment-grade rating is an important cornerstone of our financial policy, as it safeguards access to capital markets at attractive financial conditions.

On October 17, 2022, we received a rating upgrade by Scope Ratings from A- (positive outlook) to A (stable outlook). Also in October 2022, we received rating confirmations from Moody’s (A3, stable outlook) as well as from Standard & Poor’s (A, stable outlook).

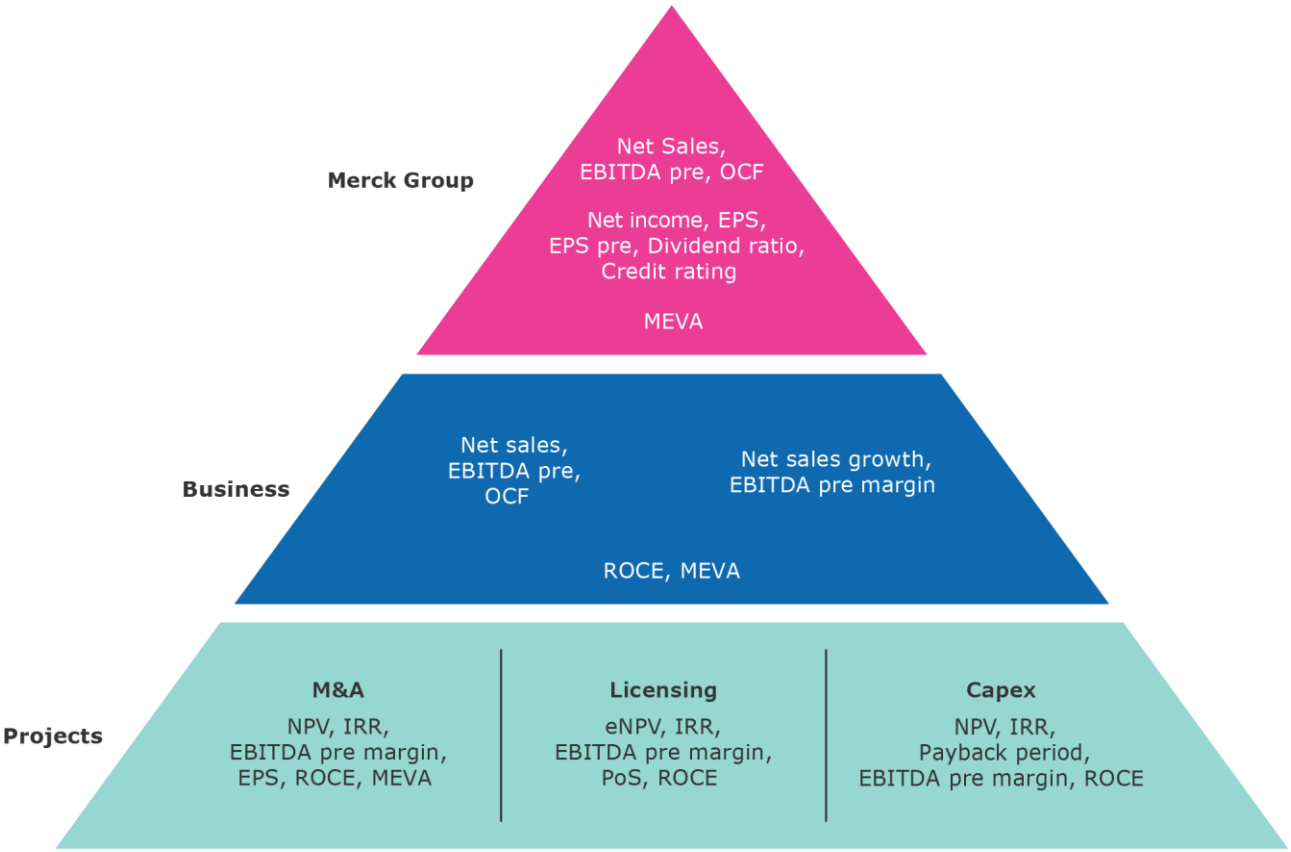
Sustainable dividend policy

We are pursuing a sustainable dividend policy. Provided the economic environment develops in a stable manner, the current dividend represents the minimum level for future dividend proposals. Our dividend policy will follow business development and earnings increases over the coming years. However, dividend growth could deviate, for example, within the scope of restructuring or in the event of significant global economic developments. We aim for a target corridor of 20% to 25% of earnings per share pre.

Internal Management System

As a global company with a diverse portfolio of products and services, we use a comprehensive framework of indicators to manage performance. The most important key performance indicator (KPI) for measuring performance is EBITDA pre[1].

The Value Creation and Financial KPI Pyramid, which summarizes our important financial performance measures, reflects the comprehensive framework of financial KPIs to steer the businesses and prioritize the allocation of cash resources. It consists of three managerial dimensions: Merck Group, Business, and Projects, each of which requires the use of different indicators.



Abbreviations
EBITDA pre [1] = Earnings before interest, income tax, depreciation and amortization as well as adjustments.
EPS = Earnings per share.
MEVA [1] = Merck value added.
OCF [1] = Operating cash flow.
ROCE [1] = Return on capital employed.
NPV [1] = Net present value.
IRR [1] = Internal rate of return.
eNPV [1] = Expected net present value.
PoS [1] = Probability of success.
M&A = Mergers and acquisitions.

[1] Not defined by International Financial Reporting Standard (IFRS)

Key performance indicators of the Group and its businesses

The three key performance indicators of net sales, EBITDA pre, and operating cash flow (OCF) are the most important factors for assessing operational performance. Accordingly, we refer to these KPIs in the Report on Economic Position, the **Report on Risks and Opportunities**, and the Report on Expected Developments. As the most important indicators of financial business performance, the KPIs are key elements of our performance management system.

Net sales

Net sales are defined as the revenues from the sale of goods, services rendered to external customers, and commission income and profit sharing from collaborations, net of value-added-tax, and after sales deductions such as rebates or discounts. Net sales are the main indicator of our business growth and therefore an important parameter of external as well as internal performance measurement. In addition, organic sales growth compared with the operating plan is used for internal performance management. Organic sales growth shows the percentage change in net sales versus a comparative period, adjusted for exchange rate and portfolio effects. Exchange rate effects may arise as a result of foreign exchange fluctuation between the functional non-euro currency of a consolidated company and the reporting currency (euro). By contrast, portfolio effects reflect sales changes due to acquisitions and divestments of consolidated companies or businesses.

Merck Group

Net sales

			Change	
€ million	**2022**	2021	€ million	%
Net sales	**22,232**	**19,687**	**2,546**	**12.9%**

EBITDA pre

EBITDA pre is the main performance indicator measuring ongoing operational profitability and is used internally and externally. To permit a better understanding of the underlying operational performance, the operating result is adjusted to exclude depreciation and amortization, impairment losses and reversals of impairment losses, as well as adjustments. These adjustments are restricted to the following categories: integration expenses, IT expenses for selected projects, restructuring expenses, gains/losses on the divestment of businesses, acquisition expenses, and other adjustments. The classification of specific income and expenses as adjustments follows clear rules and is subject to strict governance at the Group level. Within the scope of internal performance management, EBITDA pre allows for necessary changes or restructuring without penalizing the performance of the operating business. The following table shows the composition of EBITDA pre in fiscal 2022 compared with the previous year. The IFRS figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Merck Group

Reconciliation EBITDA pre[1]

	2022			2021[2]			Change
€ million	IFRS	Elimination of adjustments	pre[1]	IFRS	Elimination of adjustments	pre[1]	pre[1]
Net sales	**22,232**	**–**	**22,232**	**19,687**	**–**	**19,687**	**12.9%**
Cost of sales	-8,527	32	-8,496	-7,351	25	-7,326	16.0%
Gross profit	**13,705**	**32**	**13,737**	**12,335**	**25**	**12,361**	**11.1%**
Marketing and selling expenses	-4,714	32	-4,681	-4,304	17	-4,287	9.2%
Administration expenses[2]	-1,306	115	-1,191	-1,227	83	-1,144	4.1%
Research and development costs[2]	-2,521	75	-2,446	-2,426	8	-2,418	1.2%
Impairment losses and reversal of impairment losses on financial assets (net)	-6	–	-6	1	–	1	>100.0%
Other operating income and expenses[2]	-685	323	-361	-202	76	-125	>100.0%
Operating result (EBIT)[1]	**4,474**			**4,179**			
Depreciation/amortization/ impairment losses/ reversals of impairment losses	2,030	-232	1,798	1,767	-53	1,715	4.9%
EBITDA[3]	**6,504**			**5,946**			
Restructuring expenses	198	-198	–	79	-79	–	
Integration expenses/IT expenses	88	-88	–	81	-81	–	
Gains (-)/losses (+) on the divestment of businesses	-38	38	–	-3	3	–	
Acquisition-related adjustments	29	-29	–	-18	18	–	
Other adjustments	68	-68	–	19	-19	–	
EBITDA pre[1]	**6,849**	**–**	**6,849**	**6,103**	**–**	**6,103**	**12.2%**
thereof: organic growth[1]							6.1%
thereof: exchange rate effects							6.4%
thereof: acquisitions/divestments							-0.3%

[1] Not defined by International Financial Reporting Standard (IFRS).

[2] Adjustment of prior-year figures due to restructuring within Corporate and Other.

[3] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Operating cash flow (OCF)

Operating cash flow results from Merck's current business activities and describes the cash generated from operating activities. It is influenced mainly by EBITDA pre, income tax, the financial result and changes in net working capital.

Merck Group

Operating cash flow

			Change	
€ million	**2022**	2021	€ million	%
EBITDA pre[1]	**6,849**	**6,103**	**746**	**12.2%**
Adjustments[1]	-345	-157	-188	>100.0%
Finance result[2]	-187	-255	68	-26.7%
Income tax[2]	-948	-859	-89	10.4%
Changes in working capital[1]	-917	-349	-568	>100.0%
thereof: Changes in inventories[3]	-604	-472	-133	28.1%
thereof: Changes in trade accounts receivable[3]	-413	-310	-103	33.2%
thereof: Changes in trade accounts payable/refund liabilities[3]	101	433	-332	-76.8%
Changes in provisions[3]	113	196	-83	-42.6%
Changes in other assets and liabilities[3]	-279	-121	-158	>100.0%
Neutralization of gains/losses on disposal of fixed assets and other disposals[3]	-48	-24	-25	>100.0%
Other non-cash income and expenses[3,4]	21	81	-60	-73.9%
Operating cash flow	**4,259**	**4,616**	**-356**	**-7.7%**

[1] Not defined by International Financial Reporting Standard (IFRS).

[2] According to Consolidated Income Statement.

[3] According to the Consolidated Cash Flow Statement.

[4] Adjustment of prior-year figures due to reclassification of the presentation of impairment losses/reversals of impairment losses on financial assets from "Depreciation/amortization/impairment losses/reversals of impairment losses" to "Other non-cash income and expenses".

Investments and value management

Sustainable value creation is essential to secure the long-term success of the company. To optimize the allocation of financial resources, we use a defined set of parameters as criteria for prioritizing investment opportunities and portfolio decisions.

Net present value (NPV)

The main criterion for prioritizing investment opportunities is net present value. It is based on the discounted cash flow method and is calculated as the sum of the discounted free cash flows over the duration of a project. The weighted average cost of capital (WACC), representing the weighted average of the cost of equity and cost of debt, is used as the discount rate. Different markups are applied to the WACC depending on the nature and location of the respective project.

Internal rate of return (IRR)

The internal rate of return is a further important criterion for the assessment of acquisition projects and investments in property, plant and equipment, as well as intangible assets. It is the discount rate that makes the present value of all future free cash flows equal to the initial investment or the purchase price of an acquisition. A project adds value if the internal rate of return is higher than the weighted cost of capital including markups.

Return on capital employed (ROCE)

In addition to NPV and IRR, return on capital employed is an important metric for the assessment of investment projects when looking at individual accounting periods. It is calculated as the adjusted operating result pre (EBIT pre) divided by the sum of property, plant and equipment, intangible assets, trade accounts receivable, trade accounts payable, and inventories.

Payback period

An additional parameter to prioritize investments in property, plant & equipment, and intangible assets is the payback period, which indicates the time in years after which an investment will generate positive net cash flow.

Merck value added (MEVA)

Merck value added gives information about the financial value created in a period. Value is created when the return on capital employed (ROCE) of the company or the business is higher than the weighted average cost of capital (WACC). MEVA metrics provide us with a powerful tool to weigh investment and spending decisions against capital requirements and investors’ expectations.

Capital market-related parameters

Net income, earnings per share (EPS) and earnings per share pre (EPS pre)

Earnings per share are calculated by dividing profit after tax attributable to the shareholders of Merck KGaA (net income) by the weighted average number of theoretical shares outstanding. The use of a theoretical number of shares takes account of the fact that the general partner's capital is not represented by shares. To provide an alternative view, we also report earnings per share pre, in which the effects of integration expenses, IT expenses for selected projects, restructuring expenses, gains/losses on the divestment of businesses, acquisition expenses, and other adjustments are eliminated. Amortization of acquired intangible assets is also eliminated. The adjustment excludes impairment losses on intangible assets for acquired research and development (R&D) projects below a threshold value of € 50 million. Income tax is calculated on the basis of the Group's underlying tax rate. The following table presents the reconciliation of net income to net income pre for the calculation of EPS pre.

Reconciliation net income to net income pre[1]

			Change	
€ million	**2022**	2021	€ million	in %
Net income	**3,326**	**3,055**	**271**	**8.9%**
Non-controlling interest	14	10	3	31.1%
Income tax	948	859	89	10.4%
Amortization of acquired intangible assets	830	803	27	3.4%
Adjustments[1]	345	210	135	64.4%
Income tax on the basis of the underlying tax rate[1]	-1,310	-1,135	-174	15.3%
Non-controlling interests to be adjusted	-14	-10	-3	31.1%
Net income pre[1]	**4,371**	**3,791**	**579**	**15.3%**
Earnings per share pre[1] in €	**10.05**	**8.72**	**1.33**	**15.3%**

[1] Not defined by International Financial Reporting Standards (IFRS).

Credit rating

The rating of our creditworthiness by external agencies is an important indicator of our ability to raise debt capital at attractive market conditions. The capital market makes use of the assessments published by independent rating agencies in order to assist debt providers in estimating the risks associated with a financial instrument. We are currently assessed by Moody's, Standard & Poor's, and Scope. The most important factor for the credit rating is the ability to repay debt, which is determined in particular by the ratio of operating cash flow to net- or gross financial debt.

Dividend ratio

We pursue a reliable dividend policy with a target payout ratio based on EPS pre (see definition above) with the aim of ensuring an attractive return for our shareholders.

Other relevant/non-financial performance measures

Along with the indicators of the financial performance of the businesses, non-financial measures also play an important role in furthering the success of the company. Innovations in the businesses as well as the promotion of a diverse workforce, especially at the leadership level, and sustained planning for the filling of company-critical positions are of particular importance from a Group perspective.

Innovation

Innovation is the foundation of our business and will also be a prerequisite for our future success in changing markets. We are working continuously to develop new products and service innovations for patients and customers. Indicators of the degree of innovation are defined based on the specifics of the respective businesses.

Sustained employee development

We believe that a diverse workforce strengthens our ability to innovate. We actively promote diversity among our leaders in order to create an integrative culture that reflects our values and enables every employee to fulfill their potential. We ensure that our ambitious corporate goals can be realized through strategic succession planning for company-critical positions. To gauge the success of the related measures, we have introduced these two focus issues as non-financial indicators.

Research and Development

Science is at the heart of everything we do. We conduct research and development (R&D) worldwide to develop new products and services to improve the quality of life of patients and satisfy the needs of our customers. Further optimizing the relevance and efficiency of our research and development activities – either on our own or in cooperation with third parties – is one of our top priorities.

Around 7,700 employees (2021: approximately 8,300) worked in research and development and corresponding support functions in 2022. They dealt with innovations to address long-term health and technology trends in both established and growth markets.

Expenditures for R&D amounted to € 2.5 billion in 2022 (2021: € 2.4 billion).

The organizational setup of our R&D activities reflects our structure with three business sectors. In the Life Science business sector, our research activities focus on developing innovative technologies for laboratory and life science applications in government and academic labs, the biopharmaceutical industry, and the industrial sector. We continue to focus on digitized and automated labware, DNA purification for downstream applications, and emerging chemical synthesis, as well as software for our BioContinuum™ Platform to accelerate Biopharma 4.0. In addition, our teams remain dedicated to delivering advancements in our core portfolios, such as filtration, pure lab water, and diagnostic solutions. With our Healthcare business sector's R&D pipeline, we aspire to make a positive difference for patients – always with the goal to help create, improve, and prolong lives. Our main research areas include oncology, immuno-oncology, and immunology including multiple sclerosis. The main focus of our Electronics business sector's research is on the development of innovative materials and technologies required for the manufacturing of ever smaller, faster and more powerful processors and memory chips. In addition, Electronics develops novel materials for next-generation displays and functional and decorative effect pigments for use in the automotive and cosmetics industries and other industrial applications.

We are deeply convinced that science shouldn't be conducted in siloes. We believe a modern, multi-disciplinary approach to science will power the next wave of human progress. We call this approach bioconvergence because it leverages synergies across digital and material science as well as biotechnology. Success depends on the ability to combine a broad mix of competencies and technologies across several disciplines to create novel market solutions. As a diversified science and technology company with leading positions across life science, healthcare and electronics, we are in the sweet spot to pioneer this new era. Our goal is to harness synergies not only within our business sectors, but across them to make innovation much faster, more efficient, and far more impactful.

Examples of these opportunities that we are developing at the intersection of our business sectors and converging technologies include:

- We continue to build our automated design-make-test-analyze platform. This will contribute significantly to revolutionize drug discovery by accelerating discovery of new and better drug candidates and in turn expedite timelines for new therapies to reach patients.
- We are utilizing our capabilities across the group in messenger ribonucleic acid (mRNA) synthesis, lipid nanoparticle (LNP) synthesis and formulation and targeted delivery, and AI to enable the development of "smarter" LNPs that can more effectively target different tissue types including difficult-to-reach biological targets in various disease areas.
- We develop digital twins in smart manufacturing to optimize time, cost, quality, and sustainability. As virtual models designed to accurately reflect a physical object or organism, they can help to improve the time, cost, quality, and sustainability of manufacturing, process optimization, and product development. Examples include making pharma supply chains more traceable and trustful. We developed a model and together with a partner achieved proof-of-concept for pharma primary packaging. Here, authorized stakeholders within the supply chain get immediate access to quality and process data of products at item level.

High-quality, interoperable data combined with analytics and AI offer unprecedented potential for new digital business models adjacent to our current product offering and unlock additional growth opportunities. Examples include Syntropy and Athinia™, which are partnerships with Palantir.

Syntropy represents a data integration and analytics environment wherein healthcare organizations can contextualize and analyze infinitely diverse data types securely across their entire ecosystem, enabling experts to collaborate in the fight against cancer and many other diseases. In addition to existing partnerships with, for example, Mitre, MD Anderson Cancer Center of the University of Texas in Houston, USA, and the University of California, Irvine, USA, Syntropy partnered with another large NCI-designated academic medical center in the US on a pilot in 2022.

Athinia™, launched in December 2021, is targeting the semiconductor industry. It is the only industry-wide collaborative data ecosystem where multiple companies leverage AI to solve critical challenges by utilizing data to improve supply chain transparency, quality, and reliability of materials, and speed up time to market. In July 2022, Micron Technology, a global leader in innovative memory and storage solutions, was announced as a first customer. Together, both parties aim to create a pioneering data collaboration ecosystem that will help lead a continued journey of digital transformation with Micron's critical suppliers.

Research and Development Costs

			Change	
€ million	**2022**	2021	€ million	%
Life Science	399	351	48	13.8%
Healthcare	1,694	1,712	-18	-1.0%
Electronics	308	278	30	11.0%
Corporate and Other[1]	119	85	34	39.6%
Total	**2,521**	**2,426**	**95**	**3.9%**

[1] Adjustment of prior-year figure due to a change in functional allocation between administration expenses, research and development costs as well as other operating expenses.

The ratio of research expenditure to Group sales was 11.3% (2021: 12.3%). The decline is due to the positive sales development.

Life Science*

Across our three business units of Process Solutions, Life Science Services, and Science and Lab Solutions, our R&D teams, composed of approximately 2,000 employees, continue to bring expertise and a diversified and relevant portfolio of products and services to our customers around the world. In 2022, our Life Science business sector focused on delivering breakthrough innovations for our academic, biopharmaceutical, and industrial customers.

As such, we launched more than 27,000 products in 2022, including those launched through our "faucet program" for antibodies, reference materials, chemicals, and nanomaterials.

Process Solutions

In August, we launched the VirusExpress® 293 Adeno-Associated Virus (AAV) Production Platform, making us one of the first Contract Development and Manufacturing Organizations (CDMOs) and technology developers to provide a complete viral vector manufacturing offering including AAV, Lentiviral, CDMO, Contract Testing, and process development. This new platform enables biopharmaceutical companies to increase the speed of clinical

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manufacturing while reducing process development time and costs. It is an extension of our VirusExpress® offering, which can reduce process development time by up to 40%, based on our experience as a CDMO. We also launched Pellicon® capsule manifolds for single-use tangential flow filtration (TFF) production in August. Uniquely designed for faster installation and safer handling of filtration areas, Pellicon® Capsule manifolds offer ease-of-use for scale-up from clinical to small-volume production of biomolecules.

Science and Lab Solutions

We expanded our ZooMAb® recombinant monoclonal antibodies product portfolio with 72 new products and added 23 new products to the ColorWheel® flow cytometry antibodies and dyes portfolio. In April, ZooMAb® recombinant antibodies earned an accountability, consistency, and transparency (ACT) label from My Green Lab, a non-profit focused on promoting sustainability in science. ZooMAb is the first-ever antibody to receive the ACT label designation and received the lowest environmental impact factor (EIF) scores in the chemicals and reagents category. In addition to these factors, the manufacturing facility where the antibodies are produced has implemented energy, water, and waste reduction measures, produces renewable energy from a wind farm, and has an environmental management system program that is International Organization for Standardization 14001 certified.

Also in April, we launched our ReadyStream® system, a novel solution that prepares and instantly dispenses culture media for microbiological food testing. The ReadyStream® system eliminates five time-consuming steps in the testing process, allowing for more streamlined, cost-saving food and beverage testing. ReadyStream is designed to save testing technicians time, resources, and lab space.

In November, we launched AIDDISON™, an AI-powered drug discovery software designed to accelerate drug discovery. The integrated platform allows rapid screening for novel molecules with machine learning models to predict pharmacokinetic profiles and design de novo molecules. This is another step in our journey to digitize the life science industry, allowing medicinal and computational chemists to optimize their in-silico small molecule drug discovery research.

Recognized for award-winning innovation

In 2022, Life Science was recognized by numerous industry organizations for excellence in innovation.

In April, the Process Solutions business unit received the award for the Best New Product/Service for the Bio4C® Software Suite featured in our M Lab™ Collaboration Centers from Interphex and in October, the Best Bioprocessing Supplier Award was given at the Taiwan Biopharma Excellence Awards.

In the fall, Life Science Services was recognized with four different awards, including the Overall Best Cell & Gene Therapy Supplier Award at the Asia Pacific Cell & Gene Therapy Excellence Awards in September; and one award in October, for the ChetoSensar™ platform, given by Pharma Manufacturing's Innovation Awards.

Science and Lab Solutions received two awards. In March, we received the CiteAb Carbohydrate Supplier of the Year award, recognized as the provider with the most citations related to carbohydrates, an important sector within the biochemicals market. In August, our 3-D printable inks were recognized with the R&D 100 award for Multifunctional, 3D-Printable Inks for Energy Products in 2022, as a result of our partnership with Dr. Marcus Worsley from Lawrence Livermore National Laboratory.

Healthcare*

With our Healthcare research, we aspire to make a positive difference for patients – always with the purpose to help create, improve, and prolong lives.

In November 2022, we announced that we aim to launch one new product or indication every 1.5 years on average, bolstered by external innovation. Our companywide focused leadership approach to pipeline enrichment builds on our established expertise in the underlying biology of our core therapeutic areas of oncology, neurology and immunology as well as technological capabilities. By building on our existing strengths and maximizing synergies within our in-house discovered pipeline and with external assets, we will secure sustainable R&D productivity that leads to innovative medicines for patients in need.

Oncology

Oncology is a core focus area in our R&D portfolio, as we aim to deliver transformative treatments. Translational research is embedded into the whole R&D process, with several projects addressing unmet needs in hard-to-treat cancers through innovative treatment approaches and novel combinations. In 2022, we achieved several milestones across our oncology pipeline.

We continue to deliver on our commitment to bring new standards of care for multiple tumor types to as many patients as possible worldwide, with new regulatory approvals of our marketed therapies in additional countries around the world in 2022.

Bavencio® (avelumab), an anti-PD-L1 antibody we are co-developing and co-commercializing with Pfizer Inc., United States, is now approved as a first-line maintenance treatment for locally advanced or metastatic urothelial carcinoma (UC) in adult patients whose disease has not progressed following platinum-based chemotherapy in 63 countries. Bavencio® was first approved for this indication in the United States by the U.S. Food and Drug Administration (FDA) in June 2020. It is also approved as a monotherapy for the treatment of metastatic Merkel cell carcinoma in 63 countries and for the treatment of advanced renal cell carcinoma in combination with axitinib in 60 countries.

In February 2022, the European Commission approved Tepmetko® (tepotinib), our in-house-developed oral MET inhibitor, as monotherapy for the treatment of adult patients with advanced non-small cell lung cancer (NSCLC) harboring alterations leading to mesenchymal-epithelial transition factor gene exon 14 (*MET*ex14) skipping, who require systemic therapy following prior treatment with immunotherapy and/or platinum-based chemotherapy. Tepotinib is now available in several countries globally.

As part of our efforts to bring our medicines to as many patients as possible who may benefit from them, we are assessing these medicines in new settings as well, while also progressing promising molecules from our pipeline. In 2022, we initiated the Phase II JAVELIN Bladder Medley study in 2022. This randomized umbrella study is evaluating whether optimization of first-line maintenance treatment by adding a novel therapy to avelumab could improve outcomes for patients with advanced urothelial carcinoma whose disease did not progress with first-line platinum-containing chemotherapy. JAVELIN Bladder Medley is assessing avelumab monotherapy versus the combination of avelumab with the company's investigational anti-TIGIT antibody M6223; avelumab in combination with Nektar Therapeutics' interleukin-15 (IL-15) receptor agonist, NKTR-255; or avelumab in combination with Gilead Sciences' Trodelvy® (sacituzumab govitecan-hziy).

With the Phase III development program for the potentially first-in-class IAP (Inhibitor of Apoptosis Protein) inhibitor xevinapant, we are building on our long-standing leadership in the treatment of squamous cell carcinoma of the head and neck (SCCHN). We opened the second Phase III clinical trial, XRay Vision (NCT05386550), a randomized, double-blind, placebo-controlled study to evaluate the efficacy and safety of xevinapant versus placebo in combination with adjuvant, post-operative radiotherapy in patients with resected locally advanced (LA) SCCHN who are at high risk for relapse and are ineligible for cisplatin, in 2022.

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Recruitment continues to progress in the international, randomized, double-blind, placebo-controlled, Phase III TrilynX study (NCT04459715) to evaluate the efficacy and safety of xevinapant versus placebo when added to definitive chemoradiotherapy in patients with unresected LA SCCHN.

In 2022, we also have made progress on our ambition to deliver the next generation of innovative medicines for cancer, with two compounds from our pipeline advancing into clinical trials, with Phase I studies underway for our anti-CEACAM5 antibody-drug conjugate (ADC), M9140, and our A2aR_A2bR antagonist, M1069, in advanced solid tumors. M9140, which is the first ADC to enter clinical development that is based on our proprietary technology, showed a convincing preclinical profile with high antitumor potency in multiple models and a suitable safety profile.

We shared new data analyses for our marketed and investigational oncology medicines throughout the year at major congresses.

At the 2022 American Society of Clinical Oncology (ASCO) annual Genitourinary Cancers Symposium, February 17-19, we presented results of an exploratory analysis from the Phase III JAVELIN Bladder 100 trial with 19 additional months of follow-up data from the initial primary analysis. This analysis reinforced the original results and showed that Bavencio® plus best supportive care (BSC) in the first-line maintenance setting prolonged median overall survival by 8.8 months versus BSC alone for patients with locally advanced or metastatic UC whose tumors had not progressed on a platinum-based chemotherapy.

In June, 30 abstracts featuring key data from our broad oncology clinical portfolio were presented at the ASCO Annual Meeting. Highlights included:

New analyses of long-term data from the Phase III JAVELIN Bladder 100 study of Bavencio® as first-line maintenance treatment in advanced UC, including data from subgroups defined by best response to first-line chemotherapy and in patients who did or did not receive second-line treatment after Bavencio® maintenance.

Data for the oral MET inhibitor Tepmetko®, including two poster presentations from the VISION trial reporting efficacy, safety and quality-of-life results of Tepmetko® in Asian patients with *MET*ex14 skipping NSCLC, and updated efficacy and safety results of Tepmetko® and exploratory biomarker analyses in patients with NSCLC with high-level *MET* amplification enrolled into Cohort B of the VISION trial based on liquid biopsy.

Abstracts from key investigator-sponsored studies exploring Erbitux® (cetuximab)-based combinations, including the Phase III FIRE-4 study of early switch-maintenance from Erbitux®/FOLFIRI to bevacizumab/5-FU and rechallenge in later lines for patients with RAS wild-type metastatic colorectal cancer (mCRC), and the Phase II AVETUXIRI study evaluating Bavencio® combined with Erbitux® and irinotecan for refractory microsatellite stable mCRC.

At the European Society of Medical Oncology (ESMO) Annual Meeting, held September 9-13, we shared 29 abstracts, including five late-breaking oral presentations and two additional mini-oral presentations, demonstrating the potential to make a transformative impact for patients with cancer.

For xevinapant, a late-breaking presentation of five-year results from the 96-patient Phase II study showed that adding xevinapant to chemoradiotherapy (CRT) markedly improved long-term efficacy outcomes in patients with unresected LA SCCHN, more than halving the risk of death over five years compared with placebo. This is the first randomized trial in decades to show significant improvement in overall survival in patients with LA SCCHN, reinforcing the transformative potential of xevinapant over standard of care in the curative setting.

- Initial results from the Phase II INSIGHT 2 trial of Tepmetko® plus osimertinib in the treatment of patients with EGFR-mutant NSCLC with *MET* amplification after progression on first-line treatment with osimertinib showed encouraging signs of clinical activity with this targeted, oral, chemotherapy-sparing regimen
- Data from DDRiver Solid Tumors 301, the first-in-human Phase I study of M1774, our potentially best-in-class potent and selective inhibitor of ataxia telangiectasia and Rad3-related (ATR), were featured in a mini-oral presentation. This research, which showed a favorable safety profile and pharmacologically relevant exposure in patients with advanced solid tumors, exemplify our commitment to advancing understanding of DNA damage response (DDR) inhibition mechanisms.
- For Bavencio®, translational data characterizing genomic biomarkers in peripheral blood from patients enrolled in the Phase III JAVELIN Bladder 100 trial were shared as a late-breaker]. Additional presentations included exploratory analyses from JAVELIN Bladder 100 that examined clinical outcomes in long-term responders with advanced UC treated with Bavencio® first-line maintenance for ≥12 months.
- Additional data for Tepmetko® included results from cohorts A and C in the Phase II VISION trial, which demonstrated robust and durable efficacy in treatment-naïve and previously treated patients with metastatic NSCLC with *MET*ex 14-skipping. In previously treated patients, efficacy was observed regardless of prior therapies including immunotherapy and/or platinum-based chemotherapy.

On June 3, we announced that, following an interim analysis of the ongoing global Phase II DDRiver SCLC 250 trial of berzosertib in combination with topotecan in patients with relapsed, platinum-resistant small cell lung cancer (SCLC), the decision has been made to discontinue the study due to low probability of meeting the pre-defined objective of this trial. The safety profile for berzosertib plus topotecan was consistent with that observed in other clinical trials to date. The ongoing development of our ATR inhibitor M1774 will build on learnings from the exploration of berzosertib, which has been studied in approximately 1,000 patients to date in multiple combinations, including with chemotherapy, radiotherapy, immunotherapy and PARP inhibitors across company- and investigator-sponsored studies.

To further support our focused research and development efforts in the area of DDR inhibition, in September 2022 we entered a collaboration agreement with licensing option with Nerviano Medical Sciences S.r.l. for the next-generation highly selective and brain-penetrant PARP1 (poly (ADP-ribose) polymerase) inhibitor NMS-293. NMS-293 has strong potential in combination with a wide variety of DNA-damaging agents, including systemic or targeted chemotherapy (ADCs) or with DDR inhibitors, in numerous tumor types. NMS-293 is in early clinical development for the treatment of patients with BRCA-mutated tumors as monotherapy and in combination with temozolomide in recurrent glioblastoma. The option to license this molecule provides us with the optionality to develop a next-generation PARP inhibitor in combination with our early pipeline of DDR inhibitors and DNA-damaging ADCs.

Neurology & Immunology

Multiple sclerosis (MS) is one of the world's most common neurological diseases. Despite the emergence of a number of therapies in the last two decades, there are still significant unmet needs for people living with MS. As a company we have more than 20 years of experience in MS research, and we remain committed to finding solutions for significant unmet medical needs for those living with the disease.

New data for our investigational treatment evobrutinib, along with Mavenclad® (cladribine tablets) have been presented across key congresses in 2022, including the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) Congress in October, the American Academy of Neurology (AAN) Annual Meeting in April and the Americas Committee for Treatment and Research in Multiple Sclerosis (ACTRIMS) Forum in February.

We presented a total of 39 abstracts at ECTRIMS including data that demonstrated long-term disease stability, showing annualized relapse rates (ARR) remained low and Expanded Disability Status Scale (EDSS) scores were stable for people living with RMS treated with evobrutinib in the longest-running and most extensive analysis of any BTK inhibitor in development for RMS. As well, we presented phase IV study highlights improvement in measures of Quality of Life in people living with RMS after two years of treatment with Mavenclad®.

At AAN, we presented new Phase II data which showed evobrutinib had sustained low annualized relapse rates (ARRs) and had no new safety signals at 2.5 years. As well, updated safety data continue to demonstrate people living with MS that were treated with Mavenclad® (cladribine tablets) for their MS who had confirmed or suspected Covid-19 experienced mild to moderate disease symptoms and no increased risk of serious outcomes.

At ACTRIMS, we presented new Mavenclad® data that showed favorable efficacy outcomes as compared to other oral DMTs, with a lower occurrence of further relapses or disability progression. Additional clinical trial data show people living with MS treated with Mavenclad® early after a first clinical demyelinating event had a lower occurrence of further relapses or disability progression as compared to placebo.

Fertility

At the 2022 European Society of Human Reproduction and Embryology (ESHRE) in July, we announced a clinical study for a new innovative smart fertility patient hormone monitoring solution. This is a non-invasive device that allows hormone monitoring from the comfort of a patient's home while enabling clinicians to monitor hormone levels remotely as well as to support their clinical decisions. Through this device, we hope to improve both the patient experience and the efficiency of clinic workflows by increasing convenience and flexibility. The first patient enrolled in August.

Cardiovascular Metabolism & Endocrinology

The new formulation of Euthyrox® (levothyroxine) for the treatment of hypothyroidism obtained further regulatory approvals in 2022, resulting in a total of 91 countries where this incremental innovation is registered, allowing for more precise dosing.

Glucophage®, containing the active ingredient metformin, is the drug of choice for first-line treatment of type 2 diabetes available in more than 100 countries. It is also approved in 69 countries prediabetes when lifestyle intervention is not enough to control the condition. With a successful label extension of Glucophage® and Glucophage® XR in Europe during this year, our metformin products are the first ones that are authorized to be used, in the approved indications, during the pregnancy and around conception. The label update on the mechanism of action, also achieved for EU this year, gives credit to the still growing understanding and opportunities for metformin in the diabetes continuum.

Concor®/Concor Cor®, containing bisoprolol, is a beta-blocker for treating hypertension and cardiovascular diseases such as coronary heart diseases and chronic heart failure. In addition to Concor®/Concor Cor®, the Concor® family offers fixed-dose combinations such as Concor Plus®/Lodoz® (bisoprolol with hydrochlorothiazide) and Concor AM® (bisoprolol with amlodipine). In 2022, Concor® AM, our fixed-dose combination drug to treat hypertension, has been registered in 68 countries.

Ensuring the supply of our medicines to our patients

We are striving to ensure the supply of our high-quality medicines to patients around the world regardless of circumstances, while always observing the highest standards of health and safety for our people and partners.

Since the start of the Covid-19 pandemic, we have been continuously making every effort to proactively handle the situation and minimize the impact of the pandemic and also of any challenges from the external context on the supply of our medicines locally and globally. To this end, we are using three main levers: the thorough implementation of our business continuity plans across our network and their further development, the active management of our stocks, and the assessment of alternative transportation routes to reach our customers and patients.

In the context of the war in Ukraine, we have taken a number of measures to continue to supply to the best of our ability patients who rely on our medicines in the countries impacted, while ensuring the strictest compliance with international sanctions. These measures include constantly monitoring and updating our demand plans, building safety stocks locally, accelerating the shipment of goods from our European sites to the countries impacted and defining back-up air shipment routes in addition to truck transportation to ensure the highest flexibility at all times.

Building for the future

As part of our commitment to accelerate the discovery and availability of future medicines for patients in need, we marked the cornerstone laying for our Translational Science Center in July, and for our Launch and Technology Center in September, at our Darmstadt campus. They are both expected to be fully operational by the end of 2025 and are part of the € 1.5 billion investment package that we announced in March.

The Translational Science Center, which represents an investment of € 200 million, will be a 30,000 square meter, fully integrated, multi-use building including laboratories, a lecture hall, and office space allowing scientists from different disciplines to explore new avenues of research in fields ranging from identifying disease biomarkers to developing targeted therapies.

The Launch and Technology Center, which represents an investment of € 160 million, will offer 13,900 m^2 of space. It combines a highly technological environment with human-centered design, bridging research and commercial manufacturing, and ensuring that our next generation of pharmaceuticals are available for clinical trials, global launches and commercial supply on time, and in the right quality and quantity.

Biopharma Pipeline

As of: December 31, 2022

Therapeutic area **Compound**	**Indication**	**Status**
Neurology		
Evobrutinib (BTK inhibitor)	Relapsing multiple sclerosis	Phase III
Immunology		
Enpatoran (TLR7/8 antagonist)	Systemic lupus erythematosus/Cutaneous lupus erythematosus	Phase II
Oncology		
Xevinapant (IAP inhibitor)	Locally advanced squamous cell carcinoma of the head and neck – Unresected, cisplatin-eligible[1]	Phase III
Xevinapant (IAP inhibitor)	Locally advanced squamous cell carcinoma of the head and neck – Resected, cisplatin-ineligible	Phase III
Tepotinib (MET kinase inhibitor)	Non-small cell lung cancer, *EGFR* mutant, *MET* amplified[2]	Phase II
Avelumab (anti-PD-L1 mAb) + combinations	Locally Advanced or Metastatic Urothelial Carcinoma[3]	Phase II
M1774 (ATR inhibitor)	Solid tumors[4]	Phase Ib
M4076 (ATM inhibitor)	Solid tumors	Phase Ia
M1231 (Bispecific MUC1xEGFR Antibody drug conjugate)	Solid tumors	Phase Ia
M9140 (anti-CEACAM5 Antibody drug conjugate)	Solid tumors	Phase Ia
M6223 (anti-TIGIT mAb)	Solid tumors[5]	Phase Ib
M1069 (A2aR_A2bR antagonist)	Solid tumors	Phase Ia
Global Health		
Arpraziquantel (anthelmintic)	Pediatric schistosomiasis	Registration
M5717 (PeEF2 inhibitor)	Malaria	Phase I

Unless noted otherwise, clinical programs conducted in collaboration with external partners are not shown unless Merck has co-ownership of data. More information on the ongoing clinical trials can be found at **www.clinicaltrials.gov**. Pipeline products are under clinical investigation and have not been proven to be safe and effective. There is no guarantee any product will be approved in the sought-after indication.

[1] In combination with cisplatin and radiotherapy in unresected LA SCCHN patients eligible for cisplatin.

[2] In combination with osimertinib.

[3] Combinations include Sacituzumab Govitecan, NKTR-255 and M6223.

[4] Study as monotherapy and in combination with niraparib and M4076 ATMi

[5] Includes combinations other than avelumab

A2aR_A2bR: A2A and A2B adenosine receptors
ADC: Antibody Drug Conjugate
ATM: ATM serine/threonine kinase
ATR: Ataxia telangiectasia and Rad3-related protein
BTK: Bruton's tyrosine kinase
CEACAM5: Carcinoembryonic antigen-related cell adhesion molecule 5
EGFR: Epidermal growth factor receptor
IAP: Inhibitor of Apoptosis Proteins
mAb: Monoclonal antibody
MET: MET proto-oncogene, receptor tyrosine kinase
MUC1: Mucin 1, cell surface associated
Phase Ia: Dose finding
Phase Ib: Dose escalation/expansion and signal seeking
PD-L1: Programmed cell death ligand 1
PeEF2: Plasmodium eukaryotic elongation factor 2
TGFbeta: Transforming growth factor beta
TIGIT: T cell immunoreceptor with Ig and ITIM domains
TLR7/8: Toll-like receptors 7 and 8

Electronics*

Within our Electronics business sector, we are one of the leading players in most of our markets. As a science and technology company, we offer leading-edge products, services, and solutions that, in many cases, set us apart from the competition. Our business units are developing advanced materials for next-generation electronics. Our Chief Technology Office (CTO) is identifying trends and vetting technologies that are beyond the time horizon or scope of our business units. As a dedicated technology organization, the CTO is managing research partnerships, shaping our technology roadmaps, and managing our long-term R&D portfolio. We have also created a Technology Leadership Board to review and optimize our technology investment across the business sector. As an essential part of our Level Up growth program, we are investing significantly more than € 3 billion in innovation and capacity until the end of 2025. With these investments, we are also scaling up our research and development capabilities for next-generation semiconductor and display materials to further expand our position as a leading supplier to the electronics industry.

Semiconductor Solutions

We are addressing our customers' critical material needs through every step of the wafer manufacturing process. The outstanding capabilities and competencies of the businesses are diverse and will enable us to bring game-changing innovations for our customers into the market faster.

Our Thin Film Solutions business achieved significant progress in advancing critical PORs (Process of Record) and BKMs (Best Known Methods) for both logic and memory devices, by closely partnering with customers and OEMs: we continue to develop innovative solutions for Silicon containing films to address increasingly challenging problems, make progress in developing high-purity metal-containing precursor offerings enabled by newly engineered container delivery systems, and focus on developing new spin-on dielectric materials with improved gap fill and film characteristics for the most advanced semiconductor devices.

With our Specialty Gases, we continue to make progress with our new etch gas technology program, to develop new chemistries to enable more than 100-layer, single-stack etching for advanced memory devices such as V-NAND. We are also seeing good progress in our etch gas development work for new low-GWP (global warming potential) gases. In August 2022, we announced that we are joining forces with Micron, one of the largest semiconductor companies in the world, to develop low-GWP gas solutions used in the production of semiconductors.

Our Patterning Solutions business continues to heavily invest in pattern transfer technologies for advanced nodes. The proliferation of extreme ultraviolet lithography is gaining momentum in the industry, and our R&D programs for pattern collapse, underlayer, directed self-assembly (DSA) and image rectification are showing excellent progress with key customers. We have engaged in multiple joint development agreements with leading customers and are winning processes of record (PORs) for use of these advanced materials in high-volume chip manufacturing. We have embarked on a cross-business field program to drive the implementation of organometallic compounds into the photolithography segment. We are seeing strong interactions in hard masks and resist development with leading Asian customers leading to improved performance. As the need for heterogeneous integration drives advanced wafer packaging technologies, innovation in conventional lithography materials and formulated wet cleans is required. We are collaborating with leading companies to support this innovation and have won a new POR supporting hybrid bonding processes.

Our Planarization business is driving new product development across advanced oxide and metal segments by capitalizing on the proximity of our R&D lab to our leading customers in Asia and the United States. We are also leveraging data analytics in product development and quality control to speed up time to market for our customers while providing more predictive in-use performance for our customers. More recently, our Planarization Business focused on introducing industry-leading dielectric and tungsten slurries used in advanced node DRAM (Dynamic random-access memory) and NAND (flash memory named for the NAND logic gate)

* The contents of this chapter or section are voluntary and therefore not audited. However, our auditor has read the text critically.

applications. Also, the team has introduced new copper and copper barrier slurries in collaboration with key foundry and logic customers to enable advanced node logic, analog and multi-layer packaging applications.

Our Silicon Valley-based material innovation accelerator Intermolecular saw an increase in the amount of work done in its labs for quantum computing and neuromorphic computing companies. These companies benefit from the flexible device processing infrastructure and deep materials knowledge to quickly achieve tangible products in these emerging technology areas. For more than 15 years, Intermolecular has been exploring, testing, and developing advanced materials that are revolutionizing the next generation of electronics.

Display Solutions

Our display materials are enabling the fast-growing market of innovative displays for current and future applications such as foldable smartphones, rollable TVs, or AR/VR (Augmented Reality/Virtual Reality) devices. With liviFlex™-H, we are providing passivation solutions as protective film to free-form OLED display and are running customer qualifications at this moment. Furthermore, we are active in the development of innovative material solutions in close cooperation with customers and partners for next-generation displays, for example micro-LEDs, low k TFE (Thin Film Encapsulation), and AR/VR displays.

Our liquid crystal technology ultra-brightness fringe-field switching (UB-FFS) continues its successful growth, thanks to new product qualifications and rising demand in the liquid crystal displays (LCD) sector for mobile devices, especially mobile phones, tablet PCs and notebooks. The development of high-resolution 4K and 8K TV sets continues to pose a challenge, as the LCD backlight transmission and efficiency will be reduced due to higher pixel density. We are therefore actively working to expand our ultra-bright (UB) technology offering with our UBplus liquid crystal materials for the TV market. We are also introducing new mode Chiral-polymer stabilized vertical alignment (C-PS-VA) to boost up the transmittance of PS-VA technology. With such technologies, we increase the light transmission efficiency of applications for large-format TV sets and display panels by 10% to 15%. This contributes hugely to the reduction of power consumption and helps our customers and consumers to meet sustainability targets.

Deuteration is another key technology we are working on to realize next-generation OLED. Deuterated materials have the potential to more than double the lifetime of OLED stacks without compromising on efficiency and voltage. In general, we observe increased lifetime with higher deuteration degrees of the material. We are working with our customers to enable lifetime enhancement, focused on high purity, responsible consumption of raw materials and supply and process robustness.

Our LC-based technology licriOn™ enables extensive connectivity access, even in remote areas where fast internet connections are unavailable or unaffordable today. As part of our open innovation campaign, we completed the Ferroelectric Nematic Liquid Crystals (FNLCs) research challenge. These materials show very unique properties which could enable new, exciting applications like actuators, energy harvesting, memory, capacitors and supercapacitors. More than 50 researchers around the world submitted application ideas for this fascinating new material already predicted 100 years ago, but only recently were researchers able to confirm their existence – a discovery which doesn’t happen all too often.

Surface Solutions

In our Surface Solutions business, we focus on the empowerment of our customers to create surfaces that do what they need them to do – and look exactly the way they expect them to look. Thus, together with our customers, we not only develop product innovations but place more and more focus on new application technologies and process excellence to provide customized solutions for the individual challenges of our clients.

In our automotive pigments business, our pipeline consists of three pillars: product development, application engineering and effect visualization. We are actively working on the extension of our portfolio of Colorstream® multicolor-effect pigments with outstanding saturation in the bluish red color space as an ideal complementation of the existing Colorstream® Lava Red. We will also add a fine light silver Iriodin® pigment to our metallic stylings, offering a unique brightness and opacity.

With the development of a highly-viscous Durazane® polymer, we will extend the application field of anti-scratch and easy-to-clean coatings towards thicker films. With the development of a novel Durazane® formulation, we constantly extend the application field of durable anti-scratch, anti-graffiti and easy-to-clean coatings.

In addition, we push the boundaries of science and technology to lead our customers on the path to digitization of color evaluation processes. That is why we are implementing a digital setup that allows us to produce highly reliable color data as additional service for our customers.

In our Cosmetics business, we continue to put sustainability at the center of our efforts by focusing more and more on natural materials in our portfolio. Therefore, we will introduce additional cosmetic active materials from botanical sources with unique efficacy addressing anti-aging and anti-inflammatory claims. We also considered sustainability in the development of the first range of metal-free metal-look pigments for unique cosmetic effects based on proprietary and novel technology of pigment particle coating.

By broadening our portfolio of inorganic UV filters with two new products based on zinc oxide (ZnO_2), we will strengthen our position as one of the leading UV experts for light protection and tanning.

With the market introduction of additional specialty products for high-security applications, we will also extend our Securalic® portfolio offering our customers more reliable and highly discreet counterfeit detection.

Report on Economic Position

Macroeconomic and Sector-Specific Environment

According to the latest World Economic Outlook published on January 30, 2023, the International Monetary Fund (IMF) states that the current economic challenges will continue to slow down the global economy on a broad basis and more sharply than previously expected. Global inflation continued to rise significantly during 2022 and led to a cost-of-living crisis in many regions. Inflation is forecasted to have reached its peak in late 2022, but it is expected to remain elevated for longer than initially anticipated due to ongoing supply shortages and rising energy and food prices. The inflation pressure triggered a tightening of monetary and financial conditions together with a significant appreciation of the U.S. dollar. Further challenges to the global economy include, among others, China's recovery of private consumption and investments in its real estate sector, climate change, tight labor markets in many countries, as well as geopolitical tensions including the war in the Ukraine, the re-alignment of energy supplies and the recent deterioration in China-U.S. relations threatening international trade and policy cooperation.

According to the latest IMF forecasts, global gross domestic product (GDP) growth slowed from 6.2% in 2021 to 3.4% in 2022. The slowdown of economic activity is visible across all economies. Advanced economies registered a growth of 2.7% (2021: 5.4%) while emerging markets and developing economies saw growth of 3.9% (2021: 6.7%). The GDP of the United States grew significantly slower with 2.0% (2021: 5.9%). The euro area recorded a GDP growth of 3.5% in 2022 (2021: 5.3%). The emerging economies of Asia registered a growth of 4.3% (2021: 7.4%). The strongest growth driver was India with 6.8% (2021: 8.7%). The GDP growth of China slowed down to 3.0% after initial recovery from the impacts of the pandemic in 2021 with 8.4% growth. As part of the advanced economies, the GDP of Japan grew by 1.4% (2021: 2.1%).

Our organic sales growth was above the IMF's global growth expectations in 2022 at 6.4%. It was supported by all regions. Europe accounted for the highest share of Group-wide growth with 42.3%, followed by Asia-Pacific with 24.2%, North America with 17.8%, Latin America with 12.3% and the Middle East and Africa with 3.4%.

The overall growth was predominantly driven by the Life Science business sector, despite declining Covid-19 tailwinds in 2022. Healthcare and Electronics also contributed positively to the organic sales growth. All business sectors supported growth in Europe and Latin America. Growth in the Asia-Pacific region was principally the result of operations in the Healthcare and Life Science business sectors while growth in North America was driven by the Life Science and Electronics business sectors.

Development in 2022 and 2021

	Change 2022[1]	Change 2021
Life Science		
Growth in market for laboratory products[2]	4.4%	10.4%
Growth in global sales of biopharmaceutical drugs[2]	13.6%	11.4%
Share of biopharmaceutical sales in the global pharmaceutical market[3]	34.6%	33.1%
Early clinical monoclonal antibody (mAb) pipeline growth[4]	7.7%	12.6%
Healthcare		
Global pharmaceutical market	6.7%	8.9%
Market for multiple sclerosis therapies[5]	2.0%	-3.4%
Market for type 2 diabetes therapies[5]	18.3%	10.8%
Market for fertility treatment[5]	4.9%	28.7%
Market for the treatment of colorectal cancer[6]	-1.2%	-16.4%
Electronics		
Growth of wafer area for semiconductor chips	4.9%	14.1%
Growth of liquid crystal display surface area[7]	-4.5%	4.3%
Global sales of cosmetics and care products	15.8%	4.6%
Global number of produced light vehicles	6.4%	3.0%

[1] Predicted development. Final development rates for 2022 were not available for all industries when this report was prepared.

[2] The Global Market for laboratory products, December 2022, Frost & Sullivan. Deceleration compared to 2021 growth attributed to declining sales for Covid-19-related life science products despite strong core growth.

[3] Global pharmaceutical spending at a constant exchange rate. IQVIA market data based on the past 12 months as of the third quarter of 2022.

[4] Number of programs in Phase I or Phase II clinical trials, Cortellis.

[5] Growth rates based on market data in local currency, translated at a constant euro exchange rate. The IQVIA market data on the growth of indications are based on current figures, including the third quarter of 2022. Annual growth based on the values for the past 12 months. The type 2 diabetes market excludes the United States, since this market is insignificant to Merck.

[6] Growth rates based on market data stated in US dollars. Market data from EvaluatePharma on the growth of indications are based on published company reports and are subject to exchange rate fluctuations.

[7] Growth of display area is a pure volume indicator, which is counteracted by a negative price momentum.

Life Science

Our Life Science business sector is a leading global supplier of products, tools, and services for research laboratories, pharma and biotech production, and industrial and testing laboratories. As production of vaccines, treatments, and tests for the Covid-19 pandemic decline from their peak, robust underlying growth of the core (non-Covid-19) market results in a sustained strong outlook.

According to the market research firm Frost & Sullivan, the market for laboratory products, which is relevant to our Science & Lab Solutions business unit, grew 4.4% in 2022 (2021: 10.4%). Given strong core demand but anticipated declining demand for Covid-19 applications compared with strong previous support from additional Covid-19 revenues, the market is expected to grow in the mid-single digits longer term.

In the pharma and biotech production market, in which our Process Solutions and Life Science Services business units are active, demand is driven by the development and manufacture of therapeutics and vaccines. According to IQVIA, the end market for biopharmaceuticals grew by 14.3% in 2022 (2021: 12.0%) to € 452 billion (or 35.4% of the global pharmaceutical market). Monoclonal antibodies (mAbs), currently the leading area of biopharmaceuticals, continued to develop positively in 2022 with the number of molecules in phase 1 or 2 development growing by 7.7% (2021: 12.6%). This deceleration in year-over-year growth reflects a normalization from pandemic-era peaks in phase 1/2 pipeline growth for mAbs, viral gene therapies, and other recombinant proteins. For mAbs, year-over-year growth in the early-stage clinical pipeline remains similar to pre-pandemic rates (average 8.8% annual growth from 2018-2020).

Healthcare

In its latest study from September, the pharmaceutical market research firm IQVIA forecasts growth of 6.7% in 2022 (2021: 8.9%) for the global overall pharmaceutical market. With continued recovery from the Covid-19 pandemic, the pharmaceutical market is expected to see still high growth rates benefitting from accelerated approval pathways and increased access to innovative drugs globally. This is balanced by increasing cost containment measures driving biosimilar and generics uptake as well as stricter price reviews and prescription controls.

The developments at a regional level follow the described trend. EMEA (Europe, Middle East and Africa) grew 7.5% in 2022 (2021: 7.7%) with the EU5 growing at 7.3% (2021: 8.2%). North America grew 7.0% (2021: 7.8%) with the United States recording the same growth rate of 7.0% (2021: 7.8%). In absolute terms, the pharmaceutical market in the United States remains the biggest and most important market by far. Latin America achieved double-digit growth of 16.5% (2021: 24.9%) followed by the Asia-Pacific region (excluding China and Japan) with 8.6% growth (2021: 11.4%). China is an exception with an assumed negative growth of -1.8% in 2022 (2021: 7.6%) driven by regional and local lockdowns due to Covid-19 and continued extension of price regulations (for example, volume-based procurement) despite increasing access to innovative products and enlarged healthcare infrastructure.

Not only the growth of the pharmaceutical sector as a whole, but also the market development for biotechnologically produced active ingredients is relevant to our business. As previously stated, the market volume for biological pharmaceuticals totaled approximately € 452 billion in 2022 (2021: approximately € 396 billion) according to IQVIA, thus continuing the increase in market share of recent years. These products accounted for 35.4% of the global pharmaceutical market in 2022 (2021: 33.6%). The most important market for biological pharmaceuticals remains the United States, with a 63.2% share of global biopharmaceutical market volumes.

The developments in the therapeutic areas of relevance to Merck saw differing trends in the reporting year. The global market for type 2 diabetes excluding the United States and Russia followed the growth trend of previous years and accelerated growth, achieving 18.3% in 2022 (2021: 10.8%). The therapeutic area of infertility grew 4.9% in the reporting year (2021: 28.7%) after a significant recovery in 2021 from the pandemic in which, for example, clinics were partially closed. Colorectal cancer further declined by -1.2% in 2022 (2020: -16.4%) due to biosimilar penetration. The growth trend in the market for multiple sclerosis therapies improved compared with the previous year level of 2.0% (2021: -3.4%), as new product launches counteracted the effect of market decline due to generic competition.

Electronics

The semiconductor industry is the most important market for our business with materials, solutions and services for the production of integrated circuits (Semiconductor Solutions). In particular, the growth in demand for semiconductor materials depends mainly on the wafer area produced for semiconductors. The silicon wafers required as raw materials are used as an indicator to estimate the demand for semiconductor materials overall. According to the global industry association SEMI, the area of delivered silicon wafers grew by 4.9% in 2022, after strong growth in 2021 (14.1%). While demand for electronic devices is normalizing after the Covid-19-induced investment and upgrade cycle in 2020 and 2021, the ongoing trend of digitization and the required digital infrastructure (network, servers, 5G) continues. Semiconductors are a key component for many applications including communications, consumer electronics, automotive, transportation, clean energy, aerospace, and defense.

Driven by the aforementioned acceleration of digitization and the corresponding exponential data growth, there is a continuing need for semiconductors across all device end-markets. The high demand for and importance of semiconductors is clearly visible in the recent slow easing of the global chip bottleneck shortage and their geopolitical relevance. For this reason, all major chip manufacturers increased and accelerated their investment plans for new fabs and additional capacities. Combined with ongoing technology upgrades, these investments

will lead to rising demand for innovative materials. Our targeted semiconductor materials market is expected to have a strong long-term growth, with some cyclicality.

With our Liquid Crystals business, we are a leading producer of liquid crystal mixtures for the display industry. After the Covid-19-induced “stay at home boom” the display industry is undergoing demand normalization. The market research company OMDIA (forecast Q3 2022) forecasts a market decline in 2022. In the medium to long term, liquid crystals will continue to play a key role in the display industry in the future. OLED technology, for which we are also one of the leading material suppliers, is becoming increasingly important in high-end display applications.

The markets for automotive coatings and cosmetics are crucial to our Surface Solutions business. According to LMC, a leading global provider of automotive forecasts, global automobile production grew by 6.4% in 2022 after 3.0% growth in 2021 and a strong dip in 2020. The market is expected to continue with 4.8% growth in 2023, reaching 2019 production volumes in 2024. Underlying drivers include an ongoing latent global demand related to Covid-19 and a reduction in supply chain problems of recent years. China continues to be one of the most important markets. The market for cosmetics and care products showed a continuing, very strong development with an overall growth of 15.8% in 2022 (2021: 4.6%) following the dip in 2020. After the negative effects of Covid-19 regarding lockdowns and social distancing and increased trade conflicts between the United States and China last year, Euromonitor, a leading global provider of market research, expects the market growth to be sustainable at ~4-6% per year until 2026.

Review of Forecast against Actual Business Developments

The forecast of the Merck Group for fiscal 2022 published in the Annual Report for fiscal 2021 comprised the forecast for the Group as well as the forecast for the three business sectors: Life Science, Healthcare, and Electronics.

Net sales

We forecast strong organic net sales growth for the Group in 2022. In particular, the geopolitical and economic conditions changed in the course of the year. Additionally, renewed outbreaks of Covid-19 in China and the zero-Covid strategy pursued by the Chinese government meant that temporary, locally restricted lockdowns were imposed there. Driven by the sustained dynamic organic growth of the Life Science business sector in particular, we recorded organic growth in net sales of 6.4% in fiscal 2022, thus falling within our forecast range last revised to organic sales growth of between +6% and +8% with the publication of the figures for the third quarter. At the start of the year, we still anticipated positive exchange rate effects of between +1% and +4% on our net sales. However, several currencies saw more favorable development than expected as the year progressed, particularly the U.S. dollar and the Chinese renminbi. The positive exchange rate effect in 2022 as a whole was +6.1%, thus falling within the range of between +5% and +8% set out in our most recent update in the third quarter. The slightly positive portfolio effect was negligible at +0.4%. All in all, net sales amounted to € 22,232 million, representing a year-on-year increase of +12.9%.

Life Science

Our Life Science business sector generated organic sales growth of 8.2% in 2022, this falling within the forecast range of +7% to +10% that was specified in the first quarter. This meant that Life Science also achieved the original forecast of strong organic sales growth. This development was driven by all three business units, namely Process Solutions, Life Science Services and Science & Lab Solutions. As expected, Process Solutions was again the most dynamic business unit, delivering the largest contribution to the organic sales growth within Life Science. All in all, net sales in the Life Science business sector increased by 15.4% to € 10,380 million, including a positive exchange rate effect of 6.4% and a positive portfolio effect of 0.8%.

Healthcare

We originally forecast solid organic sales growth for our Healthcare business sector compared with the previous year. We then quantified this organic sales growth forecast at between +4% and +7% when we published the figures for the first quarter. Having retained this forecast, we achieved it with organic growth of +5.5% in fiscal 2022. This development was driven in particular by the significant growth contribution from oncology business and, above all, strong growth in our recently approved product Bavencio®. Neurology & Immunology also made a substantial contribution to organic sales growth thanks to our recently approved product Mavenclad® in particular. As we originally forecast for fiscal 2022, we returned to solid organic sales growth in the Cardiovascular, Metabolism and Endocrinology franchise. Taking into account a positive exchange rate effect of 5.1%, net sales in the Healthcare business sector increased by 10.6% to € 7,839 million in fiscal 2022.

Electronics

Since we anticipated positive development in semiconductor business, we forecast solid to strong organic sales growth for our Electronics business sector at the start of the year. We quantified our organic sales growth forecast at between +5% and +8% when we published the figures for the first quarter. In addition to various economic and geopolitical factors leading to an expected slowdown in growth in the Semiconductor Solutions business in the second half of the year compared with the previous forecast, our Display Solutions business saw weaker organic growth in the third quarter. Accordingly, we lowered our forecast for the Electronics business

sector to organic sales growth of between +2% and +5% with the publication of the figures for the third quarter. The business sector achieved this reduced forecast with organic sales growth of 3.7%. Thanks to positive exchange rate effects of 7.6%, the Electronics business sector increased its net sales by 11.3% year-on-year to € 4,013 million.

EBITDA pre

For 2022, we originally forecast strong year-on-year organic growth in EBITDA pre for the Merck Group. This assumption was based on the expectation of strong organic growth in Life Science, moderate to solid growth in Healthcare, and solid organic growth in Electronics. Because of the expected favorable foreign exchange environment, we originally expected positive exchange rate effects to impact EBITDA pre by between +2% and +5% compared with the prior year. With the presentation of the figures for the first quarter, we quantified our forecast for organic growth in EBITDA pre at between +5% and +9%. Thanks to positive exchange rate effects, especially from the U.S. dollar and the Chinese renminbi, we raised our forecast for the impact of exchange rate effects on EBITDA pre twice in the course of fiscal 2022, ultimately ending with a forecast of between +6% and +10%. EBITDA pre amounted to € 6,849 million in fiscal 2022, representing a total increase of 12.2% compared with the previous year. At +6.1%, organic sales growth fell within our forecast range of between +5% and +9%. Positive exchange rate effects amounted to +6.4%, thereby coming in at the lower end of our final forecast range. The slightly negative portfolio effect was negligible at -0.3%.

Life Science

In line with the anticipated strong organic revenue growth in Life Science, we also forecast strong organic growth in EBITDA pre in this business sector. We quantified our forecast for organic growth in EBITDA pre at between +6% and +10% in the first quarter and raised it to between +8% and +11% with the publication of the figures for the second and third quarter. In addition to reflecting the more precise forecast range for net sales growth in the Life Science business sector, this range takes account of the dynamic development of demand, the accompanying operating levers, and the product mix. With EBITDA pre of € 3,760 million in fiscal 2022 (2021: € 3,286 million) and year-on-year organic growth of 9.7%, the business sector's earnings performance fell within the forecast range. Exchange rate effects had an additional positive effect of 5.1% on EBITDA pre compared with fiscal 2021. The slightly negative portfolio effect was negligible at -0.4%.

Healthcare

We forecast moderate to solid organic growth in EBITDA pre for our Healthcare business sector on the back of substantial expected earnings contributions from our new products, especially Mavenclad®, as well as the decline in marketing and selling expenses and research and development costs as a proportion of sales thanks to systematic cost management and strict pipeline prioritization. Largely because of the absence of non-recurring effects from the previous year, this original forecast was slightly below the expected organic growth in net sales (solid organic sales growth). With the publication of the figures for the first quarter, we quantified our forecast for organic growth in EBITDA pre at between +3% and +5% in fiscal 2022. This forecast was subsequently retained. We ultimately recorded year-on-year organic growth in EBITDA pre of +3.3% in fiscal 2022, thus falling within the forecast range. Exchange rates had an additional positive effect of 11.7% on EBITDA pre compared with the previous year, thereby coming in at the lower end of the most recent forecast range of between +12% and +15%.

Electronics

For the Electronics business sector, we originally anticipated solid organic growth in EBITDA pre in fiscal 2022. We expected the growth in Semiconductor Solutions to more than offset falling prices for liquid crystals with the support of active price and cost management. In response to greater adverse effects from increased raw material and logistics costs, which we were only able to partially offset by taking countermeasures, we quantified our forecast range for organic EBITDA pre growth at between +0% and +4% with the presentation of the figures for the first quarter. After initially adjusting our forecast range slightly to between +0% and +3% with the publication of the figures for the second quarter, we lowered it significantly to a year-on-year decrease of between -7% and -10% when the figures for the third quarter were presented. The main reasons for this development were a higher projected downturn in demand as well as falling prices for liquid crystals. Electronics recorded EBITDA pre of € 1,192 million across 2022 as a whole (2021: € 1,128 million). This represented a year-on-year organic decline of -7.3%, which was at the upper end of our forecast range. Exchange rates had an additional positive effect of 13% on EBITDA pre compared with fiscal 2022 (most recent forecast range +13% to +16%).

Corporate and Other

The expenses for Corporate and Other in EBITDA pre amounted to € -579 million in fiscal 2022. This was in line with the most recent forecast range of between € -570 million and € -600 million but higher than the forecast range issued with the publication of the figures for the first quarter, which was between € -510 million and € -570 million. The amended forecast range reflects the changed assumptions regarding exchange rate developments and the associated expected negative effects of currency hedging transactions, which partially offset the positive foreign exchange effects in the business sectors. Compared with the prior-year figure of € -465 million, this corresponded to an increase in costs of 24.7%.

Operating cash flow

We originally anticipated a significant year-on-year increase in the operating cash flow of the Merck Group in 2022 (2021: € 4,616 million). We quantified this forecast at between € 4,500 million and € 5,100 million with the presentation of the figures for the first quarter in order to reflect an increase in working capital as well as the expected payments within the scope of the ongoing transformation and growth programs in fiscal 2022 (especially in the Healthcare and Electronics business sectors). The operating cash flow amounted to € 4,259 million in fiscal 2022, which was lower than the quantified forecast range of between € 4,500 million and € 5,100 million. In addition to the reasons already mentioned this was mainly due to the higher tax payments.

Merck Group

	Net sales	EBITDA pre	Operating Cash Flow	EPS pre
Actual results 2021 in € million	19,687	6,103	4,616	€ 8.72
Forecast for 2022 in the 2021 Annual Report	• Strong organic growth • Positive foreign ex-change effect of 1% to 4%	• Strong organic growth • Negative foreign exchange effect of -2% to -5%	• Strong increase	
Main comments	• Strong organic growth in Life Science • Solid organic growth in Healthcare • Solid to strong organic growth in Electronics • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi	• Strong organic growth in Life Science • Moderate to solid organic growth in Healthcare • Solid organic growth in Electronics • Positive foreign exchange effects particularity from the U.S. dollar and the Chinese renminbi	• Organic increase in EBITDA pre as well as positive foreign exchange effects • Rise in working capital within the scope of business performance • Payouts for ongoing transformation programs, particularly in Healthcare and Electronics • Higher fluctuation corridors than for net sales and EBITDA pre are to be expected	
Forecast for 2022 in the interim report:				
Q1/2022	~18,500 to 19,500 • Organic increase of +6% to +9% • Exchange rate effect +3% to +6%	~6,600 to 7,100 • Organic increase of +5% to +9% • Exchange rate effect +4% to +8%	~4,500 to 5,100	€ 9.60 to € 10.50
Q2/2022	~21,900 bis 23,000 • Organic increase of +6% to +9% • Exchange rate effect +5% to +8%	~6,750 bis 7,250 • Organic increase of +5% to +9% • Exchange rate effect +6% to +10%	~4,500 to 5,100	€ 9.85 to € 10.75
Q3/2022	~22,000 to 22,900 • Organic increase of +6% to +8% • Foreign exchange effect +5% to +8%	~6,800 to 7,200 • Organic increase of +5% to +10% • Foreign exchange effect +6% to +10%	~4,500 to 5,100	€ 9.90 to € 10.70
Results 2022 in € million	22,232 (+12.9%: +6.4% organic, +0.4% portfolio, +6.1% currency)	6,849 (+12.2%: +6.1% organic, -0.3% portfolio, +6.4% currency)	4,259 -7.7%	€ 10.05 +15.3%

Life Science

	Net sales	EBITDA pre	Operating Cash Flow
Actual results 2021 in € million[1]	8,992	3,287	n/a
Forecast for 2022 in the 2021 Annual Report	• Strong organic growth • Slight to moderately positive foreign exchange effect	• Strong organic earnings growth • Slight to moderately positive foreign exchange effect	n/a
Main comments	• All businesses contribute to organic growth • Process Solutions remains the strongest growth driver contributing Covid-19-related sales of up to € 900 million • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi	• Organic earnings growth owing to the expected sales growth • Positive foreign exchange effects particularity from the Chinese renminbi and the U.S. dollar	n/a
Forecast for 2022 in the interim report:			
Q1/2022	~10,000 to 10,650 • Organic increase of +7% to +10% • Exchange rate effect +3% to +6%	~3,600 to 3,850 • Organic increase of +6% to +10% • Exchange rate effect +3% to +6%	n/a
Q2/2022	~10,150 to 10,750 • Organic increase of +7% to +10% • Exchange rate effect +5% to +8%	~3,700 to 3,900 • Organic increase of +7% to +10% • Exchange rate effect +4% to +7%	n/a
Q3/2022	~10,200 to 10,700 • Organic increase of +7% to +10% • Foreign exchange effect +5% to +8%	~3,700 to 3,900 • Organic increase of +8% to +11% • Foreign exchange effect +4% to +7%	n/a
Results 2022 in € million	10,380 (+15.4%: +8.2% organic, +0.8% portfolio, +6.4% currency)	3,760 (+14.4%: +9.7% organic, -0.4% portfolio, +5.0% currency)	n/a

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

Healthcare

	Net sales	EBITDA pre	Operating Cash Flow
Actual results 2021 in € million	7,089	2,153	n/a
Forecast for 2022 in the 2021 Annual Report	• Solid organic growth • Slight to moderately positive foreign exchange effect	• Moderate to solid organic growth • Solid to strong positive foreign exchange effect	n/a
Main comments	• Continued significant growth contributions from Mavenclad® and Bavencio® as well as contributions from Tepmetko® • CM&E franchise returns to growth following negative impacts in the previous year due to the volume-based procurement regulations in China • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi	• Expected substantial earnings contribution especially from Mavenclad® can more than offset the effect from the expected decline in sales of Rebif® • Marketing and selling expenses as well as research and development costs with a decreasing share of sales due to systematic cost management and strict pipeline prioritization • Absence of one-time effects from the previous year • Positive foreign exchange effects particularly from the U.S. dollar and the Chinese renminbi	n/a
Forecast for 2022 in the interim report:			
Q1/2022	~7,600 to 8,000 • Organic increase of +4% to +7% • Exchange rate effect +3% to +6%	~2,350 to 2,500 • Organic increase of +3% to +5% • Exchange rate effect +8% to +12%	n/a
Q2/2022	~7,700 to 8,050 • Organic increase of +4% to +7% • Exchange rate effect +4% to +7%	~2,450 bis 2,550 • Organic increase of +3% to +5% • Exchange rate effect +12% to +15%	n/a
Q3/2022	~7,700 to 8,850 • Organic increase of +4% to +7% • Foreign exchange effect +4% to +7%	~2,450 to 2,550 • Organic increase of +3% to +5% • Foreign exchange effect +12% to +15%	n/a
Results 2022 in € million	**7.839 (+10.6%: +5.5% organic, 0.0% portfolio, +5.1% currency)**	**2,477 (+15.0%: +3.3% organic, 0.0% portfolio, +11.7% currency)**	**n/a**

Electronics

	Net sales	EBITDA pre	Operating Cash Flow
Actual results 2021 in € million[1]	3,606	1,128	n/a
Forecast for 2022 in the 2021 Annual Report	• Solid to strong organic growth • Moderate to solid positive foreign exchange effect	• Solid organic growth • Solid to strong positive foreign exchange effect	n/a
Main comments	• Strong growth dynamic in Semiconductor Solutions and OLED materials • Positive foreign exchange effects particularly from the U.S. dollar and individual Asian currencies	• Growth in Semiconductor Solutions can more than offset price decline in Liquid Crystals supported by active price and cost management Positive foreign exchange effects particularly from the U.S. dollar and individual Asian currencies	n/a
Forecast for 2022 in the interim report:			
Q1/2022	~3,950 to 4,150 • Organic increase of +5% to +8% • Exchange rate effect +4% to +7%	~1,200 to 1,300 • Organic increase of +0% to +4% • Exchange rate effect +9% to +12%	n/a
Q2/2022	~4,050 to 4,250 • Organic increase of +5% to +8% • Exchange rate effect +6% to +9%	~1,250 to 1,300 • Organic increase of +0% to +3% • Exchange rate effect +12% to +15%	n/a
Q3/2022	~4,000 to 4,150 • Organic increase of +2% to +5% • Foreign exchange effect +6% to +9%	~1,190 to 1,240 • Organic increase of –7% to –10% • Foreign exchange effect +13% to +16%	n/a
Results 2022 in € million	**4,013 (+11.3%: +3.7% organic, 0.0% portfolio, +7.6% currency)**	**1,192 (+5.7%: -7.3% organic, 0.0% portfolio, +13.0% currency)**	**n/a**

[1] Figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

Corporate and Other

	EBITDA pre	Operating Cash Flow
Actual results 2021 in € million	-465	n/a
Forecast for 2022 in the 2021 Annual Report	• For Corporate and Other, we expect a slight increase in costs in fiscal 2022. This takes into consideration expected negative effects from foreign currency hedging, which will partially offset positive foreign exchange effects in the business sectors.	
Forecast for 2022 in the interim report:		
Q1/2022	~–510 to –570	
Q2/2022	~–560 to –610	
Q3/2022	~–570 to –600	
Results 2022 in € million	**-579 (+24.7%: -13.7% organic, +1.2% portfolio, +37.1% currency)**	

Course of Business and Economic Position

Merck Group

Overview of 2022

- Group net sales up € 2.5 billion or 12.9% to € 22.2 billion (2021: € 19.7 billion)
- Organic sales growth of 6.4%; foreign exchange effects of 6.1%
- Group EBITDA pre improves by 12.2% to € 6.8 billion (2021: € 6.1 billion), with the EBITDA pre margin amounting to 30.8% (2021: 31.0%)
- Earnings per share pre increases by 15.3% to € 10.05 (2021: € 8.72)
- Operating cash flow of the Merck Group amounts to € 4.3 billion (2021: € 4.6 billion)
- Reduction in net financial debt of 4.9% to € 8.3 billion (December 31, 2021: € 8.8 billion)

Merck Group

Key figures

			Change	
€ million	**2022**	2021	€ million	%
Net sales	22,232	19,687	2,546	12.9%
Operating result (EBIT)[1]	4,474	4,179	296	7.1%
Margin (% of net sales)[1]	20.1%	21.2%		
EBITDA[2]	6,504	5,946	558	9.4%
Margin (% of net sales)[1]	29.3%	30.2%		
EBITDA pre[1]	6,849	6,103	746	12.2%
Margin (% of net sales)[1]	30.8%	31.0%		
Profit after tax	3,339	3,065	274	8.9%
Earnings per share (€)	7.65	7.03	0.62	8.8%
Earnings per share pre (€)[1]	10.05	8.72	1.33	15.3%
Operating cash flow	4,259	4,616	-357	-7.7%

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

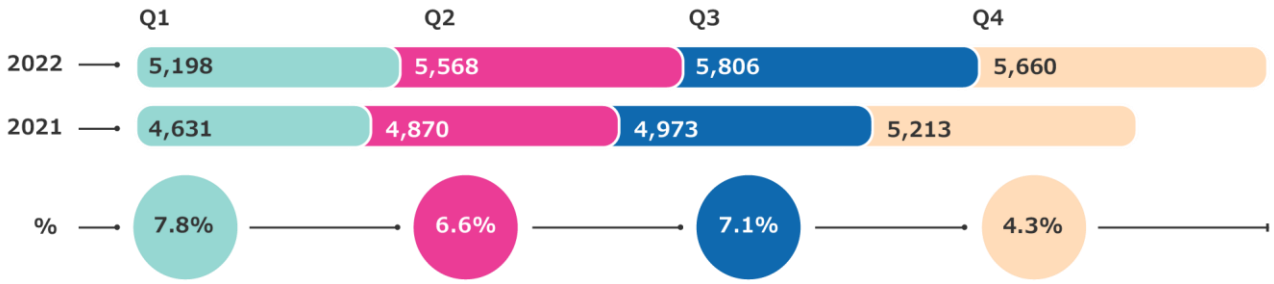
Development of sales and results of operations

In fiscal 2022, the Merck Group generated net sales of € 22,232 million (2021: € 19,687 million), representing a year-on-year increase of € 2,546 million or 12.9%. This positive development was attributable to organic net sales growth of € 1,262 million or 6.4% and was driven by all of the Group's business sectors. Positive foreign exchange effects, which resulted primarily from the development of the U.S. dollar and the Chinese renminbi, led to an increase in net sales of € 1,208 million or 6.1% in fiscal 2022. The portfolio-related net sales increase of € 76 million or 0.4% mainly resulted from the acquisition of Exelead Inc., United States, which closed on February 22, 2022.

The net sales in the individual quarters as well as the respective organic growth rates in 2022 are presented in the following graph:

Merck Group

Net sales and organic growth[1] by quarter[2]
€ million/organic growth in %

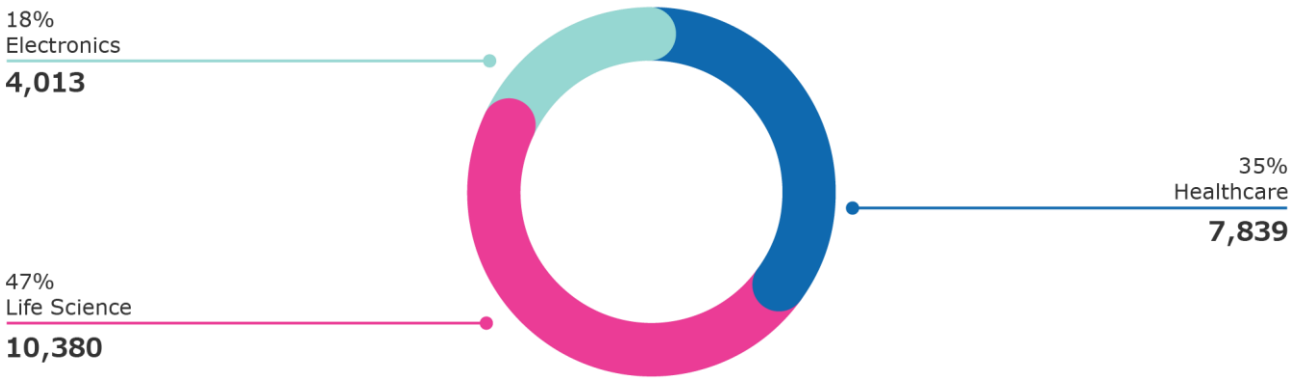


[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Net sales in the Life Science business sector increased by € 1,389 million or 15.4% year-on-year to € 10,380 million (2021: € 8,992 million). This development was attributable to organic growth of 8.2%, which was supported by a positive foreign exchange effect of 6.4% and an increase in net sales of 0.8% due to the acquisition of Exelead Inc., United States. Accounting for 47% of Group sales (2021: 46%), Life Science was the strongest business sector in terms of net sales. It was followed by Healthcare with 35% of Group sales (2021: 36%), where net sales rose by € 750 million or 10.6% to € 7,839 million in the year under review (2021: € 7,089 million). Organic sales growth of 5.5% was accompanied by positive foreign exchange effects of 5.1%. The € 407 million or 11.3% increase in net sales in the Electronics business sector to € 4,013 million (2021: € 3,606 million) resulted from organic net sales growth of 3.7% and positive foreign exchange effects of 7.6%. The percentage contribution of Electronics to Group net sales was unchanged year-on-year at 18%.

Merck Group

Net sales by business sector - 2022
€ million/% of net sales



Merck Group

Net sales by business sector[1]

€ million	2022	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2021	Share
Life Science	10,380	47%	8.2%	6.4%	0.8%	15.4%	8,992	46%
Healthcare	7,839	35%	5.5%	5.1%	–	10.6%	7,089	36%
Electronics	4,013	18%	3.7%	7.6%	–	11.3%	3,606	18%
Merck Group	**22,232**	**100%**	**6.4%**	**6.1%**	**0.4%**	**12.9%**	**19,687**	**100%**

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Reporting Standards (IFRS).

In fiscal 2022, the Merck Group recorded the following regional sales performance:

Merck Group

Net sales by region

€ million	2022	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2021	Share
Europe	6,248	28%	9.4%	0.3%	0.4%	10.1%	5,675	29%
North America	6,361	29%	4.2%	12.8%	0.9%	17.9%	5,397	27%
Asia-Pacific (APAC)	7,697	35%	4.4%	5.3%	–	9.7%	7,020	36%
Latin America	1,231	5%	15.6%	8.4%	0.3%	24.3%	990	5%
Middle East and Africa (MEA)	695	3%	7.0%	7.9%	–	15.0%	605	3%
Merck Group	**22,232**	**100%**	**6.4%**	**6.1%**	**0.4%**	**12.9%**	**19,687**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

The Consolidated Income Statement of the Merck Group is as follows:

Merck Group

Consolidated Income Statement

					Change	
€ million	**2022**	**%**	2021	%	€ million	%
Net sales	**22,232**	**100.0%**	**19,687**	**100.0%**	**2,546**	**12.9%**
Cost of sales	-8,527	-38.4%	-7,351	-37.3%	-1,176	16.0%
Gross profit	**13,705**	**61.6%**	**12,335**	**62.7%**	**1,370**	**11.1%**
Marketing and selling expenses	-4,714	-21.2%	-4,304	-21.9%	-410	9.5%
Administration expenses[1]	-1,306	-5.9%	-1,227	-6.2%	-79	6.5%
Research and development costs[1]	-2,521	-11.3%	-2,426	-12.3%	-95	3.9%
Impairment losses and reversals of impairment losses on financial assets (net)	-6	–	1	–	-7	>100.0%
Other operating income and expenses[1]	-685	-3.1%	-202	-1.0%	-483	>100.0%
Operating result (EBIT)[2]	**4,474**	**20.1%**	**4,179**	**21.2%**	**296**	**7.1%**
Financial result	-187	-0.8%	-255	-1.3%	68	-26.7%
Profit before income tax	**4,287**	**19.3%**	**3,924**	**19.9%**	**364**	**9.3%**
Income tax	-948	-4.3%	-859	-4.4%	-89	10.4%
Profit after tax	**3,339**	**15.0%**	**3,065**	**15.6%**	**274**	**8.9%**
Non-controlling interests	-14	-0.1%	-10	-0.1%	-3	31.1%
Net income	**3,326**	**15.0%**	**3,055**	**15.5%**	**271**	**8.9%**

[1] Adjustment of prior-year figures due to a change in functional allocation within Corporate and Other.

[2] Not defined by International Financial Reporting Standards (IFRS).

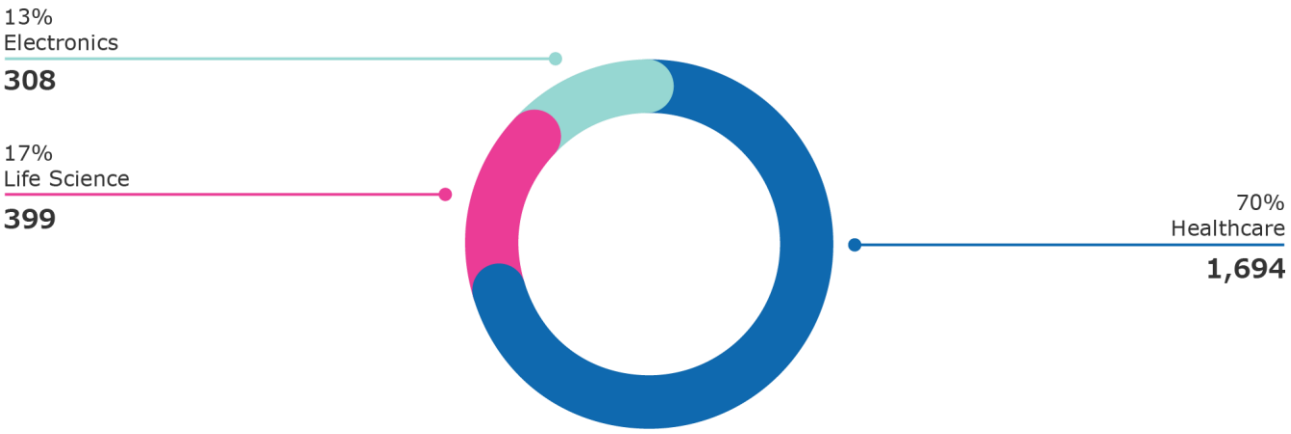
The positive business performance in fiscal 2022 led to an increase of 11.1% in the Merck Group's gross profit to € 13,705 million (2021: € 12,335 million). The resulting gross margin of the Group, i.e. gross profit as a percentage of net sales, amounted to 61.6% (2021: 62.7%).

Group-wide research and development costs rose by 3.9% to € 2,521 million in 2022 (2021: € 2,426 million) and led to a research spending ratio (research and development costs as a percentage of net sales) of 11.3% (2021: 12.3%). Accounting for a 70% (2021: 73%) share[1] of Group R&D spending, Healthcare was the most research-intensive business sector of the Merck Group. Further information can be found in the "**Research and Development**" chapter.

[1] Not including research and development costs of € 119 million allocated to Corporate and Other.

Merck Group

Research and development costs by business sector[1] - 2022
€ million/%



[1] Not presented: research and development costs of € 119 million allocated to Corporate and Other.

Net other operating expenses and income increased to € -685 million in fiscal 2022 (2021: € -202 million). This was due to higher other operating expenses, which were significantly influenced by impairment losses on non-financial assets and a negative currency result from cash flow hedging as well as higher expenses for profit share agreements in the Healthcare business sector. In addition, other operating income declined as a result of lower upfront, milestone and license payments in the Healthcare business sector in particular (see explanations under "**Healthcare**"). Detailed information about the development and composition of other operating expenses and income can be found in Note (13) "**Other operating income**" and Note (14) "**Other operating expenses**" in the Notes to the Consolidated Financial Statements.

The 7.1% increase in the operating result (EBIT) to € 4,474 million (2021: € 4,179 million) was mainly driven by the positive development of gross profit.

An increase in provisions for obligations under long-term variable compensation programs (Merck Long-Term Incentive Plan) had an adverse effect on the operating result in the year under review, with the rise in the intrinsic value of the Merck Share Units being reflected in the respective functional costs depending on the area of activity of the plan beneficiaries.

The financial result improved by 26.7% to € -187 million in fiscal 2022 (2021: € -255 million). This was due in particular to the positive development of net interest income compared with the previous year. Details about the Group's financial income and expenses can be found in Note (40) "**Finance income and expenses/Net gains and losses from financial instruments**" in the Notes to the Consolidated Financial Statements.

Income tax expense amounted to € 948 million in 2022 (2021: € 859 million) and resulted in a tax rate of 22.1% (2021: 21.9%). Further information on income taxes can be found in Note (15) "**Income tax**" in the Notes to the Consolidated Financial Statements.

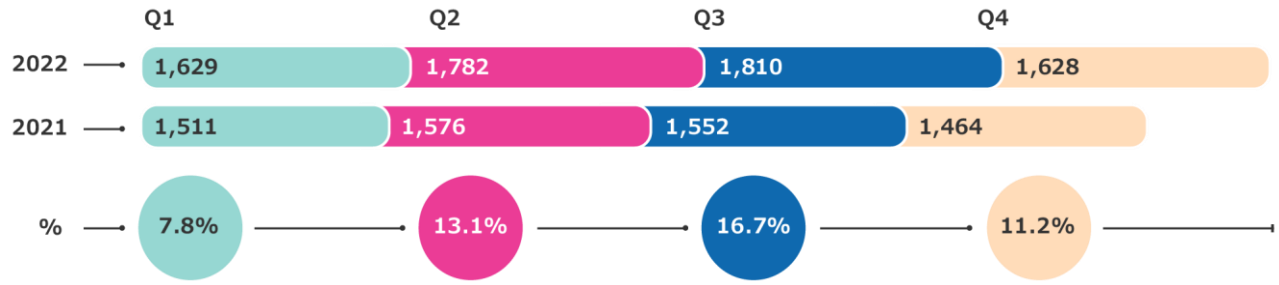
The net income attributable to Merck KGaA shareholders increased by 8.9% to € 3,326 million (2021: € 3,055 million) and resulted in an improvement in earnings per share to € 7.65 in fiscal 2022 (2021: € 7.03).

EBITDA pre, the key financial indicator used to steer operating business, rose by € 746 million or 12.2% to € 6,849 million (2021: € 6,103 million). Organic earnings growth amounted to 6.1% and foreign exchange effects had an impact of 6.4%, while portfolio effects amounted to -0.3%. The EBITDA pre margin of the Merck Group (EBITDA pre as a percentage of net sales) amounted to 30.8% (2021: 31.0%). The reconciliation of the operating result (EBIT) to EBITDA pre is presented in the "**Internal Management System**" chapter.

The development of EBITDA pre in the individual quarters in comparison with 2021 as well as the respective growth rates are presented in the following overview:

Merck Group

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

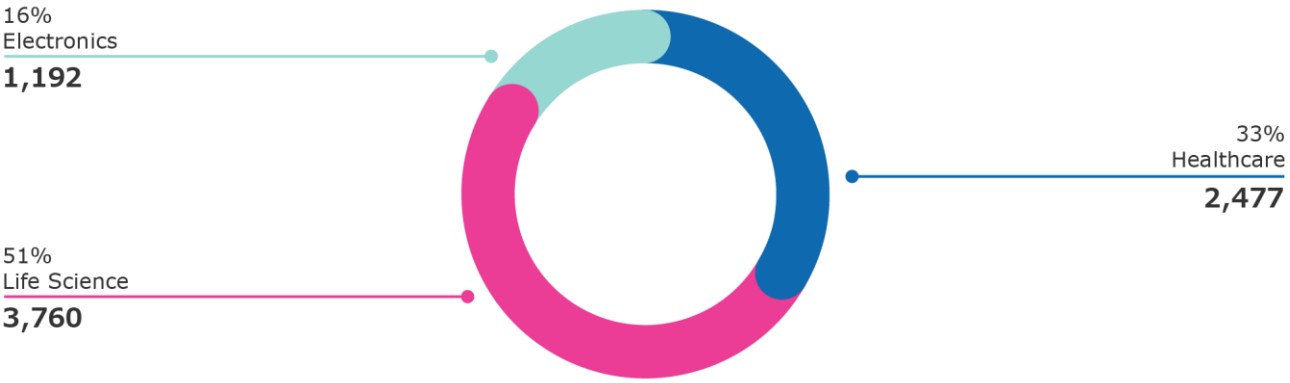
The biggest contribution to the growth in Group EBITDA pre came from the Life Science business sector, which generated EBITDA pre of € 3,760 million, up 14.4% on the previous year (2021: € 3,287 million). This meant the EBITDA pre margin in Life Science amounted to 36.2% in fiscal 2022 (2021: 36.6%). The share of Group EBITDA pre attributable to the Life Science business sector (not taking into account the € -579 million reduction due to Corporate and Other) rose to 51% (2021: 50%).

EBITDA pre in the Healthcare business sector increased by 15.0% to € 2,477 million (2021: € 2,153 million). Accordingly, the EBITDA pre margin rose to 31.6% in fiscal 2022 (2021: 30.4%). The share of Group EBITDA pre attributable to the Healthcare business sector was unchanged year-on-year at 33%.

The Electronics business sector increased its EBITDA pre by 5.7% to € 1,192 million in fiscal 2022 (2021: € 1,128 million). The share of Group EBITDA pre attributable to the Electronics business sector amounted to 16% in 2022 (2021: 17%). The EBITDA pre margin declined to 29.7% (2021: 31.3%).

Merck Group

EBITDA pre[1] by business sector[2] - 2022
€ million/%



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Not presented: Decline in Group EBITDA pre by €-579 million due to Corporate and Other.

Net assets and financial position

Merck Group

Balance sheet structure

	Dec. 31, 2022		Dec. 31, 2021		Change	
	€ million	**%**	€ million	%	€ million	%
Non-current assets	**36,325**	**74.9%**	**34,380**	**75.8%**	**1,945**	**5.7%**
thereof:						
Goodwill	18,415		17,004		1,410	
Other intangible assets	7,302		7,612		-311	
Property, plant and equipment	8,203		7,217		986	
Other non-current assets	2,406		2,546		-141	
Current assets	**12,201**	**25.1%**	**10,982**	**24.2%**	**1,219**	**11.1%**
thereof:						
Inventories	4,632		3,900		732	
Trade and other current receivables	4,114		3,646		468	
Other current financial assets	321		174		147	
Other current assets	1,280		1,362		-82	
Cash and cash equivalents	1,854		1,899		-45	
Total assets	**48,526**	**100.0%**	**45,362**	**100.0%**	**3,164**	**7.0%**
Equity	**26,005**	**53.6%**	**21,416**	**47.2%**	**4,590**	**21.4%**
Non-current liabilities	**13,007**	**26.8%**	**13,515**	**29.8%**	**-507**	**-3.8%**
thereof:						
Non-current provisions for employee benefits	2,030		3,402		-1,372	
Other non-current provisions	299		269		30	
Non-current financial debt	9,200		8,270		931	
Other non-current liabilities	1,477		1,574		-96	
Current liabilities	**9,513**	**19.6%**	**10,432**	**23.0%**	**-919**	**-8.8%**
thereof:						
Current provisions	611		601		10	
Current financial debt	1,228		2,531		-1,304	
Trade and other current payables/ refund liabilities	3,410		3,219		191	
Other current liabilities	4,264		4,081		184	
Total equity and liabilities	**48,526**	**100.0%**	**45,362**	**100.0%**	**3,164**	**7.0%**

The total assets of the Merck Group amounted to € 48,526 million as of December 31, 2022 (December 31, 2021: € 45,362 million), representing an increase of 7.0% or € 3,164 million in the year under review. In addition to the impact of the successful operating business performance, this increase was due in particular to exchange rate changes.

The year-on-year increase in property, plant and equipment was attributable to additions of € 1,730 million (2021: € 1,443 million), which significantly exceeded depreciation and disposals in the reporting period.

Of the additions to property, plant and equipment in 2022, € 279 million (2021: € 198 million) related to strategic investments in Germany, including € 234 million for the expansion of the Darmstadt site. Among other things, the Life Science business sector invested € 39 million in a new membrane production plant and € 35 million in a new filling and logistics center in Schnelldorf. The Healthcare business sector also invested € 28 million in a new research center. Outside Germany, high levels of strategic investments were recorded in the United States (€ 232 million), Ireland (€ 97 million) and Switzerland (€ 80 million) in particular. In the United States, the Life Science business sector invested € 23 million in a new manufacturing facility for gene therapy products in Carlsbad, while the Electronics business sector invested € 21 million in a new production facility for specialty gases for the semiconductor industry in Hometown. In Ireland, the Life Science business sector invested € 76 million in the expansion of membrane production capacities and the construction of a new filtration plant in Cork. In Switzerland, the Healthcare business sector invested € 54 million in a new development center for the manufacture of biotechnological products.

In fiscal 2022, the equity of the Merck Group rose by 21.4% to € 26,005 million (December 31, 2021: € 21,416 million). This increase was attributable not only to profit after tax (€ 3.3 billion), but especially to a positive currency translation difference (€ 1.2 billion) as well as adjustments to pension provisions recognized in equity owing to the increase in the discount factors (€ 1.4 billion). By contrast, the dividend payments and profit distribution in the reporting year served to reduce equity (see "**Consolidated Statement of Changes in Net Equity**" in the Consolidated Financial Statements). The equity ratio improved by more than six percentage points to 53.6% (December 31, 2021: 47.2%).

The composition and the development of net financial debt were as follows:

Merck Group

Net financial debt[1]

			Change	
€ million	**Dec. 31, 2022**	Dec. 31, 2021	€ million	%
Bonds and commercial paper	8,726	9,320	-594	-6.4%
Bank loans	203	36	168	>100.0%
Liabilities to related parties	919	896	23	2.6%
Loans from third parties and other financial debt	59	56	3	5.3%
Liabilities from derivatives (financial transactions)	30	35	-5	-13.3%
Lease liabilities	491	459	32	6.9%
Financial debt	**10,428**	**10,801**	**-373**	**-3.5%**
less:				
Cash and cash equivalents	1,854	1,899	-45	-2.4%
Other current financial assets[2]	247	149	98	65.9%
Net financial debt[1]	**8,328**	**8,753**	**-425**	**-4.9%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

[2] Excluding current derivatives (operational) and contingent considerations, which are recognized in the context of business combinations according to IFRS 3.

Merck Group

Reconciliation of net financial debt[1]

€ million	2022	2021
January 1	**8,753**	**10,758**
Operating Cash Flow	-4,259	-4,616
Payments for investments in intangible assets[2]	275	355
Payments from the disposal of intangible assets[2]	-38	-39
Payments for investments in property, plant and equipment[2]	1,531	1,066
Payments from the disposal of property, plant and equipment[2]	-21	-7
Acquisitions[2]	854	4
Payments from divestments[2]	-4	-1
Change in lease liabilities	187	151
Dividend payments/profit withdrawals[2]	967	757
Currency translation difference	86	203
Other	-3	122
December 31	**8,328**	**8,753**

[1] Not defined by International Financial Reporting Standards (IFRS).

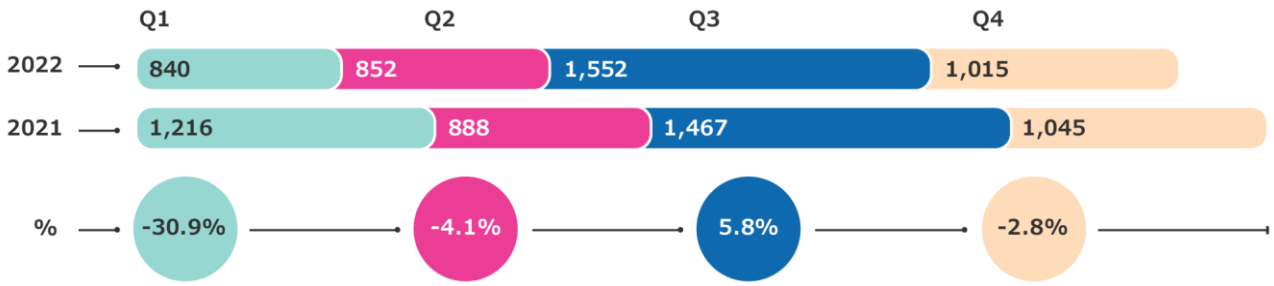
[2] As reported in the Consolidated Cash Flow Statement.

The composition of operating cash flow, which is one of the three most important key performance indicators alongside net sales and EBITDA pre, is presented in the "**Internal Management System**" chapter.

In fiscal 2022, operating cash flow decreased by -7.7% to € 4,259 million (2021: € 4,616 million). Further information about the development of the operating cash flow can be found in the "**Consolidated Cash Flow Statement**" in the Consolidated Financial Statements and Note (16) "**Operating cash flow**" in the Notes of the Consolidated Financial Statements. The distribution of operating cash flow across the individual quarters and the percentage changes in comparison with 2021 were as follows:

Merck Group

Operative cash flow[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

The capital market uses the assessments published by rating agencies to help lenders assess the risks of a financial instrument used by Merck. Merck is currently rated by Standard & Poor's, Moody's, and Scope. Standard & Poor's has issued a long-term credit rating of A with a stable outlook, Moody's a rating of A3 with a stable outlook, and Scope a rating of A– with a stable outlook. An overview of the development of our rating in recent years is presented in the **Report on Risks and Opportunities**.

The development of key balance sheet figures was as follows:

Merck Group

Key balance sheet figures

%		Dec. 31, 2022	Dec. 31, 2021	Dec. 31, 2020	Dec. 31, 2019	Dec. 31, 2018
Equity ratio[1]	Total equity / Total assets	53.6%	47.2%	40.7%	40.9%	46.7%
Asset ratio[1]	Non-current assets / Total assets	74.9%	75.8%	77.8%	79.4%	75.0%
Asset coverage[1]	Total equity / Non-current assets	71.6%	62.3%	52.3%	51.5%	62.3%
Finance structure[1]	Current liabilities / Liabilities (total)	42.2%	43.6%	37.3%	45.7%	43.3%

[1] Not defined by International Financial Reporting Standards (IFRS).

Overall assessment of business performance and economic situation

Despite the challenging societal and macroeconomic environment, Merck can look back on a successful fiscal 2022 in which it remained on its growth path. However, growing geopolitical tensions mean that Merck remains compelled to respond to various challenges and uncertainties around the world. Nevertheless, the strong business performance in fiscal 2022 once again served to underline Merck's impressive resilience in difficult times, which has always proved to be an important competitive advantage in the past.

Our 'Big 3' growth drivers – Process Solutions and Life Science Services in the Life Science business sector, new products from the Healthcare development pipeline, and Semiconductor Solutions in the Electronics business sector – made a particularly important contribution to our success. The Merck Group generated sales growth in all regions in its three business sectors. All in all, the Merck Group increased its net sales by 12.9% or € 2.5 billion to € 22.2 billion in fiscal 2022. With organic growth of 6.4% or € 1.3 billion, we reached an important milestone on the way to achieving our medium-term growth target of sales of around € 25 billion by 2025. Our most important key performance indicator, EBITDA pre, increased by 12.2% to € 6.8 billion. In light of our successful performance in fiscal 2022, we will propose to the Annual General Meeting that the dividend payment be increased by 19% to € 2.20 per share.

The solid financing policies of the Merck Group were reflected in its consistently good key balance sheet figures. The equity ratio was an impressive 53.6% as of December 31, 2022 (December 31, 2021: 47.2%). Net financial debt was reduced further, amounting to € 8.3 billion at the end of the fiscal year.

Merck's extremely successful business performance allowed it to continue to expand its excellent financial flexibility. This forms the basis for realizing our ambitious investment and growth plans and means we are still planning to increase total investments between 2021 and 2025 by more than 50% compared with the previous five-year period.

Based on our solid net assets and financial position as well as our profitable operations, we view the economic situation of the Merck Group as positive overall. Thanks to our resilient business model and our clear positioning as a science and technology company, we are well positioned even in economically challenging times.

Life Science

Life Science

Key figures[1]

€ million	2022	2021	Change € million	Change %
Net sales	10,380	8,992	1,389	15.4%
Operating result (EBIT)[2]	2,808	2,480	328	13.2%
Margin (% of net sales)[2]	27.1%	27.6%		
EBITDA[3]	3,678	3,258	420	12.9%
Margin (% of net sales)[2]	35.4%	36.2%		
EBITDA pre[2]	3,760	3,287	473	14.4%
Margin (% of net sales)[2]	36.2%	36.6%		

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Reporting Standards (IFRS).

[3] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

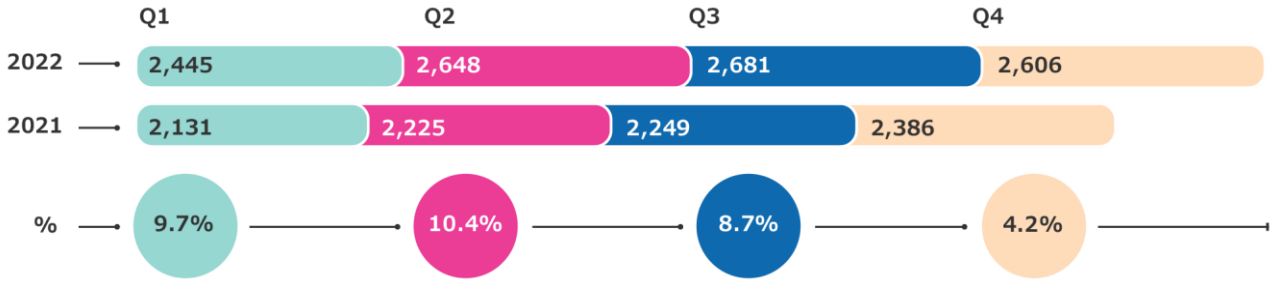
Development of sales and results of operations

In fiscal 2022, Life Science generated organic sales growth of 8.2%. Including a favorable foreign exchange effect of 6.4% and a portfolio effect of 0.8%, net sales grew by 15.4% compared with the previous year. All three business units contributed to the organic growth, with the largest contribution coming from Process Solutions followed by Science & Lab Solutions and Life Science Services. Overall, Life Science net sales increased to € 10,380 million (2021: € 8,992 million).

The development of sales in the individual quarters in comparison with 2021 as well as the respective organic growth rates are presented in the following graph:

Life Science

Net sales[1] **and organic growth**[2] **by quarter**[3]
€ million/organic growth in %



[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.
[2] Not defined by International Financial Reporting Standards (IFRS).
[3] Quarterly breakdown unaudited.

Life Science

Net sales by business unit[1]

€ million	2022	Share	Organic growth[2]	Exchange rate effects	Acquisitions / divestments	Total change	2021	Share
Science & Lab Solutions	4,898	47%	6.2%	6.0%	–	12.2%	4,367	48%
Process Solutions	4,526	44%	10.9%	6.6%	–	17.5%	3,853	43%
Life Science Services	956	9%	6.1%	8.0%	9.8%	23.9%	772	9%
Life Science	**10,380**	**100%**	**8.2%**	**6.4%**	**0.8%**	**15.4%**	**8,992**	**100%**

[1] Prior-year figures have been adjusted owing to the reorganization of the Life Science business sector completed on April 1, 2022, as well as to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Accounting Standards (IFRS).

The Science & Lab Solutions business unit, which provides products and services to support life science research for pharmaceutical, biotechnology, academic research laboratories and researchers as well as scientific and industrial laboratories, delivered organic sales growth of 6.2% in 2022. This was mainly driven by growth in the core business amid a decline in pandemic-related demand. Including a favorable foreign exchange effect of 6.0%, net sales amounted to € 4,898 million (2021: € 4,367 million). Science & Lab Solutions thus accounted for 47% of Life Science net sales (2021: 48%). Organic sales growth was mainly driven by Asia-Pacific and North America.

The Process Solutions business unit, which markets products and services for the pharmaceutical production value chain, generated organic sales growth of 10.9%. While pandemic-related business declined as expected, the performance of the core business was robust. Including a favorable foreign exchange effect of 6.6%, net sales increased to € 4,526 million in 2022 (2021: € 3,853 million). The percentage contribution of the Process Solutions business unit to Life Science net sales was 44% (2021: 43%). In regional terms, mainly Europe and North America contributed to the organic sales growth within Process Solutions.

The Life Science Services business unit, which offers fully integrated Contract Development and Manufacturing Organization (CDMO) and Contract Testing services, accounted for a 9% share of Life Science net sales (2021: 9%). Life Science Services delivered an organic sales growth of 6.1% in 2022 which was driven by both Covid-19-related and core business sales. Including a favorable foreign exchange effect of 8.0% as well as a positive portfolio effect of 9.8% from the acquisition of Exelead Inc., USA, net sales totaled € 956 million (2021: € 772 million). Geographically, Life Science Services organic sales growth was mainly attributable to the North America and Asia-Pacific regions.

Net sales of the business sector by region developed as follows:

Life Science

Net sales by region[1]

€ million	2022	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2021	Share
Europe	3,445	33%	7.9%	1.1%	0.7%	9.8%	3,139	35%
North America	3,931	38%	8.4%	13.3%	1.6%	23.3%	3,189	36%
Asia-Pacific (APAC)	2,536	25%	7.0%	3.9%	–	10.9%	2,286	25%
Latin America	353	3%	16.8%	9.0%	1.1%	26.9%	278	3%
Middle East and Africa (MEA)	116	1%	13.9%	2.0%	–	15.9%	100	1%
Life Science	**10,380**	**100%**	**8.2%**	**6.4%**	**0.8%**	**15.4%**	**8,992**	**100%**

1 Prior-year figures have been adjusted due to product reallocations between Life Science and Electronics business sectors.

[2] Not defined by International Financial Accounting Standards (IFRS).

The following table presents the composition of EBITDA pre for 2022 in comparison with 2021. The International Financial Reporting Standards (IFRS) figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Life Science

Reconciliation EBITDA pre[1,2]

	2022			2021			Change
€ million	IFRS	Elimination of adjustments	Pre[2]	IFRS	Elimination of adjustments	Pre[2]	Pre[2]
Net sales	**10,380**	**–**	**10,380**	**8,992**	**–**	**8,992**	**15.4%**
Cost of sales	-4,280	7	-4,273	-3,578	4	-3,574	19.6%
Gross profit	**6,100**	**7**	**6,107**	**5,414**	**4**	**5,418**	**12.7%**
Marketing and selling expenses	-2,400	16	-2,384	-2,119	5	-2,114	12.8%
Administration expenses	-400	22	-377	-352	22	-331	14.1%
Research and development costs	-399	–	-399	-351	1	-349	14.3%
Impairment losses and reversals of impairment losses on financial assets (net)	-9	–	-9	-3	–	-3	>100.0%
Other operating income and expenses	-85	61	-24	-109	7	-102	-76.4%
Operating result (EBIT)[2]	**2,808**			**2,480**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	870	-24	845	778	-11	767	10.2%
EBITDA[3]	**3,678**			**3,258**			
Restructuring expenses	41	-41	–	26	-26	–	
Integration expenses/IT expenses	24	-24	–	21	-21	–	
Gains (-)/losses (+) on the divestment of businesses	–	–	–	–	–	–	
Acquisition-related adjustments	18	-18	–	-18	18	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[2]	**3,760**	**–**	**3,760**	**3,287**	**–**	**3,287**	**14.4%**
of which: organic growth[2]							9.7%
of which: exchange rate effects							5.0%
of which: acquisitions/ divestments							-0.4%

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Reporting Standards (IFRS).

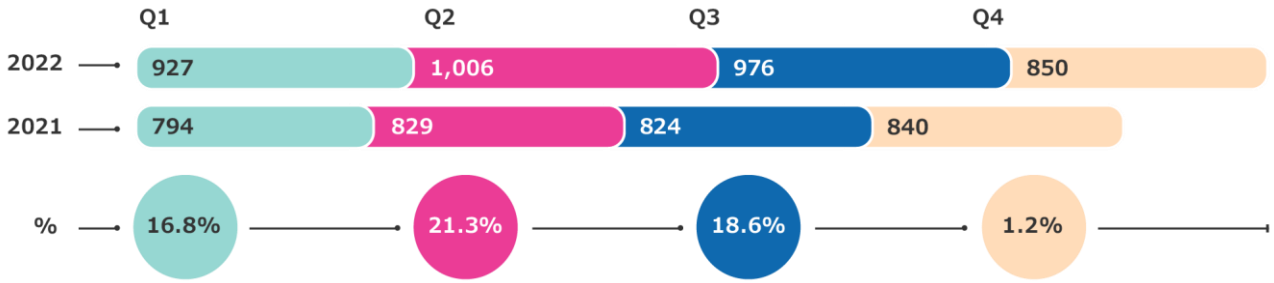
[3] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Adjusted gross profit increased by 12.7% to € 6,107 million (2021: € 5,418 million). The increase was mainly driven by a strong sales growth of the core business, while sales related to the Covid-19 pandemic declined. Adjusted marketing and selling expenses increased by 12.8% to € 2,384 million (2021: € 2,114 million) due to higher logistics costs and increased personnel expenses. Adjusted administration expenses increased by 14.1% to € 377 million (2021: € 331 million) owing to additional expenses to support our sustainability strategy as well as our organic transformation. Adjusted research and development costs increased by 14.3% to € 399 million (2021: € 349 million) driven mainly by our core growth areas. In addition to organic developments, unfavorable foreign exchange effects impacted the development of costs compared to 2021. After eliminating adjustments, amortization and depreciation, EBITDA pre rose by 14.4% to € 3,760 million (2021: € 3,287 million). Organically, the EBITDA pre grew by 9.7% in 2022.

The development of EBITDA pre in the individual quarters in comparison with 2021 is presented in the following overview:

Life Science

EBITDA pre[1,2] and change by quarter[3]
€ million/change in %



[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.
[2] Not defined by International Financial Reporting Standards (IFRS).
[3] Quarterly breakdown unaudited.

Healthcare

Healthcare

Key figures

€ million	2022	2021	Change € million	Change %
Net sales	7,839	7,089	750	10.6%
Operating result (EBIT)[1]	1,895	1,823	72	3.9%
Margin (% of net sales)[1]	24.2%	25.7%		
EBITDA[2]	2,385	2,146	239	11.2%
Margin (% of net sales)[1]	30.4%	30.3%		
EBITDA pre[1]	2,477	2,153	323	15.0%
Margin (% of net sales)[1]	31.6%	30.4%		

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

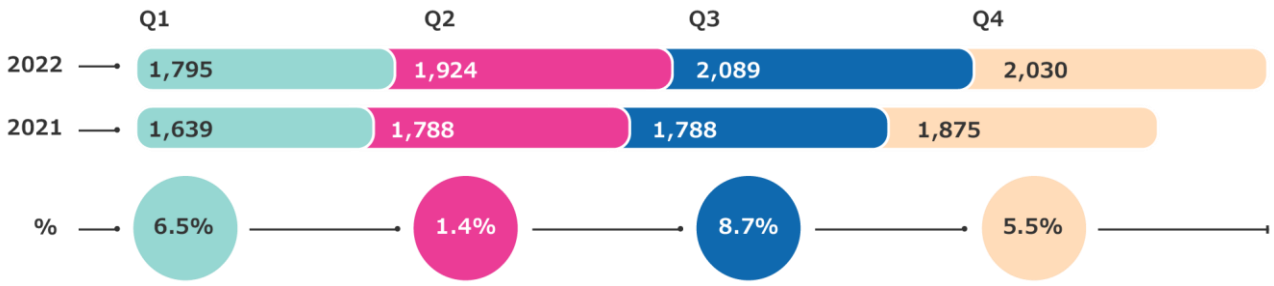
Development of sales and results of operations

The Healthcare business sector reported organic sales growth of 5.5% in fiscal 2022. Including positive foreign exchange effects of 5.1%, net sales totaled € 7,839 million (2021: € 7,089 million). The positive foreign exchange effects were attributable in particular to the development of the U.S. dollar and the Chinese renminbi.

The net sales in the individual quarters as well as the respective organic growth rates in 2022 are presented in the following graph:

Healthcare

Net sales and organic growth[1] by quarter[2]
€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Net sales of the key product lines and products developed as follows in 2022:

Healthcare

Net sales by major product lines/products

€ million	2022	Share	Organic growth[1]	Exchange rate effects	Total change	2021	Share
Oncology	**1,683**	**22%**	**16.9%**	**2.3%**	**19.2%**	**1,411**	**20%**
thereof: Erbitux®	1,023	13%	2.7%	1.0%	3.6%	987	14%
thereof: Bavencio®	611	8%	57.9%	5.8%	63.8%	373	5%
Neurology & Immunology	**1,743**	**22%**	**-0.5%**	**6.5%**	**6.0%**	**1,645**	**23%**
thereof: Rebif®	887	11%	-13.2%	6.4%	-6.8%	952	13%
thereof: Mavenclad®	856	11%	16.9%	6.6%	23.6%	693	10%
Fertility	**1,446**	**18%**	**3.9%**	**4.3%**	**8.2%**	**1,337**	**19%**
thereof: Gonal-f®	825	11%	3.1%	4.4%	7.5%	767	11%
Cardiovascular, Metabolism and Endocrinology	**2,806**	**36%**	**4.5%**	**6.0%**	**10.5%**	**2,540**	**36%**
thereof: Glucophage®	930	12%	0.4%	7.2%	7.6%	864	12%
thereof: Concor®	590	8%	6.2%	6.7%	12.9%	523	7%
thereof: Euthyrox®	553	7%	12.8%	4.8%	17.7%	470	7%
thereof: Saizen®	266	3%	7.2%	-0.1%	7.1%	248	3%
Other	**161**	**2%**				**157**	**2%**
Healthcare	**7,839**	**100%**	**5.5%**	**5.1%**	**10.6%**	**7,089**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

The oncology drug Erbitux® generated organic sales growth of 2.7% compared with the previous year. Including positive foreign exchange effects of 1.0%, net sales increased by a total of 3.6% to € 1,023 million (2021: € 987 million). The prior-year figure was positively impacted by the temporary partnership with Eli Lilly and Company, United States, which led to net sales of € 59 million in the North America region. Organic growth was driven in particular by the Asia-Pacific region, which recorded organic growth of 9.1% and net sales totaling € 441 million (2021: € 391 million), as well as the similarly important Europe region, where organic growth amounted to 4.8% and net sales totaled € 434 million (2021: € 417 million). Encouraging development was also recorded in the Latin America region, with organic growth of 26.3% and total net sales of € 85 million (2021: € 71 million), and the Middle East and Africa region, with organic growth of 23.3% and net sales of € 62 million (2021: € 49 million).

Thanks to strong organic growth of 57.9% and positive foreign exchange effects of 5.8%, net sales of the oncology drug Bavencio® rose to € 611 million (2021: € 373 million). All regions contributed to this encouraging development, which was mainly driven by further growth in the drug's market share for first-line maintenance treatment for patients with locally advanced or metastatic urothelial carcinoma (UC).

Mavenclad®, for the oral short-course treatment of highly active relapsing multiple sclerosis (MS), saw organic sales growth of 16.9% in fiscal 2022. Including positive foreign exchange effects of 6.6%, total net sales increased to € 856 million (2021: € 693 million). The organic growth of Mavenclad® was driven by higher demand in all regions, especially Europe.

Healthcare

Product sales and organic growth[1] of Erbitux®, Glucophage® and Rebif® by region – 2022

		Total	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
	€ million	1,023	434	–	441	85	62
Erbitux®	Organic growth[1]	2.7%	4.8%	–	9.1%	26.3%	23.3%
	Share	100%	43%	–	43%	8%	6%
	€ million	930	132	–	524	174	100
Glucophage®	Organic growth[1]	0.4%	1.3%	–	–	9.7%	-11.3%
	Share	100%	14%	–	56%	19%	11%
	€ million	887	240	563	9	33	43
Rebif®	Organic growth[1]	-13.2%	-14.9%	-12.4%	-13.4%	6.9%	-24.3%
	Share	100%	27%	63%	1%	4%	5%

[1] Not defined by International Financial Reporting Standards (IFRS).

Net sales of Rebif®, which is used to treat relapsing forms of multiple sclerosis, amounted to € 887 million in fiscal 2022 (2021: € 952 million). The downward trend that was observed in the previous year continued as a result of the persistently difficult competitive situation on the interferon market and the competition from oral dosage forms and high-efficacy MS therapies. This led to an organic decline in net sales of -13.2% even though foreign exchange effects were positive at 6.4%. Net sales in North America, the biggest market for Rebif®, fell by -12.4% organically to € 563 million (2021: € 571 million), while net sales in Europe saw an organic decline of -14.9% to € 240 million (2021: € 286 million).

With organic growth of 4.5% and positive foreign exchange effects of 6.0%, net sales of products from the Cardiovascular, Metabolism and Endocrinology franchise totaled € 2,806 million in fiscal 2022 (2021: € 2,540 million). Sales of the diabetes drug Glucophage® amounted to € 930 million in fiscal 2022 (2021: € 864 million). Following an organic decline in the previous year, Glucophage® returned to slight organic growth of 0.4% in fiscal 2022. Net sales of the beta-blocker Concor® saw organic growth of 6.2% to € 590 million (2021: € 523 million). The thyroid product Euthyrox® enjoyed strong organic growth of 12.8% in fiscal 2022, with net sales increasing to € 553 million (2021: € 470 million). Saizen® also saw encouraging organic growth of 7.2% and increased its net sales to a total of € 266 million (2021: € 248 million).

The Fertility franchise delivered organic growth of 3.9%. Taking into account positive exchange rate effects of 4.3%, global net sales increased to € 1,446 million (2021: € 1,337 million). Gonal-f®, the leading recombinant hormone used in the treatment of infertility, saw organic growth of 3.1% on the back of development in the Asia-Pacific region in particular. Including positive foreign exchange effects of 4.4%, net sales of Gonal-f® increased to € 825 million (2021: € 767 million).

Net sales in the Healthcare business sector by region in 2022 developed as follows:

Healthcare

Net sales by region

€ million	2022	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2021	Share
Europe	2,433	31%	8.6%	-1.3%	–	7.3%	2,268	32%
North America	1,781	23%	-5.1%	11.5%	–	6.5%	1,673	23%
Asia-Pacific (APAC)	2,261	29%	8.2%	5.0%	–	13.2%	1,997	28%
Latin America	838	10%	14.9%	7.9%	–	22.8%	682	10%
Middle East and Africa (MEA)	527	7%	3.4%	9.0%	–	12.4%	468	7%
Healthcare	**7,839**	**100%**	**5.5%**	**5.1%**	**–**	**10.6%**	**7,089**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRS).

The following table presents the composition of EBITDA pre in fiscal 2022 in comparison with 2021. The IFRS figures have been modified to reflect the elimination of adjustments included in the functional costs.

Healthcare

Reconciliation EBITDA pre[1]

	2022			2021			Change
€ million	IFRS	Elimination of adjustments	Pre[1]	IFRS	Elimination of adjustments	Pre[1]	Pre[1]
Net sales	**7,839**	**–**	**7,839**	**7,089**	**–**	**7,089**	**10.6%**
Cost of sales	-1,925	4	-1,921	-1,713	-3	-1,715	12.0%
Gross profit	**5,914**	**4**	**5,917**	**5,376**	**-3**	**5,374**	**10.1%**
Marketing and selling expenses	-1,644	13	-1,631	-1,600	7	-1,593	2.4%
Administration expenses	-313	18	-296	-313	12	-302	-1.9%
Research and development costs	-1,694	73	-1,622	-1,712	5	-1,707	-5.0%
Impairment losses and reversals of impairment losses on financial assets (net)	2	–	2	5	–	5	-44.9%
Other operating income and expenses	-370	172	-198	67	-8	59	>100.0%
Operating result (EBIT)[1]	**1,895**			**1,823**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	490	-187	303	323	-6	317	-4.3%
EBITDA[2]	**2,385**			**2,146**			
Restructuring expenses	91	-91	–	11	-11	–	
Integration expenses/IT expenses	16	-16	–	9	-9	–	
Gains (-)/losses (+) on the divestment of businesses	-15	15	–	-13	13	–	
Acquisition-related adjustments	–	–	–	–	–	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[1]	**2,477**	**–**	**2,477**	**2,153**	**–**	**2,153**	**15.0%**
of which: organic growth[1]							3.3%
of which: exchange rate effects							11.7%
of which: acquisitions/ divestments							–

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

The adjusted gross profit of the Healthcare business sector rose to € 5,917 million in fiscal 2022 (2021: € 5,374 million). At 75.5%, the resulting gross margin was at almost the same level as in the 2021 reporting period (2021: 75.8%).

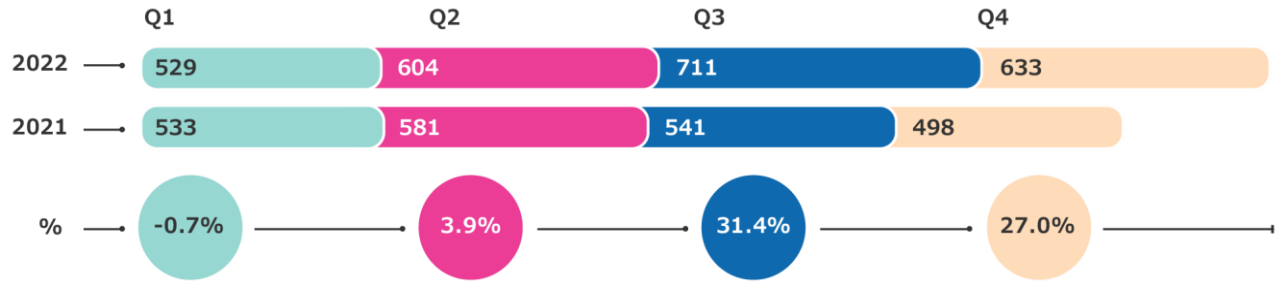
Adjusted marketing and selling expenses increased by 2.4% year-on-year to € 1,631 million (2021: € 1,593 million). The -5.0% reduction in research and development costs to € 1,622 million (2021: € 1,707 million) was due in part to the comparatively high cost base in the previous year as a result of the provisions that were recognized for subsequent costs from the near-complete discontinuation of the bintrafusp alfa program and the associated cost savings. The termination of the global Phase II study of the drug candidate berzosertib, which was announced in the second quarter of 2022, also led to cost savings. Adjustments to research and development costs in the amount of € 73 million primarily related to costs for transformation programs. The reduction in other operating expenses and income to € -198 million (2021: € 59 million) was mainly due to the final earnings effect of € 123 million in the previous year from the receipt of the previously deferred upfront cash payment for the global strategic alliance with GlaxoSmithKline plc, United Kingdom (GSK), to co-develop and co-commercialize bintrafusp alfa, as well as higher profit transfers from the strategic alliance with Pfizer Inc., United States, to develop and commercialize Bavencio®. In addition, the figure for the previous year included milestone payments of around € 50 million for the approvals of Bavencio® in Europe and Japan as a first-line maintenance treatment for patients with locally advanced or metastatic urothelial carcinoma (UC). License income from partners on sales of the medicine Viibryd® also declined in 2022.

After eliminating adjustments, amortization, and depreciation, EBITDA pre increased to € 2,477 million (2021: € 2,153 million). This overall rise of 15.0% was composed of organic earnings growth of 3.3% and positive foreign exchange effects of 11.7%. The resulting EBITDA pre margin for fiscal 2022 amounted to 31.6% (2021: 30.4%).

The development of EBITDA pre in the individual quarters in comparison with 2021 is presented in the following overview:

Healthcare

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Quarterly breakdown unaudited.

Electronics

Electronics

Key figures[1]

€ million	2022	2021	Change € million	Change %
Net sales	4,013	3,606	407	11.3%
Operating result (EBIT)[2]	572	508	64	12.6%
Margin (% of net sales)[2]	14.3%	14.1%		
EBITDA[3]	1,138	1,070	68	6.3%
Margin (% of net sales)[2]	28.3%	29.7%		
EBITDA pre[2]	1,192	1,128	64	5.7%
Margin (% of net sales)[2]	29.7%	31.3%		

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Reporting Standards (IFRS).

[3] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

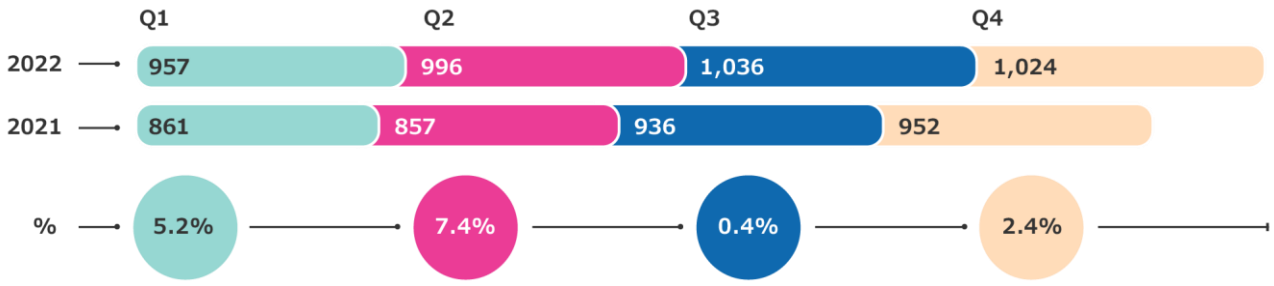
Development of net sales and results of operations

In 2022, net sales of the Electronics business sector increased 11.3% to € 4,013 million (2021: € 3,606 million). Strong growth in Semiconductor Solutions compensated for market weakness in Display Solutions and led to an overall organic increase of 3.7% for the Electronics business sector. Foreign exchange rates were favorable at 7.6%.

The net sales in the individual quarters as well as the respective organic growth rates in 2022 are presented in the following graph:

Electronics

Net sales[1] **and organic growth**[2] **by quarter**[3]
€ million/organic growth in %



[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.
[2] Not defined by International Financial Reporting Standards (IFRS).
[3] Quarterly breakdown unaudited.

Electronics

Net sales by business unit[1]

€ million	2022	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2021	Share
Semiconductor Solutions	2,674	67%	15.4%	9.0%	–	24.4%	2,150	60%
Display Solutions	900	22%	-20.1%	6.1%	–	-14.0%	1,046	29%
Surface Solutions	439	11%	3.2%	3.9%	–	7.1%	410	11%
Electronics	**4,013**	**100%**	**3.7%**	**7.6%**	**–**	**11.3%**	**3,606**	**100%**

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors and adjustments within the Electronics business sector.

[2] Not defined by International Financial Accounting Standards (IFRS).

Net sales of Semiconductor Solutions increased by a total of 24.4% to € 2,674 million (2021: € 2,150 million). The Semiconductor Solutions business unit, which comprises two businesses, namely Semiconductor Materials and Delivery Systems & Services, accounted for 67% of net sales of the Electronics business sector in 2022 (2021: 60%). Semiconductor Materials focuses on the development and commercialization of innovative material-based solutions for the semiconductor industry, while Delivery Systems & Services focuses on developing, selling and operating delivery systems for semiconductor manufacturers. Organically, net sales grew by 15.4% in 2022 for Semiconductor Solutions. Strong, broad-based demand across both Semiconductor Materials and Delivery Systems & Services along with price increases to offset inflation drove the organic increase. Foreign exchange effects of 9.0% contributed to the increase in sales.

Net sales of the Display Solutions business unit, consisting mainly of the business with liquid crystals, photoresists for display applications as well as OLED materials, decreased by -14.0% to € 900 million (2021: € 1,046 million). Display Solutions saw an organic decline of -20.1% primarily from weaker end-market demand driving decreased utilization at key customers in both liquid crystals and OLED. Foreign exchange effects were favorable at 6.1%.

Net sales of the Surface Solutions business unit grew 7.1% to € 439 million (2021: € 410 million). Organically, Surface Solutions increased sales by 3.2%. Price increases across Surface Solutions to offset inflation along with increased demand for cosmetic actives drove the growth. Foreign exchange effects were favorable at 3.9%.

Net sales of the Electronics business sector by region developed as follows:

Electronics

Net sales by region[1]

€ million	2022	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2021	Share
Europe	371	9%	33.6%	4.3%	–	37.9%	269	7%
North America	649	16%	7.9%	13.4%	–	21.3%	535	15%
Asia-Pacific (APAC)	2,901	72%	-0.6%	6.7%	–	6.0%	2,736	76%
Latin America	40	1%	22.0%	14.0%	–	36.0%	30	1%
Middle East and Africa (MEA)	53	2%	34.9%	10.2%	–	45.1%	36	1%
Electronics	**4,013**	**100%**	**3.7%**	**7.6%**	**–**	**11.3%**	**3,606**	**100%**

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Reporting Standards (IFRS).

The following table presents the composition of EBITDA pre for 2022 in comparison with 2021. The IFRS figures have been modified to reflect the elimination of adjustments included in the respective functional costs.

Electronics

Reconciliation EBITDA pre[1,2]

	2022			2021			Change
€ million	IFRS	Elimination of adjustments	Pre[2]	IFRS	Elimination of adjustments	Pre[2]	Pre[2]
Net sales	**4,013**	**–**	**4,013**	**3,606**	**–**	**3,606**	**11.3%**
Cost of sales	-2,314	21	-2,292	-2,059	23	-2,036	12.6%
Gross profit	**1,700**	**21**	**1,721**	**1,547**	**23**	**1,570**	**9.6%**
Marketing and selling expenses	-662	3	-659	-573	5	-569	16.0%
Administration expenses	-128	8	-120	-138	16	-122	-2.2%
Research and development costs	-308	2	-306	-278	1	-277	10.8%
Impairment losses and reversals of impairment losses on financial assets (net)	–	–	–	-1	–	-1	-61.8%
Other operating income and expenses	-28	40	12	-49	46	-3	>100.0%
Operating result (EBIT)[2]	**572**			**508**			
Depreciation/amortization/ impairment losses/reversals of impairment losses	565	-20	545	561	-33	528	3.1%
EBITDA[3]	**1,138**			**1,070**			
Restructuring expenses	31	-31	–	26	-26	–	
Integration expenses/IT expenses	13	-13	–	32	-32	–	
Gains (-)/losses (+) on the divestment of businesses	–	–	–	–	–	–	
Acquisition-related adjustments	11	-11	–	–	–	–	
Other adjustments	–	–	–	–	–	–	
EBITDA pre[2]	**1,192**	**–**	**1,192**	**1,128**	**–**	**1,128**	**5.7%**
of which: organic growth[2]							-7.3%
of which: exchange rate effects							13.0%
of which: acquisitions/ divestments							–

[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.

[2] Not defined by International Financial Reporting Standards (IFRS).

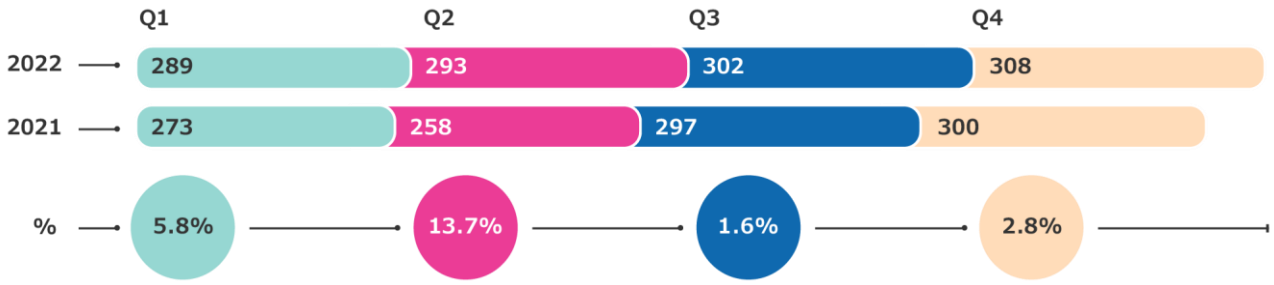
[3] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

Adjusted gross profit of the Electronics business sector increased 9.6% to € 1,721 million (2021: € 1,570 million) largely due to the higher sales discussed above. The adjusted gross profit margin declined slightly to 42.9% (2021: 43.5%) as positive foreign exchange effects and increased pricing discussed above were not enough to cover the rising costs of materials and other inflationary cost increases. Further pressure on gross profit and margin arose from a negative product mix caused by a temporary loss of high-margin liquid crystals sales while our customers significantly reduced their factory utilization. Adjusted marketing and selling expenses increased by 16.0% as global shipping capacity constraints and increasing fuel costs drove significantly higher logistics expenses. Adjusted administration expenses declined slightly. Adjusted research and development costs increased by 10.8% as we continued to invest in our innovation capabilities and product pipeline. EBITDA pre of Electronics grew by 5.7% to € 1,192 million (2021: € 1,128 million). Sales increases discussed above, including price increases, were not enough to cover for the liquid crystal sales shortfall and the inflationary increases in production and logistics costs which led to an organic EBITDA pre decline of -7.3%. Foreign exchange effects favorably impacted EBITDA pre by 13.0%. At 29.7%, the EBITDA pre margin was below the year-earlier figure (2021: 31.3%).

The development of EBITDA pre in the individual quarters in comparison with 2021 is presented in the following overview:

Electronics

EBITDA pre[1,2] and change by quarter[3]
€ million/change in %



[1] Prior-year figures have been adjusted due to product reallocations between the Life Science and Electronics business sectors.
[2] Not defined by International Financial Reporting Standards (IFRS).
[3] Quarterly breakdown unaudited.

Corporate and Other

Corporate and Other comprises administrative expenses for central Group functions that cannot be directly allocated to the business sectors, such as Finance, Procurement, Legal, Communications, and Human Resources. Corporate costs additionally encompass expenses for central, non-allocated IT functions, including expenses related to the expansion and harmonization of IT systems within the Merck Group as well as research and development costs spanning business sectors.

Corporate and other

Key figures

			Change	
€ million	**2022**	2021	€ million	%
Operating result (EBIT)[1]	-801	-632	-169	26.7%
EBITDA[2]	-696	-527	-169	32.1%
EBITDA pre[1]	-579	-465	-115	24.7%

[1] Not defined by International Financial Reporting Standards (IFRS).

[2] Not defined by International Financial Reporting Standards (IFRS); EBITDA corresponds to operating result (EBIT) adjusted by depreciation, amortization, impairment losses, and reversals of impairment losses.

The operating result (EBIT) amounted to € -801 million in fiscal 2022 (2021: € -632 million). Earnings were impacted in particular by a negative currency result from cash flow hedging, which were reflected in higher net other operating expenses. After eliminating adjustments, administrative expenses amounted to € 399 million in 2022 (2021: € 390 million). Cross-business research and development costs amounting to € 119 million (2021: € 85 million) were allocated to Corporate. After eliminating depreciation, amortization, and adjustments, EBITDA pre amounted to € -579 million in 2022 (2021: € -465 million).

Report on Risks and Opportunities

In our constant pursuit of making our business resilient and generating value, risks and opportunities are an integral and indispensable part of our activities. We operate in a highly complex, global, and interconnected business environment that further necessitates a competent management of risks and opportunities. For us, risks and opportunities management are hence an imperative and a core component of our internal business planning and forecasting. We have put in place clear processes, appropriate tools, and fixed responsibilities to enable early identification of risks to derive effective and efficient mitigation strategies. In our internal risk reporting framework, we define risks as potential future events or developments that could result in unfavorable deviation from our financial and non-financial targets. Risk parameters in this context are the probability of financial (quantitative) impact (EBITDA pre/Operating Cash Flow) or non-financial (qualitative) impact (reputation/brand, Environment, Social, Governance (ESG) including Workforce and Ethics, Strategy, Operations).

Meanwhile, opportunities imply a favorable deviation from targets. Future events and expected developments are considered in internal planning if a likely occurrence can be assumed within the planning period. The following section presents the risks and opportunities that could result in favorable and unfavorable deviations from existing plans and targets.

For additional information and details regarding the non-financial topics, please refer to the **Non-Financial Statement**.

Risk and opportunity management

Group Controlling & Risk Management forms the organizational framework for risk management and reports to the Group Chief Financial Officer. Within the scope of audits, Group Internal Auditing regularly reviews the performance of risk management processes within the units on local level and, at the same time, the communication of relevant risks from the operating businesses to Group Risk Management. Furthermore, the external auditor reviews the risk early warning system during the annual audit of the financial statements.

The objective of our risk management activities is to identify, assess and manage risks in a timely manner so that appropriate measures can be implemented to mitigate their potential negative impact. Our internal risk management guidelines detail the responsibilities, objectives, and processes of risk management. The business heads, managing directors of Merck subsidiaries, and the heads of Group functions are appointed as “risk owners”, who run local risk management processes. Requirements for local risk management are risk identification taking all internal and external influences into consideration (impacting financial or non-financial targets), risk analysis, risk mitigation by appropriate actions, definition of preventive measures and emergency plans if applicable, and documentation of risks and mitigation actions.

The risk owners regularly assess the risk status and report their risk portfolio to Group Risk Management. We use special risk management tools to manage and support these activities. Group Risk Management coordinates and supervises the bottom-up risk reporting, confirming the plausibility of the reported risk, evaluates the mitigation measures and the planned time frames, and determines the residual risk, which is presented as net risk in the internal risk report.

For the internal bottom-up risk reporting process, reporting is based on defined thresholds, and a variety of distribution functions are used to reflect scenarios with varied occurrence probabilities. Risks below the global reporting threshold are managed and monitored locally. The timeframe applied for internal risk reporting is five years. It can go beyond five years in special cases, e.g., for regulatory risks related to climate change. The

outlined risks and their evaluation are based on respective annual values in the reporting time frame. The assessment of the risks presented relates to December 31, 2022. There were no relevant changes after the balance sheet date that would have necessitated an amended presentation of the risk situation of the Group.

Group Risk Management uses the information reported to determine the current risk portfolio for the Merck Group, presenting this in a report to the Executive Board, the Supervisory Board, and relevant Committees with detailed explanations twice per year. This also encompasses a quantitative aggregation of risks at Group level, using a Monte Carlo simulation. Furthermore, significant changes in the assessment of the risks already known and new significant risks can be reported at any time and are communicated to the Executive Board on an ad-hoc basis.

The opportunity management process is integrated into our internal controlling processes and is carried out based on the Group strategy in the operating units. The business sectors analyze and assess potential market opportunities as part of the strategy and planning processes. In this context, investment opportunities are examined and prioritized primarily in terms of their potential value proposition, to ensure an effective allocation of resources. We target investment in growth markets to leverage the opportunities of dynamic development and customer proximity at a local level.

If the occurrence of the identified opportunities is rated as likely, they are incorporated into the business plans and forecasts. Trends going beyond this, or events that could lead to a positive development in the net assets, financial position, and results of operations, are presented in the following report as opportunities. These could have a positive effect on our medium-term prospects.

Risk and opportunity assessment

The significance of a risk is determined based on its probability to cause potential unfavorable deviations from our financial and non-financial targets.

The underlying scales for measuring these factors are shown below:

Probability of occurrence

Probability of occurrence	Explanation
< 1%	Highly improbable
1 – 5%	Improbable
5 – 20%	Possible
20 – 50%	Likely
> 50%	More than likely

Degree of impact

Degree of impact	Explanation
> € 500 million	Critical negative impact on the net asset, financial position, and results of operations
€ 100 – 500 million	Significant negative impact on the net asset, financial position, and results of operations
€ 25 – 100 million	Moderate negative impact on the net asset, financial position, and results of operations
€ 10 – 25 million	Minor negative impact on the net asset, financial position, and results of operations
< € 10 million	Immaterial negative impact on the net asset, financial position, and results of operations

For non-financial risks (such as reputation, Environmental, Social, Governance (ESG)), we introduced a qualitative rating scale as a reference for comprehensive assessment. The evaluation range is from low to critical.

Opportunities are assessed in their respective specific business environment. General measures of the business functions are quantified during forecasting and strategic planning usually in relation to sales, EBITDA pre, and operating cash flow. Net present value, internal rate of return, the return on capital employed (ROCE), and the payback period of the investment are primarily used to assess and prioritize investment opportunities. We use these indicators to assess the opportunities arising from the investment projects. Similarly, scenarios are used to simulate the influence of possible fluctuations and changes in the respective parameters on results.

Internal control system for the (Group) accounting process

The objective of the internal control system for the accounting process is to implement controls that provide assurance that the financial statements are prepared in compliance with the relevant accounting laws and standards. This system covers measures designed to ensure the complete, correct, and timely reporting and presentation of information that is relevant for the preparation of the Consolidated Financial Statements and the Combined Management Report.

Our internal control system for financial reporting is based on the COSO framework, a globally recognized standard divided into five components: control environment, risk assessment, control activities, information and communication, as well as monitoring activities. Each of these components is regularly documented, tested and/or assessed.

The internal control system aims to ensure the accuracy of the consolidated accounting process through functioning internal controls with reasonable assurance. The Group Accounting function centrally steers the preparation of the Consolidated Financial Statements of Merck KGaA as the parent company of the Merck Group. This Group function defines the reporting requirements that all Merck subsidiaries must meet. At the same time, this function steers and monitors the scheduling and process-related requirements of the Consolidated Financial Statements. Group Accounting centrally manages all changes to the equity holding structure and correspondingly adapts the Group's scope of consolidation. The proper elimination of intragroup transactions within the scope of the consolidation process is ensured. Group-wide accounting guidelines form the basis for the preparation of the statutory financial statements of the parent company and of the subsidiaries, which are reported to Group Accounting; the guidelines are adapted in a timely manner to reflect changes in the financial regulatory environment and are updated in accordance with internal reporting requirements. For special issues, such as the accounting treatment of intangible assets within the scope of company acquisitions or pension obligations, external experts are additionally involved where necessary.

The individual companies have a local internal control system within a global framework. Where financial processes are handled by a Shared Service Center, the internal control system of the Shared Service Center is additionally applied. Both ensure that accounting complies with IFRS (International Financial Reporting Standards) and with the Group accounting guidelines.

Group Accounting provides support to the local contacts and ensures a consistently high quality of reporting throughout the entire reporting process.

For Group financial reporting purposes, most of our subsidiaries use standard SAP software. Consolidation software from SAP is also used for the elimination of intragroup transactions. A detailed authorization concept ensures the separation of duties with respect to both single-entity reporting and the Consolidated Financial Statements. The accounting process is generally designed to ensure that all units involved adhere to the principle of dual control.

The operational effectiveness of our internal control system is regularly tested in the format of self-assessments by our legal entities, group functions, and shared services. The quality is systematically reviewed by a dedicated global financial control and governance team. Control deficiencies are properly recorded and, wherever necessary, adequate countermeasures are taken to remediate control deficiencies in a timely manner.

The overall effectiveness of our internal control system with regard to accounting and compliance with financial reporting on the part of the individual companies is confirmed by both the local Managing Director and the local Chief Financial Officer by signing the single-entity reporting and a separate confirmation regarding the effectiveness of the financial control system (internal control system sign-off letter). For the accounting treatment of balance sheet items, Group Accounting closely cooperates with Group Risk Management to correctly present potential risks in the balance sheet.

All structures and processes described above related to the Group Accounting procedures are subject to regular review by Group Internal Auditing based on an annual audit plan set out by the Executive Board.

The results of the self-assessments, quality reviews, and internal audits are dealt with by the Executive Board, the Supervisory Board, and the Audit Committee. The internal control system at Merck makes it possible to lower the risk of material misstatements in accounting to a minimum. However, residual risk cannot be entirely ruled out as no internal control system is infallible, irrespective of its design.

The Internal Control System of the Merck Group as the entirety of all controls shall avoid and reduce the probability of potential risks occurring as well as actively steer risks in business processes. Thereby, it contributes to ensure the compliance of the company's activities with laws and regulations. The Internal Control System in its entirety and the applied methods are continuously developed further. The responsibility for the effectiveness of the Internal Control System and the further development of the non-financial key metrics lies with the respective responsible senior leaders/risk and process owners.

Business-related risks and opportunities

Political and regulatory risks and opportunities

As a global company, we face political and regulatory changes in a large number of countries and markets.

Risk of more restrictive regulatory requirements regarding drug pricing and reimbursement

In the Healthcare business sector, the known trend towards increasingly restrictive requirements in terms of drug pricing, reimbursement, and the expansion of rebate groups is continuing. Specifically, in the United States, a pricing reform on prescription drugs is part of the agenda of the current administration. These requirements can negatively influence the profitability of our products, as can market referencing between countries, and the success of market launches. Foreseeable effects are considered as far as possible in the business sector's plans. Close communication with health and regulatory authorities serves as a preventive measure to avert such risks.

Remaining risks beyond the current plans resulting from restrictive regulatory requirements are likely with a potential moderate to significant impact.

Risk of stricter regulations for the manufacturing, testing, and marketing of products

We must adhere to a multitude of regulatory requirements regarding the manufacturing, testing, and marketing of many of our products. Specifically, in the European Union, we are subject to the EU chemicals regulation REACH. Similar regulations are emerging globally in relevant markets, particularly in Asia. These regulations demand comprehensive tests for chemicals. Moreover, the use of chemicals in production and final products could be restricted, which would negatively impact the ability to manufacture and market certain products. With the EU Chemicals Strategy for Sustainability, an initiative of the European Green Deal, we expect increasing demands concerning the substitution of specific hazardous substances. We are constantly pursuing research and development in substance characterization and the possible substitution of critical substances so as to mitigate this risk. Nevertheless, it is classified as a possible risk with a potential significant impact on the net assets, financial position, and results of operations.

Risk of negative political and macroeconomic developments

The ongoing general trend of de-globalization and reshoring critical supplies might further increase the establishment of trade barriers. Additionally, the increased threat from armed conflicts and the rising tensions between the United States and China could lead to further sanctions. These risks can have a negative impact on our supply chains and sales in certain countries and regions. Such risks are considered as much as possible in the business plans of the affected countries and regions, and are mitigated through product, industry, and regional diversification as well as measures to ensure resilience of supply chains and networks. In addition, strategic geopolitical risk management is in place at the Group and sector levels in order not to lose sight of the global context and to prepare Merck holistically for possible risks.

The rise in inflation in the course of 2022 across some of our major markets could negatively impact our business. The current inflation dynamics are driven by a combination of supply disruptions, hefty fiscal spending, and special factors. Persistently high inflation could increase our operating expenses (e.g., raw materials, utilities, and logistics) as well as capital expenditures and lead to an increase in central bank rates, which would affect our refinancing costs.

Potential negative macroeconomic developments can also impact our business. We see an increasing risk for a global recession driven by current economic and political developments. In addition, the spread of the corona virus is associated with risks in global developments, likewise with the potential for negative effects on our businesses. To minimize these impacts, corresponding measures have been initiated.

The net risk of negative geo-political and macroeconomic developments is seen as possible and might have significant to critical effects on the net assets, financial position, and results of operations.

Market risks and opportunities

We compete with numerous companies in the pharmaceutical, chemical, and life science sectors. Rising competitive pressure can have a significant impact on the quantities that can be sold and prices attainable for our products.

Opportunities presented by our fully integrated CDMO and Contract Testing Services

The newly formed business unit, Life Science Services, fully integrates our Contract Development and Manufacturing Organization (CDMO) and contract testing services, strengthening our portfolio offerings and value chain to better serve the evolving needs of our global customers. Our CDMO service business covers traditional modalities such as monoclonal antibodies (mAbs) and high-potency active pharmaceutical ingredients (HP-APIs) and novel modalities such as antibody drug conjugates (ADCs) and viral and gene therapies (VGTs). This also includes our mRNA offerings.

We continually invest in the expansion of our portfolio and production capabilities to provide highly-specialized solutions for manufacturing traditional and novel therapies. For example, we strengthened our viral vector manufacturing capabilities with the launch of the production platforms VirusExpress® Lentiviral in 2020 and VirusExpress® 293 Adeno-Associated Virus (AAV) in 2022. This makes us one of the first CDMOs and technology-developers to provide a full viral vector manufacturing offering. We are committed to accelerating the manufacture of cell and gene therapies with the goal of getting these lifesaving treatments to patients faster. These proven, scalable platforms increase dose yields and reduce process development times. More details on our capacity expansions are included in the following sections of this report.

We also expanded our manufacturing capabilities for HP-APIs and ADCs in the United States, positioning us as one of the largest single-digit nanogram occupational exposure limit CDMO providers in the world. This will allow the continuous manufacturing of increasingly potent agents at an industrial scale for therapies with the potential to treat cancer. ADCs are an emerging class of medicines designed for the high-specificity targeting and destruction of cancer cells, while preserving healthy cells. Only 13 ADCs are

currently approved worldwide. The ADC industry is experiencing strong growth and is expected to reach € 13 billion market value by 2030. Additionally, we strengthened our CDMO services across the mRNA value chain with the acquisition of Exelead in 2022. Exelead specializes in complex injectable formulations, including Lipid Nanoparticle-based drug delivery technology, which is key in mRNA therapeutics for use in many other indications. We plan to invest more than € 500 million in the technology scale-up of Exelead over the next ten years. This will further enable us to capture the significant potential of the fast-growing market for mRNA therapies by providing leading CDMO services to our customers.

Opportunities in Bioprocessing

In Life Science, our bioprocessing business within the Process Solutions business sector is an important growth driver. In 2022, we advanced our bioprocessing capabilities with the acquisition of the MAST® (Modular Automated Sampling Technology) Platform. This leading automated, antiseptic bioreactor sampling system provides real-time process information and cuts process development time by half, improving efficiency and lowering costs. This makes us the first company to offer a fully integrated ecosystem for advanced process technologies. The technology, coupled with the software to analyze and manage data, allows us to offer unique and integrated solutions to help customers optimize their bioprocesses and moves us closer toward our vision of connected and continuous bioprocessing to increase speed and lower costs. The MAST® Platform is part of Merck's BioContinuum™ Platform.

In addition, we announced a collaboration with Agilent Technologies to fill an industry gap in Process Analytical Technologies (PAT) for downstream processing. By combining our advanced bioprocess portfolio with Agilent's leading analytical solutions, we are able to offer integrated capabilities for enhanced downstream process monitoring and control, bringing us one step closer to making the facility of the future a reality. Furthermore, in December 2022, we announced the acquisition of Massachusetts-based Erbi Biosystems, a developer of the two milliliter (mL) micro-bioreactor platform technology known as the Breez™. The deal strengthens our upstream portfolio in therapeutic proteins by enabling scalable cell-based perfusion bioreactor processes from 2 ml to 2,000 L with rapid lab-scale process development. At the same time it also offers future development opportunities in novel modality applications.

Opportunities from leveraging the e-commerce and distribution platform

In the Life Science business sector, our dedication to the customer experience extends from the lab to our primary e-commerce platform, sigmaaldrich.com, which connects scientists in nearly every country around the world with the products, publications, and technical expertise needed to advance their discovery, research, and development further and faster. Our efforts include innovative approaches across the globe, bolstering sigmaaldrich.com and our e-commerce expertise to continually improve the customer experience and leverage the platform as a scalable growth driver for the business.

Opportunities in the semiconductor industry

We have huge long-term growth opportunities in the semiconductor market due to the significantly accelerating global demand for innovative semiconductor materials. This demand is driven by exponential data growth and highly impactful technology trends such as the Internet of Things (IoT) and 5G. We are working on nearly all of these new technology inflection points of the semiconductor roadmap together with our customers. Our capacity investments are synchronized with our customers' expansion plans, and we continue to tackle industry challenges as well as supply reliability. Our semiconductor business has a very broad and unique portfolio that is not dependent on a single product or technology. It consists of different, independent technologies: Thin Film, Patterning, Planarization, as well as Specialty Gases and Delivery System & Services (DS&S). With this portfolio, we supply products for all essential production steps of wafer processing to support our customers with their advanced needs integral to realizing next-generation chips: patterning, deposition, planarization, etching, cleaning, doping and packaging. Moreover, we are developing new dielectric platforms in cooperation with our key customers for 3D NAND applications. We also continue to see significant potential in our DS&S business to provide our largest customers with turnkey solutions for the delivery of bulk gases in the

manufacturing process. As the electronics industry continues to announce major capacity expansions over the next few years, our DS&S business is well poised to benefit from this with their portfolio of gas and chemical cabinets.

Opportunities due to new technologies in the manufacturing of displays

We see opportunities in market growth of organic light-emitting diode (OLED) materials in high-quality display applications. We have been performing research and development in the area of OLED technology for more than 15 years and have become one of the leading material suppliers for OLEDs. Through our semiconductor and display knowledge, we will be able to contribute to the new generation of optimized sensors. Furthermore, we see opportunities in foldable displays, which require a broad set of materials ranging from encapsulation to the OLED stack.

Risks due to increased competition and customer technology changes

In the Healthcare business sector, both our biopharmaceutical products and classic pharmaceutical business are exposed to increased competition from other rival products (in the form of biosimilars and generics). In the Life Science and Electronics business sectors, risks are posed by not only cyclical business fluctuations but also changes in the technologies used or customer sourcing strategies. We use close customer relationships and in-house further developments as well as market proximity, including precise market analyses, as mitigating measures. Overall, the risks might have potential significant to critical impact.

Risks and opportunities of research and development

Innovation driven by research and development is a major element of the Group strategy, in particular in the Healthcare business sector. In regular portfolio management reviews, we continually evaluate and, if necessary, realign research areas and R&D pipeline projects to focus our investments in areas where patient needs are served best. Nevertheless, research and development projects can experience delays, expected budgets can be exceeded, or targets can remain unmet. In addition to inhouse research and development efforts, strategic alliances with external partners and the in- or out-licensing of programs also form part of the catalog of measures to develop innovative medicine and ensure the efficient allocation of resources.

In Healthcare, we are committed to drive the launches of Bavencio®, Tepmetko® and Mavenclad®. Bavencio® is a human anti-programmed death ligand-1 (PD-L1) antibody jointly developed under the strategic alliance concluded with Pfizer Inc. in 2014. It is currently approved for at least one indication for patients in more than 50 countries and targets different kinds and stages of carcinoma. Additional applications for Bavencio® have been submitted to regulatory authorities worldwide. Tepmetko® is a once-daily oral mesenchymal-epithelial transition (MET) inhibitor that inhibits the oncogenic MET receptor signaling caused by MET (gene) alterations. Discovered and developed in-house at Merck, Tepmetko® has a highly selective mechanism of action, with the potential to improve outcomes in aggressive tumors that have a poor prognosis and harbor these specific alterations. Tepmetko® (tepotinib) is available in a number of countries and under review by various other regulatory authorities globally. We are further investigating the potential role of tepotinib in treating patients with NSCLC and acquired resistance due to MET amplification in the Phase II INSIGHT 2 study. Mavenclad® (cladribine tablets) was approved by the European Commission in 2017 and is the first short-course oral treatment approved in Europe for the treatment of relapsing multiple sclerosis (RMS) in patients with high disease activity. It is now approved in more than 80 countries. New real-world data from the MSBase Registry demonstrate favorable efficacy outcomes for Mavenclad® versus other oral disease modifying therapies (DMTs) and lower occurrence of further relapses or disability progression.

In addition to marketing already approved medicines, we are pushing ahead with research projects in important therapeutic areas. We target the set-up of a new standard of care in squamous cell carcinoma of head and neck (LA SCCHN) through our potent oral inhibitor of apoptosis proteins (IAPi) antagonist xevinapant, which is currently being investigated in two randomized, double-blind, placebo-controlled Phase III clinical trials: the TrilynX study for patients with unresected LA SCCHN and the XRay Vision study for patients with resected LA SCCHN. Xevinapant is the only medicine in its class in late-stage clinical development and has the potential to

be first-in-class. We have a worldwide in-licensing agreement with Debiopharm, Lausanne, Switzerland, for the development and commercialization of xevinapant. Furthermore, the development of our Bruton's tyrosine kinase inhibitor (BTKi) evobrutinib with first-in-class potential in relapsing multiple sclerosis (RMS) is further progressing in the Phase III Evolution RMS clinical trial program. Evobrutinib is an oral, highly selective BTKi offering a novel dual mechanism of action that could address MS pathobiology in a fundamentally new way.

Sustainable long-term growth will be driven by new pipeline entrants in DNA damage biology, novel ADC and enpatoran (TLR 7/8) that underline an exciting and less risk-correlated approach in oncology and neuroinflammation. With enpatoran and M1231, a MUC1/EGFR bi-specific ADC, we have two additional assets in our portfolio with first-in-class potential. Enpatoran is a small molecule for targeted inhibition of the important lupus mediator TLR7/8, aiming for improved efficacy with low infection risk. For enpatoran, we are currently in a Phase II study in CLE (cutaneous lupus erythematosus) and SLE (systemic lupus erythematosus). M1231 is considered as next generation ADC for patients with solid tumors aiming for effective delivery of potent chemotherapy payload with reduced on- and off-target toxicity. In September 2022, we announced a collaboration agreement with licensing option with Nerviano Medical Sciences S.r.l. (NMS) for the next-generation highly selective and brain-penetrant PARP1 (poly (ADP-ribose) polymerase) inhibitor, NMS-293. NMS-293 is in early clinical development for the treatment of patients with breast cancer (BRCA)-mutated tumors as a single agent and in combination with temozolomide in recurrent glioblastoma. It has strong potential in combination with a wide variety of DNA-damaging agents, including systemic or targeted chemotherapy (ADCs) or with DNA damage response inhibitors, in numerous tumor types. In December 2022, we announced a research collaboration and commercial license agreement with Mersana Therapeutics, Inc to develop novel immunostimulatory ADC. The collaboration is focused on discovering novel STING-agonist ADCs for up to two targets leveraging Mersana's proprietary Immunosynthen platform to conjugate proprietary antibodies from our company. The STING pathway is a fundamental means of generating innate immune response that can lead to anti-tumor activity and immunological memory.

Sometimes, development projects are discontinued after high levels of investment at a late phase of clinical development. Decisions – such as those relating to the transition to the next clinical phase – are taken with a view to minimizing risk. We are currently not aware of any risks beyond general development risks that could significantly affect the net assets, financial position, and results of operations. There is the risk that regulatory authorities either do not grant or delay approval or grant only restricted approval. The risk that undesirable side effects of a pharmaceutical product could remain undetected until after approval or registration could result in a restriction of approval or withdrawal from the market. Well-advanced programs in our pipeline and those of our partners result in potential new approvals. Missing targets in this area may have significant to critical effects on our financial position and operating result, for example due to lower net sales or the non-occurrence of milestone payments from collaboration agreements. These risks are evaluated with probabilities ranging from improbable to likely.

For more detailed description on our R&D activities worldwide, please refer to the section "**Research and Development**" in "**Fundamental Information about the Group**" in the annual report.

Opportunities presented by activities to boost innovative strength

We see the rise of bioconvergence, which we define as a multidisciplinary approach that harnesses the synergies across digital and material science, as well as biotechnology. It will improve the speed and impact of scientific discovery. Fostering innovation at the intersection of our business sectors will allow us to benefit from our unique positioning at the sweet spot of converging technologies, unlocking organic growth opportunities and enabling pioneering solutions for customers and patients. Examples of innovation at the intersection of our business sectors include an automated design-make-test-analyze platform powered with state-of-the-art AI and lab automation, new treatment possibilities via enhanced mRNA LNP delivery platforms, and the deployment of digital twins in smart manufacturing.

Digital technologies and data will enable the development of personalized solutions of the future, accelerate our R&D pipelines, and ultimately improve patient and customer outcomes. In this context, developing and

adhering to rigorous ethical standards is of utmost importance for all our activities. Therefore, we created the Merck Digital Ethics Advisory Panel to provide external guidance and expertise on complex ethical matters around data usage, algorithms, and new digital innovations, ensuring that the company develops new digital technologies responsibly. In addition, we established the Code of Digital Ethics, which serves as a basis for ethical risk assessment in existing ventures as well as the design of ethic checkpoints for nascent digital solutions throughout the company.

Risks and opportunities related to the quality and availability of products

Opportunities arising from capacity expansion

We make targeted investments worldwide to expand our regional capacities and drive sustainable growth in all our three business sectors, especially in the "Big 3" growth drivers of Merck: Process Solutions and Life Science Services in Life Science, new innovative Healthcare products, and Semiconductor Solutions in Electronics.

In Life Science, we opened a new commercial facility in Martillac, France, to expand our production capacity for mAbs and other recombinant proteins as part our global Millipore® Contract Testing, Development, and Manufacturing Organization (CTDMO) Services. Leveraging state-of-the-art technology and a proven quality system allows our clients to streamline and accelerate the commercialization process by eliminating the need for tech transfer and scale-up between clinical and commercial stages. Our Millipore® CTDMO Services network includes facilities throughout Europe, the United States and Asia covering pre-clinical to commercial phases, including testing. Investments into our global network also include the recently announced € 290 million investment in a new facility to support the increasing demand for biosafety testing and analytical development services at our site in Rockland, Maryland, USA. This is the largest testing investment in company history.

In addition, we opened a € 59 million facility in Verona, Wisconsin, USA, which positions us as one of the leading, global CDMOs of HP-APIs used in novel cancer therapies, including ADCs. We also opened a viral clearance lab as part of the first building phase of our new € 29 million biologics testing center in Shanghai, China.

We further invested more than € 230 million to strengthen our manufacturing capabilities for single-use assemblies critical to the manufacture of Covid-19 vaccines and other life-saving therapies at our sites in Molsheim, France, and Wuxi, China. In addition, we invested € 440 million in the production capacity expansion for single-use membranes and filtration at our site in Cork, Ireland. We also started construction of a lateral flow membrane production facility at our U.S. site in Sheboygan, Wisconsin, USA, supported by a € 121 million contract award from the U.S. Department of Defense, on behalf of the U.S. Department of Health and Human Services. Lateral flow membranes are a key component in rapid diagnostic test kits for a variety of applications, including Covid-19 testing.

In Electronics, we plan to invest nearly € 3 billion in innovation and capacities up to the end of 2025. We will continue to heavily invest in research and development (R&D) in leading-edge material solutions and plan to spend close to € 2 billion in long-term fixed assets (capital expenditures). Through our Level Up growth program, we aim to capture the growth opportunities that come along with the significantly accelerating global demand for innovative semiconductor and display materials and invest in smart localization of our footprint to further boost customer proximity and ensure supply stability. Furthermore, we recently completed the acquisition of the chemicals business of Mecaro, a Korean supplier to the semiconductor industry to expand our portfolio in the fast-growing Semiconductor Solutions business unit. Among other things, we will further leverage our data analytics capabilities and invest even further into the safety realm.

Risk of a temporary ban on products/production facilities or of non-registration of products due to non-compliance with quality standards

We are required to comply with the highest standards of quality in the manufacturing of pharmaceutical products (Good Manufacturing Practice or official pharmacopoeia). In this regard, we are subject to the supervision of the regulatory authorities. Conditions imposed by national regulatory authorities could result in a

temporary ban on products/production facilities and possibly affect new registrations with the respective authority. We make the utmost effort to ensure compliance with regulations, regularly perform our own internal audits, and carry out external inspections. Thanks to these quality assurance processes, the occurrence of a risk with a significant impact is improbable to possible; however, it cannot be entirely ruled out. Depending on the product concerned and the severity of the objection, such a risk might have a negative impact on the net assets, financial position, and results of operations.

Risks of production availability

Further risks include operational failures due to fire or force majeure, for example natural disasters such as floods, droughts, or earthquakes, which could lead to a substantial interruption or restriction of business activities. Insofar as it is possible and economically viable, the Group limits its damage risks with insurance coverage, the nature and extent of which is constantly adapted to current requirements. Likewise, we are exposed to risks of production outages and the related supply bottlenecks that can be triggered by technical problems in production facilities with very high-capacity utilization. Furthermore, there are risks of supply bottlenecks due to a lack or disappearance of capacity. We work towards continual mitigation of such risks by making regular investments, setting up alternative sourcing options, and maintaining inventory levels.

Although the occurrence of these risks is considered – improbable, an individual event could have a critical negative effect on the net assets, financial position, and results of operations.

Risks of dependency on suppliers

In balanced markets, single-sourcing strategies may be chosen to bundle our company's demand and achieve price reductions. However, this strategy might result in dependency on individual suppliers for a number of goods or services. Consequently, events like discontinued/curtailed production or supply disruptions could potentially result in unavailability of such goods or services and have a critical impact on the concerned businesses. The Covid-19 pandemic represented an additional force, highlighting the potential risks of the single-source strategies. The past few years an increasing number of events, from the Covid-19 pandemic to the war in Ukraine, have shaped the risks and opportunities around single source strategies. With long-term strategic alliances, qualification and validation of alternative sources, as well as second supplier development strategies, we are able to reduce the probability of occurrence of these risks and rate them as possible.

Risks due to product-related crime

As a leading global science and technology company and manufacturer of innovative products of the highest quality, we are exposed to various security- and crime-related risks. Due to the increasing complexity of international trade and global supply chains, our products are particularly at risk from being counterfeited, stolen, illegally diverted and misused. If left unaddressed, this would not only lead to financial loss, reputational damage, and business disruption but also impact patient and customer safety. Consequently, we have implemented technical, operational, and procedural measures aimed at protecting the integrity of our products and supply chains, while also ensuring new threats are identified and managed appropriately. Overall, the threat resulting from product-related crime is likely with a potential moderate impact.

Risks and opportunities from the use of social media

We and our employees are active on numerous social media platforms. The consistent and legally compliant use of such platforms and their content is important in terms of increasing awareness of our brand, among other things. We take all necessary precautions and have implemented processes to ensure awareness regarding the proper handling of social media as well as actively manage and control our publication and communication.

Nevertheless, reputational risks could result, for instance through public dialogues in social media. We thus rate this as a potentially significant risk.

Financial risks and opportunities

As we operate internationally, and due to our presence in the capital markets, we are exposed to various financial risks and opportunities. Above all, these are liquidity and counterparty risks, financial market risks and opportunities, and risks of fluctuations in the market values of operational tangible and intangible assets, as well as risks and opportunities from pension obligations.

In the area of financial risks and opportunities, we use an active management strategy to reduce the effects of fluctuations in exchange and interest rates. The management of financial risks and opportunities by using derivatives is regulated through extensive guidelines. Speculation is prohibited, and derivative transactions are subject to constant risk controls. The strict separation of functions between trading, settlement, and control functions is ensured.

Liquidity risks

To ensure continued existence, we must be able to fulfill our commitments arising from operating and financial activities at any time. Therefore, to reduce potential liquidity risks, we have a central Group-wide liquidity management system in place, and a balanced maturity profile. The maturities of our financial liabilities are aligned with our planned free cash flow. Furthermore, we have a syndicated loan facility of € 2.5 billion with a term until 2027, which ensures continuing solvency if any liquidity bottlenecks occur. As our loan agreements do not contain any financial covenants, these agreed lines of credit can be accessed even if Merck's credit rating should deteriorate. Additionally, we have a commercial paper program with a maximum volume of € 2 billion.

Counterparty risks

Counterparty risks arise from the potential default by a partner in connection with financial investments, loans, and financing commitments on the one hand and receivables in operating business on the other.

As for counterparty risks from financial transactions, we review all central positions relating to trading partners and their credit ratings daily. We manage financial risks of default by diversifying our financial positions and through the related active management of our trading partners. Significant financial transactions involving credit risk are entered into with banks and industrial companies that have a good credit rating. Moreover, our large banking syndicate – the renewed syndicated loan facility of € 2.5 billion was syndicated among 15 banks in 2022 – reduces possible losses in the event of default.

The solvency and operational development of trading partners are regularly reviewed as part of the management of operational counterparty risks. Sovereign risks are also analyzed. The volume of receivables of each customer is capped in line with their credit ratings. Risk-mitigating measures, such as credit insurance, are utilized as appropriate. Nevertheless, defaults by isolated trading partners, even those with outstanding credit ratings, cannot be entirely ruled out, although rated as unlikely (further information can be found in "Credit risks" in the note "Management of financial risks" in the Notes to the Consolidated Financial Statements).

Counterparty risk is classified as a possible risk with a moderate effect.

Financial market risks and opportunities

As a result of our international business activities and global corporate structure, we are exposed to risks and opportunities from fluctuations in exchange rates. These result from financial transactions, operating receivables, and liabilities, as well as future cash flows from sales and costs in foreign currency. We use derivatives to manage and reduce these risks and opportunities (further information can be found in the note "Derivative financial instruments" in the Notes to the Consolidated Financial Statements). Foreign exchange rate risks are rated as possible with a potential substantial effect on the net assets, financial position, and results of operations.

Variable interest and current financial liabilities are exposed to the risks and opportunities of interest rate fluctuations. These are also managed and reduced using derivatives. Interest rate risks have a potentially negative impact, are considered possible, and pose an immaterial risk overall.

Risks of impairment of balance sheet items

The carrying amounts of individual balance sheet items are subject to the risk of changing market and business conditions and thus to changes in fair values as well. Necessary impairments could have a significant negative non-cash impact on earnings and affect the accounting ratios. This applies specifically to the high level of intangible assets including goodwill, which mainly derive from the purchase price allocations made in connection with past acquisitions (further information can be found in the notes “Goodwill” and “Other intangible assets” in the Notes to the Consolidated Financial Statements). All relevant risks were assessed during the preparation of the Consolidated Financial Statements and were taken into consideration accordingly. We rate risks beyond this as improbable with a potential critical impact.

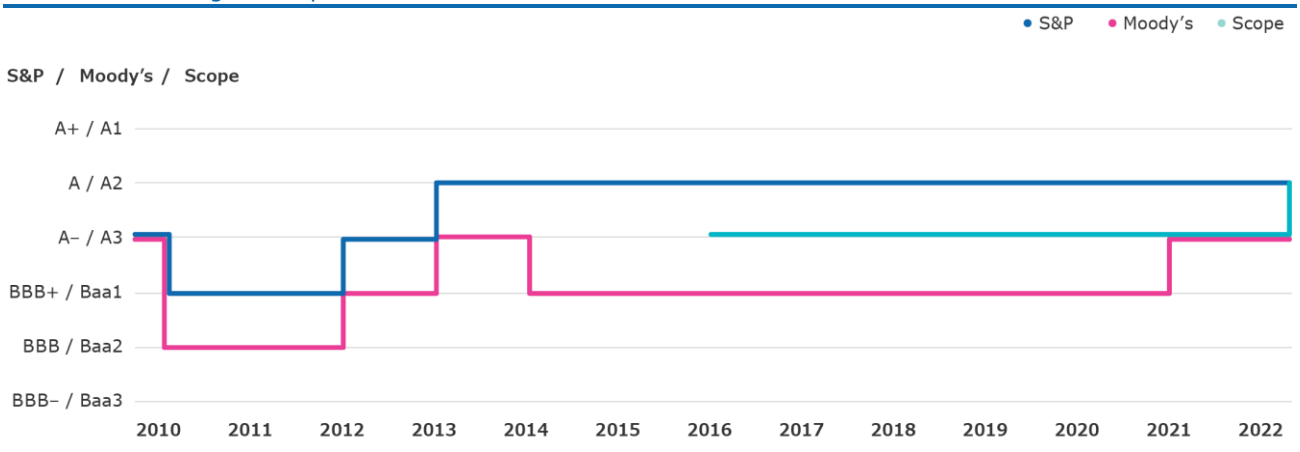
Risks and opportunities from pension obligations

We have commitments in connection with pension obligations. The present value of defined benefit obligations can be significantly increased or reduced by changes in the relevant valuation parameters, for example the interest rate or future salary increases. Pension obligations are regularly assessed as part of annual actuarial reports. The obligations are covered by the pension provisions reported in the balance sheet based on the assumptions as of the balance sheet date. Some of these obligations are funded by plan assets (further information can be found in the note “Provisions for pensions and other post-employment benefits” in the Notes to the Consolidated Financial Statements). To the extent that pension obligations are covered by plan assets consisting of interest-bearing securities, shares, real estate, and other financial assets, decreasing or negative returns on these assets can adversely affect the fair value of plan assets and thus result in further additions to pension provisions. By contrast, rising returns increase the value of plan assets, thereby resulting in excess cover of plan liabilities. We increase the opportunities of fluctuations in the market value of plan assets on the one hand and reduce the risks on the other by using a diversified investment strategy. The possible risk due to pension obligations could have moderate effects on the net assets, financial position, and results of operations.

Assessment by independent rating agencies

The capital market uses the assessments published by rating agencies to help lenders assess the risks of a financial instrument used by Merck. We are currently rated by Standard & Poor’s, Moody’s, and Scope. Standard & Poor’s has issued a long-term credit rating of A with a stable outlook, Moody’s a rating of A3 with a stable outlook, and Scope a rating of A with a stable outlook. In line with market procedures, our financing conditions are closely tied to our rating. The better the rating, the more favorably we can generally raise funds on the capital market or from banks.

Overview of Rating Development



Risks due to the divestment, acquisition, and integration of companies and businesses

Successfully acquiring and subsequently integrating new businesses entails risks. These are primarily centered around the uncertainty of reaching business targets and synergy goals, as well as staying within the planned integration budget. Divestments, on the other hand, could lead to liabilities and additional expenses related to potential indemnifications and commitments guaranteed in the sale transaction. We leverage our solid acquisition track record to reduce the probability of any transaction-associated risks, by integrating lessons learned from past transactions, strong due diligence, and closely managed integration processes. Given the current situation, there are no major risks.

Tax risks

Merck and its subsidiaries operate worldwide and are consequently subject to different national tax laws and regulations. National tax audits of our entities are conducted on an ongoing basis by the tax authorities of the respective countries in which we operate. Tax risks originate particularly from the changes in national tax laws and regulations, and case laws and interpretations by national tax authorities, as well as from significant transactions such as acquisitions, divestments and reorganizations.

Findings of the national audit authorities of the various countries may lead to higher tax expenses and payments and may also have an impact on the amount of tax receivables, and tax liabilities as well as on deferred tax assets and liabilities.

The tax function at Merck regularly and systematically assesses the relevant tax risks. Appropriate standards are put in place to identify tax risks at an early stage in order to review, assess and mitigate them effectively and efficiently. Mitigation measures are coordinated by the tax department with the subsidiaries. Risks in addition to those already considered in the balance sheet are classified as improbable to possible with potential moderate to substantial impact on the net asset, financial position, and results of operations.

For information on the accounting and measurement policies for income taxes, please refer to the section "**Income tax**" in "**Notes to the Consolidated Financial Statements**" in the annual report.

Legal risks

Generally, we strive to minimize and control our legal risks. To this end, we have taken the necessary precautions to identify threats and defend our rights where necessary.

Nevertheless, we are still exposed to risks from litigations or legal proceedings. In particular, these include risks in the areas of product liability, competition and antitrust law, pharmaceutical law, patent law, trademark law, data protection law, tax law, and environmental protection. As a research-based company, we have a valuable portfolio of industrial property rights, patents, and brands that could become the target of attacks and infringements. The outcome of future proceedings or those currently pending is difficult to foresee.

For instance, we are currently involved in litigation with Merck & Co. Inc., Kenilworth, NJ, United States (outside the United States and Canada: Merck Sharp & Dohme Corp. (MSD)), against whom we have filed lawsuits in various countries. This company has also sued us in the United States for trademark infringement, among other things.

Due to long statutes of limitations or in some cases the absence thereof, it is not possible to rule out that we will face third-party claims arising from the same issue despite the conclusion of legal proceedings. Court or official rulings or settlements can lead to expenses with a substantial to critical impact on our business and earnings.

Despite extensive precautionary measures, non-compliance with laws and regulations leading to related consequences can never be completely excluded.

In our opinion, the lawsuits described below constitute the most significant legal risks. This should not be seen as an exhaustive list of all legal disputes currently ongoing.

Risks due to antitrust and other government proceedings

Raptiva®: In December 2011, the federal state of São Paulo, Brazil, sued Merck for damages because of alleged collusion between various pharmaceutical companies and an association of patients suffering from psoriasis and vitiligo. This collusion is alleged to have been intended to increase sales of the medicines from the companies involved to the detriment of patients and state coffers. Moreover, patients are also suing for damages in connection with the product Raptiva®. Merck has taken appropriate accounting measures for these issues, which relate to various legal cases. Risks in excess of this with a negative effect on the net assets, financial position, and results of operations cannot be ruled out, but are considered possible with minor impact.

Risks in connection with a settlement agreement concluded by the divested Generics group

Paroxetine: In the United Kingdom, Merck was subject to antitrust investigations by the British Competition and Market Authority in connection with the generics business that was divested in 2007. In March 2013, the authorities informed Merck of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd., United Kingdom, and several subsidiaries of GlaxoSmithKline plc, United Kingdom, in connection with the antidepressant drug paroxetine, violated British and European competition law and set a fine. They stated that Merck was liable as the then owner of Generics (UK) Ltd. and because it was involved in the negotiations for the settlement agreement. The investigations into Generics (UK) Ltd. started in 2011, without this being known to Merck. After the European Court of Justice confirmed in January 2020 that such settlement agreements can violate European competition law, the Competition Appeal Tribunal confirmed in May 2021 the low single-digit million euro fine that Merck paid in September 2021. British National Health Services subsequently asserted claims for damages on account of the anti-competitive settlement agreements in 2002. Merck and the National Health Service for England and Wales agreed on a settlement payment in December 2022. The payment was made in January 2023. The previous provision in a low double-digit million euro amount was reversed almost in full. Citalopram: In connection with the generics business that was divested in 2007, Merck was accused of breaching EU antitrust law through agreements entered into by its former subsidiary Generics (UK) Ltd., United Kingdom, relating to the antidepressant Citalopram patented by Lundbeck A/S, Denmark. The European Commission imposed a fine in June 2013. Merck filed a lawsuit against the Commission’s decision with the European Court (EC) in August 2013. The lawsuit was rejected in 2016. Merck subsequently filed an appeal against this decision with the European Court of Justice, which confirmed the first instance ruling in March 2021. Although the fine of € 18 million was paid in 2013, additional potential claims were considered to be probable. A provision in a mid-double-digit million euro amount was recognized for these proceedings as of December 31, 2022. A cash outflow within the next twelve months is considered possible.

Product liability risks

Operating in the chemical and pharmaceutical industry, we are particularly exposed to product liability risks. Product liability risks can lead to considerable claims for damages, costs to avert damages, and potentially loss of reputation. Considering this, we have taken out the liability insurance that is a standard within our industry to mitigate such risks. However, it could be that the insurance coverage available is insufficient for individual cases. Although the occurrence of product liability claims in excess of the existing insurance coverage is considered highly improbable, individual cases could still have a critical effect on the net assets, financial position, and results of operations.

Human resources risks

Our future growth is highly dependent on our strength to innovate. Therefore, the expertise and engagement of employees in all sectors in which we operate are crucial to our success. The markets relevant to the company are characterized by intense competition to recruit qualified specialists and talents, and by the challenge of being perceived by the public as an attractive employer. Fluctuation risks specific to countries and industries have to be identified ahead of time and specifically addressed in order to keep the skills and expertise critical to success and business within the company.

Recruiting and retaining specialists and talents are therefore key priorities for the company and are managed through the targeted use of, for instance, employer branding initiatives, global talent, and succession management processes, as well as competitive compensation packages. Nevertheless, employee-related risks that affect business activities are possible; even though their impact is difficult to assess we evaluated a potential impact on the qualitative rating scale as significant.

Information technology risks

We use a variety of IT systems and processes to optimally support our globalization. Trends in information technology offer various opportunities but also harbor risks.

Risks due to cybercrime and the failure of business-critical applications

Increasing international networking and the related possibility of IT system abuse are resulting in cybercrime risks for Merck, such as the failure of central IT systems, the loss of the data integrity or the disclosure of confidential data from research and business activities, the manipulation of IT systems in process control, or an increased burden or adverse impact on IT systems as a result of virus attacks.

The Merck Group maintains and operates an information protection management system based on ISO 27001. Our governance framework contains organizational, process-related, and technical information security countermeasures based on recognized international standards. In addition, we employ harmonized electronic and physical security controls (e.g., access control and security monitoring) to bolster our ability to handle sensitive data, such as trade secrets.

Cyber Security is part of our Group Corporate Security Office. In addition, we have a Group Chief Information Security Officer and a network of Information Security Officers within the business sectors, each supported by dedicated networks. The individual sectors hold risk ownership and act as our first line of cyber security defense. Our Global Cyber Security function acts as a second line of defense and has responsibilities regarding cyber security risk governance and oversight. Our third line of defense consists of internal audits.

Globally used IT applications form the basis for the contractual delivery of products and solutions. The failure of business-critical IT applications could therefore have a direct influence on our ability to deliver and on the quality of our products. This also applies to the failure of a data center. To achieve the required service quality, we use a quality management system certified to ISO 9001 that also applies to the provision of IT. In addition, to reduce the risk of failure, we operate several redundantly designed data centers. Furthermore, insurance solutions for cybercrime offenses are in place at Group level.

Likewise, complications with the changeover of IT systems could negatively impact the earnings situation. Close monitoring of critical IT projects serves to mitigate this risk.

Despite the mitigation measures applied and functional continuity plans, the effects of cybercrime or the failure of business-critical IT applications and their influence on the net assets, financial position, and results of operations are considered to be possible and with potentially significant impact.

Environmental, climate-related, and safety risks and opportunities

Risks arising from environment, and climate as well as plant and equipment

As a company with global production operations, we are exposed to risks of possible damage to personnel, goods, and our reputation. Those include physical risks stemming from exposure to droughts, storms, and floods. Mitigation measures like audits, consultations, and trainings on environmental protection, occupational health and safety minimize these risks to people as well as the environment. In order to ensure the continuity of plant and equipment, we monitor these risks both at our own sites as well as at suppliers and contract manufacturers. By adhering to high technical standards, our rules of conduct, and all legal requirements in environmental protection, and occupational health and safety, we ensure the preservation of goods and assets. We have taken sufficient appropriate accounting measures for the environmental risks known to us. We monitor regulatory risks in connection with the transition to a low-carbon economy, which could materialize in the mid- and long-term through rising carbon prices through emissions trading systems, taxes or energy legislation. We mitigate those risks with our energy and carbon management measures. We classify these as possible risks based on which a significant impact on the financial position cannot be ruled out.

Opportunities arising from the further integration of sustainability in the corporate strategy

In 2020, we integrated sustainability more strongly in the corporate strategy, setting three goals in the areas of science and technology, value chain, and climate and environment. By considering the goals of the sustainability strategy when making business decisions and actively shifting our portfolio to increase the positive sustainability impact, we contribute to achieving the United Nations Sustainable Development Goals. In 2022, we extended the targeted strategies for our business sectors. Also, we launched a sustainability scorecard for our research and development activities. Our dedication to sustainability paired with our commitment to quality, regulatory excellence, and compliance is important for us. Combining these strategic elements will ensure an effective and efficient execution of our strategy and enable us to cater to the increasing expectations of customers, patients, employees, investors, and the general public.

Overall view of the risk and opportunity situation and management assessment

The most significant individual risks or risk clusters have been named in the report above, with business- and market-related risks being the most significant alongside IT and legal risks. Most notably, the still ongoing Covid-19 pandemic and global macroeconomic and geo-political developments increase existing risks related to more restrictive regulatory requirements regarding drug pricing and reimbursement, the demand for our products, business interruptions at our production sites, lack of availability of good quality materials or services, and risks related to research and development.

Following the risk mitigation measures taken – such as the implementation of management action (organizational responsibility and process improvements), existing insurance coverage, and accounting precautions – we were able to take counteraction, in particular against significant individual risks.

The overall risk of the Group, which is derived from the probability-weighted aggregation of the identified risks, leads to the assessment that an existence-threatening risk-scenario, for which coverage and financing of the losses are questionable, is highly improbable. We are convinced that we will also successfully manage the above-mentioned challenges in the future and benefit from diversification through our different products and markets. For our assessment of the appropriateness and effectiveness of the risk management system and the internal control system we refer to the Statement on Corporate Governance.

In our view, business-related opportunities offer the greatest potential. The activities listed hold significant opportunities for us in the medium to long term, beyond the underlying forecast period. We pursue the opportunities that arise and specify their expected effects in the forecast development of net sales, EBITDA pre, and operating cash flow. Furthermore, we will actively seek new opportunities, examine their implementation, and drive them forward where appropriate. If opportunities arise in addition to the forecast developments, or these occur more quickly than anticipated, this could have positive effects on our net assets, financial position, and results of operations.

Report on Expected Developments

The following report provides a forecast for fiscal 2023 for the Merck Group and its three business sectors: Life Science, Healthcare and Electronics.

Fundamental assumptions

We do not expect the acquisitions of Erbi Biosystems Inc., USA, and M Chemicals Inc., Korea, the chemical business of Mecaro Co. Ltd., Korea, to have a material portfolio effect at Group level in fiscal 2023 (more detailed information on these transactions can be found in Note (6) “Acquisitions and divestments” in the Notes to the Consolidated Financial Statements).

Against the backdrop of macroeconomic and geopolitical circumstances, the forecast is also subject to high uncertainty and volatility in fiscal 2023. It continues to assume an elevated level of inflation. Countermeasures will be taken to soften the expected negative effects as far as possible. Renewed outbreaks of Covid-19, in combination with local lockdowns, are not taken into consideration in this forecast.

As regards the development of exchange rates, we expect a continuing volatile environment due to geopolitical and macroeconomic developments. In contrast to the previous year, we expect a negative foreign exchange impact in 2023 resulting mainly from the development of the U.S. dollar and the Chinese renminbi. The majority of the remaining currencies are also expected to have negative foreign exchange impacts. The expected negative foreign exchange effects on EBITDA pre of the business sectors will be softened by our foreign currency hedging; however, we do not hedge all growth market currencies (see Note (42) “**Management of financial risks**” in the Notes to the Consolidated Financial Statements). This forecast for 2023 is based on a euro-U.S. dollar exchange rate in a corridor of 1.07 to 1.11.

Forecast for the Merck Group

Net sales

For the Merck Group in fiscal 2023, we expect slight to solid organic net sales growth, driven by all our business sectors. Our core business (excluding Covid-19 sales) is likely to deliver solid to strong growth. We assume negative foreign exchange effects of between -1% and -4%.

EBITDA pre

The forecast for the development of EBITDA pre is organically from a moderate decline to about stable. Inflation-related price increases will have a visibly adverse impact on earnings. The forecast foreign exchange development will likely adversely affect Group EBITDA pre by between -1% and -4%; it is expected to be seen mainly in the Healthcare and Electronics business sectors.

Operating cash flow

The forecast for operating cash flow is generally subject to a higher fluctuation corridor than the forecast for net sales and EBITDA pre. We provide an estimate of the development of operating cash flow only for the Group as a whole.

The development of operating cash flow is forecast to be largely in line with operating performance. Positive effects will result from a weaker rise in working capital in comparison with the previous year. Fiscal 2022

included adverse effects from the increase in inventories to secure production and supply as well as owing to higher material prices. As in the case of EBITDA pre, we expect impacts from negative foreign exchange effects in fiscal 2023. Overall, our forecast ranges from a moderate decline to a stable development in fiscal 2023. As regards the composition of operating cash flow, we refer to the section entitled "**Internal Management System**" in the combined management report as well as the Consolidated Cash Flow Statement in the Consolidated Financial Statements.

Forecast for the Life Science business sector

Net sales

For the Life Science business sector in fiscal 2023, we forecast slight to moderate organic growth. With respect to our core business, in other words excluding Covid-19-related sales, we expect solid to strong organic growth. In the core business, the Process Solutions business unit will be the strongest driver of growth. With the development of the core business, the Life Science Services and Science & Lab Solutions business units will also contribute positively to growth. We expect sales generated by demand for products in connection with the Covid-19 pandemic to total around € 250 million. This represents a continued decline in comparison with the previous year (2022: around € 800 million). The growth in our Life Science business sector is currently subject to higher volatility due to the varying developments across product groups and customer segments. Increased research and development activity as well as higher production volumes among pharmaceutical companies, especially in the biopharmaceutical segment, are the key drivers of growth in the core business. We forecast a slight to moderately negative foreign exchange effect.

EBITDA pre

Our forecast for EBITDA pre of the Life Science business sector for fiscal 2023 ranges from a moderate organic decline to about stable organic development compared with the previous year. In contrast to the positive development of demand, we expect inflation-driven price increases to weigh more heavily on earnings. We will take corresponding measures to counteract this effect if reasonably possible. We forecast a slightly negative foreign exchange effect.

Forecast for the Healthcare business sector

Net sales

For fiscal 2023, we forecast moderate to solid organic growth of net sales. We expect further significant increases in sales of Mavenclad® and Bavencio® to contribute substantially to this. For our established portfolio, we forecast an about stable organic development. This will be driven mainly by the organic growth of our products in the Cardiovascular, Metabolism & Endocrinology (CM&E) franchise. The expected decline in sales of Rebif® due to continued competitive pressure can thus be offset. We assume a slight to moderately negative foreign exchange effect.

EBITDA pre

We expect slight to moderate organic growth of EBITDA pre with further significant contributions from Mavenclad® and Bavencio®. On the cost side, the continued inflation-driven high price level will adversely affect earnings. The effects will be dampened as far as possible by strict cost management and continued prioritization of our development pipeline. In fiscal 2023 we expect active portfolio management to lead to income in the mid to high double-digit million euro range. For Healthcare, we expect negative foreign exchange effects in the high single-digit to low teens percentage range.

Forecast for the Electronics business sector

Net sales

For the Electronics business sector, we forecast slight to solid organic net sales growth in fiscal 2023. Despite the economically and geopolitically challenging circumstances in the market for semiconductor materials, the Semiconductor Solutions business unit will remain the key growth driver. This forecast is based on the assumption that the semiconductor market will recover in the second half of 2023. We expect that the growth of the Semiconductor Solutions business unit will continue to exceed market growth. In particular, the project business will contribute to growth. As expected, sales in the project business will be subject to stronger fluctuations owing to the dependency on major individual orders. We also expect our Surface Solutions business unit to see a positive organic development in fiscal 2023. Sales in our Display Solutions business unit will continue to decline organically. This will be attributable to the organic decrease in the Liquid Crystals business, which is facing persistent price erosion due to the price pressure common in this industry. We forecast a slight to moderately negative foreign exchange effect.

EBITDA pre

For our Electronics business sector, we expect a slight to strong organic decrease in EBITDA pre in fiscal 2023. Earnings will reflect inflation-driven cost increases, which will be seen particularly clearly in material costs. Owing to the price pressure faced by our customers, we assume that we will only be able to pass on costs increases to a limited extent in the coming quarters. Through active cost management, we will attempt to dampen these effects as far as possible. Owing to the tendencies outlined, the development of EBITDA pre is subject to a higher degree of uncertainty. We assume significantly negative foreign exchange effects on EBITDA pre.

Corporate and Other

For Corporate and Other, we expect a significant decrease in costs in fiscal 2023. This is mainly due to the positive effects expected from foreign currency hedging compared with the previous year, which will partly offset negative foreign exchange effects in the business sectors.

€ million		**Actual results 2022**	Forecast for 2023
Merck Group	Net sales	22,232	• Slight to solid organic growth (ex-Covid: solid to strong organic growth) • Negative foreign exchange effect -1% to -4%
	EBITDA pre	6,849	• Moderate organic decline to about stable organically • Negative foreign exchange effect -1% to -4%
	Operating cash flow	4,259	• Moderate decline to about stable
Life Science	Net sales	10,380	• Slight to moderate organic growth (ex-Covid: solid to strong organic growth) • Slight to moderately negative foreign exchange effect
	EBITDA pre	3,760	• Moderate organic decline to about stable organically • Slightly negative foreign exchange effect
Healthcare	Net sales	7,839	• Moderate to solid organic growth • Slight to moderately negative foreign exchange effect
	EBITDA pre	2,477	• Slight to moderate organic growth • Negative foreign exchange effect in a high single-digit to low teens percentage range
Electronics	Net sales	4,013	• Slight to solid organic growth • Slight to moderately negative foreign exchange effect
	EBITDA pre	1,192	• Slight to strong organic decline • Significantly negative foreign exchange effect
Corporate and Other	EBITDA pre	-579	• Significant decline in costs

Report in Accordance with section 315a of the German Commercial Code (HGB)

The following information is provided in accordance with section 315a of the German Commercial Code (HGB) and the explanatory report pursuant to section 176 (1) sentence 1 of the German Stock Corporation Act (AktG).

As of the balance sheet date, the company's subscribed capital is divided into 129,242,251 no-par value bearer shares plus one registered share. Each share therefore corresponds to € 1.30 of the share capital. The holder of the registered share is E. Merck Beteiligungen KG. It is entitled and obliged to appoint one-third of the members of the Supervisory Board representing the limited liability shareholders. If the holder of the registered share is a general partner, he or she has no such right of appointment. The transfer of the registered share requires the company's approval. The approval is granted at the sole discretion of the personally liable general partner with an equity interest, namely E. Merck KG.

Pursuant to the information on voting rights submitted to us in accordance with the German Securities Trading Act (WpHG), on December 31, 2022, no shareholders owned direct or indirect investments exceeding 10% of the voting rights.

According to the Articles of Association of Merck, the general partners not holding an equity interest who form the Executive Board are admitted by E. Merck KG with the consent of a simple majority of the other general partners. A person may be a general partner not holding an equity interest only if he or she is also a general partner of E. Merck KG. In addition, at the proposal of E. Merck KG and with the approval of all general partners not holding an equity interest, further persons who are not general partners not holding an equity interest may be appointed to the Executive Board.

The Articles of Association can be amended by a resolution at the Annual Meeting that requires the approval of the general partners. Notwithstanding any statutory provisions to the contrary, the resolutions of the Annual General Meeting are adopted by a simple majority of the votes cast. Where the law requires a capital majority in addition to the voting majority, resolutions are adopted by a simple majority of the share capital represented in the vote. The Articles of Association of the company encompass authorized and contingent capital.

The Executive Board is authorized to increase the company's share capital with the approval of the Supervisory Board and of E. Merck KG on one or more occasions, up to and including April 21, 2027, by a total of up to € 56,521,124.19 by issuing new no-par value bearer shares in exchange for cash and/or non-cash contributions (Authorized Capital 2022). Limited liability shareholders are generally granted statutory rights to subscribe to the new shares. However, the Executive Board is authorized, with the approval of the Supervisory Board, to exclude limited liability shareholders' subscription rights, either in full or in part, in the case of a capital increase in exchange for cash contributions pursuant to or by analogous application of section 186 (3) sentence 4 AktG, if the issue price of the new shares is not substantially lower than the stock exchange price of the company's shares already listed and if the new shares issued under exclusion of these subscription rights do not exceed a proportional amount of 10% of the share capital either at the time of Authorized Capital 2022 taking effect or being utilized. This restriction to 10% of the share capital shall include the proportional amount of the share capital that is attributable to shares that are issued under exclusion of subscription rights or sold during the term of Authorized Capital 2022, based on an authorization to issue new shares or sell own shares by direct or analogous application of section 186 (3) sentence 4 AktG. This restriction shall also include the proportional amount of the share capital that is attributable to shares which may or must be issued in order to service bonds carrying a conversion or option right or a conversion or option obligation, if the bonds are

issued during the term of Authorized Capital 2022 under exclusion of limited liability shareholders' subscription rights by analogous application of section 186 (3) sentence 4 AktG.

It is likewise possible to exclude the subscription rights of limited liability shareholders with the approval of the Supervisory Board in the case of capital increases in exchange for non-cash contributions, particularly for the purpose of acquiring enterprises, parts of enterprises, or interests in enterprises. In addition, with the approval of the Supervisory Board, limited liability shareholders' subscription rights can be excluded in order to enable E. Merck KG to exercise its right pursuant to article 32 (3) of the company's Articles of Association to participate in a capital increase by issuing shares or freely transferable share subscription rights.

It is likewise possible to exclude, with the approval of the Supervisory Board, the subscription rights of limited liability shareholders in order to enable E. Merck KG to exercise its right pursuant to article 33 of the Articles of Association to convert its equity interest into share capital, either in full or in part.

Moreover, with the approval of the Supervisory Board, the subscription rights of limited liability shareholders can be excluded if and to the extent this is necessary to grant the holders or creditors of conversion or option rights, and/or the holders or creditors of financing instruments carrying conversion or option obligations, which were or are issued by the company or by a domestic or foreign company in which the company directly or indirectly holds the majority of the votes and capital, subscription rights to the extent to which they would be entitled after the exercise of the conversion or option rights or after the performance of a conversion or option obligation.

Finally, with the approval of the Supervisory Board, the subscription rights of limited liability shareholders can be excluded in order to offset any fractional amounts resulting from a capital increase.

The sum of shares issued on the basis of Authorized Capital 2022 under exclusion of limited liability shareholders' subscription rights must not exceed a proportional amount of 10% of the share capital, taking into account other shares of the company which, during the term of Authorized Capital 2022, are sold or issued under exclusion of subscription rights or which are to be issued under bonds issued after April 22, 2022, under exclusion of subscription rights; this limitation shall apply both at the time of this authorization taking effect and at the time of this authorization being exercised.

To the extent that subscription rights are not excluded under the above provisions, they may also be granted to limited liability shareholders by way of indirect subscription rights pursuant to section 186 (5) AktG or, in part, by way of direct subscription rights, and otherwise by way of indirect subscription rights pursuant to section 186 (5) AktG. Furthermore, the Executive Board is authorized, with the approval of the Supervisory Board, to determine the additional details of the capital increase and its implementation, including the content of rights attached to the shares as well as the terms and conditions of the share issue.

The Articles of Association also encompass contingent capital. The share capital is contingently increased by up to € 66,406,298.40 composed of 51,081,768 shares (Contingent Capital I). The contingent capital increase serves to grant exchange rights to E. Merck KG in accordance with article 33 of the Articles of Association to enable the conversion of its equity interest. The shares carry dividend rights from the beginning of the fiscal year following the year in which the conversion option is exercised.

Moreover, the share capital is contingently increased by up to € 16,801,491.20 composed of up to 12,924,224 no par value bearer shares (Contingent Capital II). This contingent capital increase is only to be implemented insofar as the bearers or creditors of option or conversion rights, or with an obligation to convert or exercise options on warrant bonds, option participation certificates, option participation bonds, convertible bonds, convertible participation certificates, or convertible participation bonds issued in exchange for contributions that are issued or guaranteed by the company or a subordinate Group company on the basis of the authorization resolution of the Annual General Meeting of April 27, 2018, to April 26, 2023, utilize their option or conversion rights, or to fulfill their conversion obligation or obligation to exercise options insofar as they are obliged to fulfill their conversion or option exercise obligation, or insofar as the company exercises an option, in full or in part, to grant shares in the company instead of paying the sum of money due, and to the extent that in each

case a cash settlement is not granted, or own shares or other forms of fulfillment are used. Each issue of new shares shall take place at the determined option or conversion price, pursuant to the aforementioned authorization resolution. The new shares participate in the profit from the beginning of the fiscal year in which they are created; insofar as this is legally permissible, the Executive Board may, with the approval of the Supervisory Board, and in deviation from section 60 (2) AktG, stipulate that the new shares also participate in the profit for a past fiscal year. The Executive Board is authorized, with the approval of the Supervisory Board and of E. Merck KG, to stipulate the further details of the implementation of the increase in contingent capital.

The company is not authorized to acquire its own shares.

The company has not entered into any material agreements subject to a change of control pursuant to a takeover offer, nor has it entered into any compensation agreements with the members of the Executive Board or employees in the event of a takeover offer.

Non-Financial Statement**

The combined management report of Merck KGaA and the Merck Group for the fiscal year 2022 includes a combined non-financial statement in accordance with sections 315b and 315c in conjunction with 289b to 289e of the German Commercial Code (HGB) in the form of a separate chapter. Our non-financial statement orients towards the requirements of the Global Reporting Initiative (GRI) standards. It also includes our reporting in accordance with the EU taxonomy regulation.

KPMG AG Wirtschaftsprüfungsgesellschaft conducted a **limited assurance engagement** of the combined non-financial statement. References to information not included in the management report are not part of the non-financial statement. The additional content provided on both the company's websites as well as external websites that are linked in this report are not part of the information assured by KPMG – excluding references to our Sustainability Report. Our Sustainability Report 2022 is produced in accordance with GRI Standards. It will be available **online** as of April 13, 2023. With this, we also disclose topics set forth by Sustainability Accounting Standards Board (SASB) and Task Force on Climate-related Financial Disclosures (TCFD).

Description of our business model

Our business model as well as our Group structure, governance and strategy are described under "**Fundamental Information about the Group**".

Governance

The requirements we place on responsible corporate governance are derived from our **company values** on the one hand and from the regulations, external initiatives, and international guidelines to which we are committed on the other hand. We have integrated these requirements into our **sustainability strategy** and our **Group-wide guidelines**. These guidelines comprise charters and principles that are valid for the entire company as well as specific standards and procedures for individual business sectors and sites.

Some examples: Our **Human Rights Charter** aligns with the **UN Guiding Principles** for Business and Human Rights. Our Group-wide **Social and Labor Standards Policy** reflects the labor standards of the International Labour Organization (**ILO**). Our **EHS Policy** (Corporate Environment, Health and Safety Policy) for environmental impact mitigation and health and safety forms the basis for implementing the chemical industry's **Responsible Care® Global Charter** within our company. Our standard entitled Corporate Chemicals Regulations Governance describes the processes and management structures required to ensure global compliance with the pertinent chemical and product safety regulations.

We comply with all applicable laws as a matter of principle. Where necessary, we review our internal guidelines, standards and instruction manuals on compliant behavior and adapt them to reflect changes in the regulatory landscape.

Roles and responsibilities

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

We employ management systems to steer processes and 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

** The summarized non-financial statement was not part of the audit of the financial statements but was subject to a separate limited assurance audit by KPMG.

management. Our company regularly undergoes **ISO 14001** and **ISO 9001** certification, which are conducted by an independent auditing firm. We hold group certificates for both standards.

We support the following responsible governance initiatives:

- United Nations **Global Compact**
- Chemical industry's **Responsible Care® Global Charter**
- Company network Together for Sustainability (**TfS**)
- Pharmaceutical Supply Chain Initiative (**PSCI**)
- Initiative Chemie[3], a collaboration between the German Chemical Industry Association (VCI), the German Employers' Federation of the Chemical Industry (BAVC), and the German Mining, Chemical and Energy Industrial Union (IG BCE).

Strategic and organizational approach to sustainability

The world is facing multiple challenges that we too as a company face. These include climate change, international conflicts and economic crises, for instance. Our ambition is to leverage science and technology to achieve sustainable progress for mankind.

We describe our sustainability strategy in the "**Strategy**" section of the management report within the Annual Report for 2022 and, in more detail, in the Sustainability Report for 2022 in the chapter entitled "**Sustainability Strategy**".

Measuring progress made with the sustainability strategy

On the basis of 14 key indicators, which we defined back in 2021, we record and assess our progress towards achieving our sustainability goals. In 2022, we implemented various digital working tools that we believe will allow us gain greater transparency with regard to our achievements. Moreover, we added a sustainability factor to the Merck Long-Term Incentive Plan (LTIP) in 2022. It measures the performance of three selected sustainability goals over a period of three years, thus making it possible to increase or reduce target achievement resulting from the key financial performance indicators by up to 20%. Details on how this sustainability factor is calculated can be found in the **Compensation report**.

Goal 1: In 2030, we will achieve human progress for more than one billion people through sustainable science and technology.

Focus area	Sustainability key indicator	Further details
Sustainability innovation and technology	• Percentage of newly published patent families with positive sustainability impact	Sustainable innovation & technologies
Health and wellbeing impact	• People treated with our Healthcare products[1]	Will be published in the SASB index as of April 13, 2023

Goal 2: By 2030, we will integrate sustainability into all our value chains.

Focus area	Sustainability key indicator	Further details
Sustainability culture and values	• Percentage of women in leadership positions	Diversity, equity and inclusion
	• Percentage of employees trained on sustainability	Attracting and retaining talent
Sustainable and transparent supply chain	• Percentage of relevant suppliers (in terms of number and supplier spend) that are covered by a valid sustainability assessment[1]	Responsible supply chain
Securing our social license to operate in all regions	• Environment, Health and Safety (EHS) Incident Rate	Process, plant and transport safety
	• Violations of Global Social and Labor Standards Policy	Human rights
	• Lost Time Injury Rate (LTIR)	Health and safety

[1]The key indicator is used to determine the sustainability factor for the Merck Long-Term Incentive Plan (LTIP).

Goal 3: By 2040, we will achieve climate neutrality and reduce our resource consumption.

Focus area	Sustainability key indicator	Further details
Climate change and emissions	• Greenhouse gas emissions (Scope 1+2)[1]	Climate action
	• Indirect greenhouse gas emissions (Scope 3)	Climate action
	• Percentage of purchased electricity from renewable sources	Climate action
Water and resource intensity	• Waste Score	Will be published in the Sustainability Report 2022 as of April 13, 2023
	• Water Intensity Score	Water management
Water and resource intensity	• Wastewater quality	Will be published in the Sustainability Report 2022 as of April 13, 2023

[1]The key indicator is used to determine the sustainability factor for the Merck Long-Term Incentive Plan (LTIP).

Roles and responsibilities

Our Executive Board has Group-wide responsibility for our sustainability strategy. It has adopted our three strategic goals. In 2030, we will achieve human progress for more than one billion people through sustainable science and technology. By 2030, we will integrate sustainability into all our value chains. And by 2040, we will achieve climate neutrality and reduce our resource consumption (details can be found under "**Strategy**").

The Group Corporate Sustainability unit is responsible for developing and shaping the sustainability strategy and it informs the Executive Board at least once a year about the progress made and the need for action. It is part of the Group function Corporate Sustainability, Quality and Trade Compliance (SQ), which reports to the Chair of the Executive Board. Consequently, overarching Executive Board responsibility for Environment, Social, Governance (ESG) also lies with the Chair of the Executive Board.

Group Corporate Sustainability is also responsible for coordinating the Merck Sustainability Board (previously Corporate Sustainability Council), which was set up in 2022. The Merck Sustainability Board is chaired by the Head of SQ and consists of representatives from our business sectors and from key Group functions, such as Procurement, Communications, as well as Controlling and Risk Management.

The Sustainability Board steers and monitors the Group-wide implementation of the sustainability strategy. It aligns the strategy with the individual business strategies, defines priorities and specifies globally applicable sustainability guidelines. In addition, the Sustainability Board ensures that the initiatives of our various business sectors, Group functions and subsidiaries align with our global sustainability strategy. Moreover, it recommends corresponding initiatives to the Executive Board. Within their respective area of responsibility, each Executive Board member is also responsible for sustainability, reviews the priorities that have been set, and decides on the implementation of initiatives.

In 2022, the Sustainability Board met nine times by video conference. The participants addressed the following topics: Implementing the sustainability strategy in the business sectors, key indicators for measuring and steering sustainability within the company, lowering greenhouse gas emissions, and supply chain due diligence requirements.

An external expert committee for sustainability issues has been supporting our company since 2021. The Merck Sustainability Advisory Panel (MSAP) consists of six independent experts on sustainability-related topics from several institutions worldwide. They advise the members of the Sustainability Board on selected issues and assess the sustainability of our company's business models as well as planned activities. Moreover, they provide their external insights to help address societal and political challenges and developments that could be strategically relevant for our businesses. This panel is chaired by the Head of SQ.

Topics for the non-financial statement

Pursuant to section 289c para 3 of the German Commercial Code, we are obligated to review topics for their double materiality. The principle of double materiality requires companies to disclose non-financial information as soon as the following two criteria are met: Firstly, the information makes it possible to understand how the company's business activities affect non-financial aspects. And secondly, the information is necessary to understand the company's course of business, results of operations and economic position. In 2022, we examined the topics identified within the scope of a **materiality analysis** in accordance with the Global Reporting Initiative standards (GRI) for their double materiality.

The following topics achieved the relevance threshold for double materiality in 2022. They cover fiscal year 2022 and pertain to our entire Group. Any deviations from the reporting framework are indicated on a case-by-case basis.

Aspect	Topic
Environmental matters	• Environmental management • Climate action • Water management • Plant, process and transport safety • Chemical product safety
Employee-related matters	• Attracting and retaining talent • Diversity, equity and inclusion • Health and safety
Social matters	• Sustainable supply chains (including the mica supply chain) • Patient safety • Prices of medicines • Clinical studies • Bioethics • Digital ethics • Data protection and security
Respect for human rights	• Human rights
Anti-corruption and anti-bribery	• Governance and compliance (including anti-corruption anti-competitive behavior) • Responsible marketing • Interactions with health systems
Other topics	• Sustainable innovation and research & development

As part of our approach to comprehensive risk and opportunity management, we also identify current and potential risks and opportunities resulting from environmental, social and governance aspects. This includes tracking information on the gross risks in terms of potential damage and probability, as well as the residual net risks remaining after mitigation measures have been executed. As of the reporting date and pursuant to the risk analysis of the material non-financial topics, no significant risks within the meaning of section 289c (3) sentence 1 No. 3 and 4 of the German Commercial Code (HGB) from the company's own business activities or from business relationships are known that are very likely to have or will have serious negative effects on non-financial aspects. Additional risks are described in the **Report on Risks and Opportunities** in the combined management report.

Environmental matters

Environmental protection

Minimizing negative environmental impacts and taking meaningful climate action requires a holistic approach while also constantly monitoring practices and performance. Our goal is to decouple business growth from negative environmental impacts wherever possible. Our production sites are located in established industrial and commercial zones. Before acquiring a company – and thus its facilities – we first conduct an environmental risk assessment, taking into consideration information from publicly accessible sources such as local residents and non-governmental organizations (NGOs).

Roles and responsibilities

The Chair of the Executive Board and CEO of our company is responsible for environmental protection, which also covers climate action, water management, waste and recycling, biodiversity, and plant and process safety. Her duties include the approval of overarching Group-wide guidelines such as our EHS Policy. Furthermore, the Merck Sustainability Board (MSB) monitors the Group-wide implementation of environmental protection goals.

The Group function Corporate Sustainability, Quality and Trade Compliance (SQ) is responsible for steering all the related measures globally. SQ senior leadership approves operational standards and regularly reports on environmental protection to the Executive Board. Every year, SQ prepares a comprehensive environment, health and safety report that covers topics such as climate action, water management, waste and recycling, and plant and process safety. The Executive Board uses this report to steer the strategic direction and as verification for our ISO 14001 certifications. Additionally, the Executive Board receives a monthly update so that measures can be adjusted in a timely manner.

Within our business sectors, the Operations Leadership Committee (OLC) makes strategic decisions on issues pertaining to emissions, energy, water, and waste topics. This body consists of representatives from Life Science, Healthcare and Electronics as well as from SQ. Decisions made by the OLC and any resulting actions are implemented by the respective business sector. Once per quarter, the OLC members update their leaders on matters relating to environmental protection, and this information, if relevant, is then shared with the MSB.

Our commitment: Standards and standard operating procedures

Our approach to environmental management is founded on our Group **EHS (Environment, Health and Safety) Policy**, which has been approved by our Executive Board. Aligned with the requirements of the chemical industry's **Responsible Care® Global Charter** and the ISO 14001 environmental management standard, this policy underscores our leaders' responsibility for environmental stewardship and health and safety. It is also aimed at our suppliers, calling on them to likewise adopt higher standards of environmental sustainability and safety. Our EHS policy thus complements the **Supplier code of conduct** (formerly Responsible Sourcing Principles) of our Group Procurement function. Through our Contractor EHS Management Standard we aim to ensure that our contract partners also take environment, health and safety aspects into account.

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

Material investments in environmental impact mitigation

Efforts to prevent and monitor air, water and soil emissions entail significant expense on our part, as does proper waste disposal. Moreover, we set up provisions for groundwater and soil remediation to ensure that we can execute all the necessary measures. As of December 31, 2022, our **provisions for environmental protection** totaled € 148 million, 94% of which was attributable to Merck KGaA, Darmstadt, Germany.

Assessing environmental impacts

As a matter of principle, we conduct risk-based assessments along with audits of all our production facilities every three years with the goal of analyzing and minimizing our environmental footprint. Conducted by Corporate Sustainability, Quality and Trade Compliance (SQ), these assessments serve to ensure that our requirements are being met, with appropriate corrective measures being implemented as needed. In our Group EHS audits, we assess our sites' performance on a five-tier scale ("excellent", "good", "satisfactory", "poor" and "critical"), which in turn determines how frequently audits are conducted. If the findings are deemed to be good, we audit the facility less often, while significant violations can increase the frequency. In 2022, we commissioned a total of 41 audits, which were conducted either virtually or on site. Almost all audited sites received either a "good", "satisfactory" rating, one site was rated "poor" and no sites were rated as "critical".

Reporting incidents and violations

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

In the event of a major occurrence, our digital Rapid Incident Report System (RIRS) promptly notifies SQ and Group Communications functions, who, if necessary, inform the Executive Board. Major incidents could include fatalities, accidents with multiple casualties, incidents that impact neighboring communities or natural disasters such as earthquakes and flooding. Through the RIRS, we can quickly coordinate with all those involved and inform the other sites immediately of the respective event. In addition, employees as well as external stakeholders can report any violations of our standards to Group Compliance.

In 2022, we recorded two significant incident-related spills. One took place at a production site in Germany, the other one in the USA. In neither case were people injured nor were negative environmental impacts expected, which is why it was not necessary to communicate these incidents to the public.

ISO 14001:2015 Group certificate

Since 2009, our company has held an ISO 14001 Group certificate that requires all production sites with more than 50 employees to implement an environmental management system with predefined indicators such as greenhouse gas emissions and water consumption. Other facilities are not obligated to undergo certification. The annual internal audit reports and management reviews carried out under the Group certificate give us a better overview of how all our sites are performing. In 2022, 95 of our sites worldwide were covered by the **ISO 14001** certificate.

Annual external audits are used to monitor our certifications. As part of a defined sample procedure for the Group certificate, a total of 12 sites were externally audited in 2022, with all audited facilities passing. In addition to external inspections, internal audits serve to ensure Group-wide compliance with our requirements.

Climate action

We want to do our part to preserve the climate and comply with the Paris Agreement on climate change. Therefore, we have set our own objectives:

By 2030, we intend to lower our direct (Scope 1) and indirect (Scope 2) greenhouse gas emissions by 50% compared with 2020. We aim to achieve this mainly by reducing process-related emissions, implementing energy efficiency measures and purchasing more electricity from renewable sources.

In May 2022, this near-term goal for 2030 was approved by the Science Based Targets initiative (SBTi), which independently assesses and approves company targets based on its strict climate science criteria. With this confirmation, we are contributing to limiting global warming to 1.5 °C, thus complying with the requirements of the Paris Agreement.

We also aim to cover 80% of our purchased electricity with renewables by 2030.

Moreover, we aim to reduce our Scope 3 emissions across the entire value chain by 52% (per euro of gross profit) by 2030. This target was also approved by SBTi.

By 2040, we intend to have achieved climate-neutral operations throughout our entire value chain; this target covers our Scope 1, 2 and 3 emissions.

Roles and responsibilities

Corporate Sustainability, Quality and Trade Compliance (SQ) is responsible for overseeing all climate action efforts throughout the Group, with our individual sites and business sectors worldwide implementing the necessary measures at the local level. You can find more information under "**Environmental protection**".

Our commitment: Standards and legal frameworks

We have three EHS standards in place to manage energy and process-related emissions consistently across the Group, specifically "Energy Management", "Emissions" and "Emissions of Refrigerants". We utilize an internal audit process to randomly check compliance with all EHS standards.

Emissions reduced further

In 2022, we reduced our greenhouse gas emissions by nearly 10%, emitting a total of approximately 1,667,000 metric tons of CO_2 equivalents (CO_2eq) (2021: 1,843,000 metric tons). Our direct emissions (Scope 1) totaled 1,425,000 metric tons of CO_2eq, with process-related emissions accounting for 1,167,000 metric tons of CO_2eq and fuel use accounting for the remainder. Indirect emissions (Scope 2) totaled roughly 242,000 metric tons calculated according to the market-based method (approximately 377,000 metric tons according to the location-based method). Greenhouse gas emission intensity (Scope 1 and 2) amounted to 0.07 kg of CO_2eq per € of net sales in this period (2021: 0.09).

In 2022, we focused on creating more transparency on our Scope 3 emissions. The Greenhouse Gas Protocol defines 15 categories for Scope 3 emissions from upstream and downstream activities. In 2022, these emissions totaled 6,616,000 metric tons of CO_2eq. Categories 1 and 2 (Purchased Goods and Services and Capital Goods) accounted for 69% of our total Scope 3 emissions in this period.

Total greenhouse gas emissions (Scope 1 and 2 of the GHG Protocol)[1,2]

metric kilotons	2019	2020[3]	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total CO_2eq[4] emissions	**621**	**2,028**	**1,843**	**1,667**	**148**
thereof:					
direct CO_2eq emissions (Scope 1)	341	1,706	1,522	1,425	108
indirect CO_2eq emissions[5] (Scope 2)	280	322	321	242	40
Biogenic CO_2 emissions	**13**	**13**	**15**	**13**	**0**

[1] In line with the Greenhouse Gas Protocol, for all previous years greenhouse gas emissions were calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

[2] Baseline for our emission targets is 2020.

[3] Includes Versum Materials as of 2020.

[4] eq = equivalent

[5] The figures presented here have been calculated in accordance with the market-based method.

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, NF_3, SF_6.
Indirect CO_2 emissions: CO_2.

Other relevant indirect greenhouse gas emissions (Scope 3 of the GHG Protocol)[1]

	2019	2020	2021	2022
Total gross other indirect emissions (metric kilotons CO_2eq[2])	**339**	**5,030**	**5,716**	**6,616**
Purchased goods & services (category 1)[3]	n/a	3,040	3,572	4,200
Capital goods (Category 2)[3]	n/a	293	291	388
Fuel- and energy-related emissions, not included in Scope 1 or 2 (category 3)	127	102	143	121
Upstream transportation & distribution (category 4)[4]	n/a	264	264[5]	319[6]
Waste generated in operations (category 5)	50	85	79	85
Business travel (category 6)	87	32	26	78
Employee commuting (category 7)	75	90	94	99
Upstream leased assets (category 8)[7]	0	0	0	0
Downstream transportation & distribution (category 9)[4]	n/a	8	8[5]	6[6]
Processing of sold products (category 10)[8]	0	0	0	0
Use of sold products (category 11)[4]	n/a	1,091	1,213	1,290[9]
End-of-life treatment of sold products (category 12)[4]	n/a	23	23[5]	26[9]
Downstream leased assets (category 13)	0	2	2	2
Franchises (category 14)[10]	0	0	0	0
Investments (category 15)	n/a	0	1	2

[1] In line with the Greenhouse Gas Protocol, for all previous years greenhouse gas emissions were calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

[2] eq = equivalent

[3] The reported figures contain 95-97% of our total spend. The difference stems from smaller sites that are not integrated in our Group-wide purchase volume data. 2020 data are slightly over-reported (approx. 3%) as the currency conversion factor (USD to EUR) from 2021 was used. Non-categorized spends are distributed pro rate to category 1 and 2.

[4] Compared to other Scope 3 categories, the screening of the emissions in this category contains more uncertainties. Their impact cannot be estimated more precisely at this time. We are working on improving the accuracy of these data.

[5] Due to high efforts for data preparation, we reference 2020 data for 2021.

[6] Since 2022, we have applied a new calculation approach – a mix of primary data, distance-based data and a small share of spend-based data. The previous years' figures have not been recalculated retrospectively.

[7] Already covered under Scope 1 and 2 emissions

[8] Our company produces a huge variety of intermediate products for various purposes. Due to their many applications and our customer structure, the associated greenhouse gas emissions cannot be tracked in a reasonable fashion.

[9] Due to high efforts for data preparation, we partly use 2020 data for 2022.

[10] This category is not relevant for us as we do not operate franchises, i.e. businesses operating under a license to sell or distribute another company's goods or services. Out-licensing in the pharmaceutical sector is not regarded as franchising.

Biogenic emissions (Scope 3), if present, are not being recorded.

Significant spills

	2019	2020	2021	2022
Total number of significant spills	0	0	0	2

Energy efficiency

In 2022, a variety of energy efficiency initiatives helped us save around 3,000 metric tons of CO_2eq at our global headquarters in Darmstadt (1,700 metric tons of CO_2eq in 2021). For instance, we improved heating, ventilation and air conditioning systems and reduced base loads for compressed air systems.

As part of the energy and water efficiency program of our Life Science business sector, we rolled out new tools and governance structures in 2022 to help us assess projects to save energy and water. The energy and water efficiency program had a capital expenditure budget of € 4.6 million in 2022, which we will increase to € 9.3 million in 2023. In 2022, we formally trained 18 Facility, Plant Engineering, and EHS Managers from sites globally on energy management.

Slight decline in energy consumption

We consumed 2,432 gigawatt hours of energy in 2022, compared with 2,454 gigawatt hours in 2021. Our energy intensity relative to sales totaled 0.11 kWh/€ in 2022 (2021: 0.12 kWh/€).

In 2022, we further strengthened our focus on purchasing electricity from renewable sources. In this period, we sourced 47% of our purchased electricity from renewable energies, meaning direct supply contracts and energy attribute certificates (2021: 30%). The share of our total energy consumption by renewable energies increased to 20% in 2022 (2021: 13%).

Energy consumption[1]

In GWh	2019	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total energy consumption	**2,178**	**2,374**	**2,454**	**2,432**	**586**
Direct energy consumption	**1,288**	**1,266**	**1,318**	**1,294**	**521**
Natural gas	1,222	1,179	1,232	1,188	492
Liquid fossil fuels[2]	33	52	48	70	29
Biomass and self-generated renewable energy	33	35	38	36	0
Indirect energy consumption	**890**	**1,108**	**1,136**	**1,138**	**65**
Electricity	745	945	958	984	65
Steam, heat, cold	145	163	178	154	0
Total energy sold	**0.1**	**0.2**	**0.1**	**0.01**	**0.0**
Electricity	0.1	0.2	0.1	0.01	0.0
Steam, heat, cold	0.0	0.0	0.0	0.00	0.0

In TJ					
Total energy consumption	**7,839**	**8,546**	**8,834**	**8,755**	**2,110**
Direct energy consumption	**4,637**	**4,558**	**4,745**	**4,658**	**1,876**
Natural gas	4,399	4,244	4,435	4,277	1,771
Liquid fossil fuels[2]	119	187	173	252	104
Biomass and self-generated renewable energy	119	126	137	130	0
Indirect energy consumption	**3,202**	**3,989**	**4,090**	**4,097**	**234**
Electricity	2,682	3,402	3,449	3,542	234
Steam, heat, cold	520	587	641	554	0
Total energy sold	**0.5**	**0.7**	**0.4**	**0.04**	**0.0**
Electricity	0.5	0.7	0.4	0.04	0.0
Steam, heat, cold	0.0	0.0	0.0	0.00	0.0

[1] In line with the Greenhouse Gas Protocol, for all previous years energy consumption has been calculated based on the current corporate structure as of Dec. 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

[2] Light and heavy fuel oil, liquefied petroleum gas (LPG), diesel, biodiesel, gasoline and kerosene

We use photovoltaics to produce power at multiple sites.
We currently only record 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.

Water management

To us, sustainable water management means obtaining freshwater or discharging treated wastewater without negatively impacting aquatic ecosystems. We are also concerned with addressing water scarcity. To determine whether a site is located in a water-stressed area, we apply a risk factor of the Aqueduct Water Risk Atlas of the World Resources Institute (WRI). We want to reduce the environmental impact of our wastewater and make our processes more water-efficient. In the medium term, we will also take into account water-related risks that exist in our supply chain when purchasing important raw materials. In the long term, we intend to transparently map water use and environmental impacts throughout the entire life cycle of our products.

To this end, we have defined two targets: First, by 2025, we aim to lower our "Merck Water Intensity Score" by 10% compared to 2020. Second, by 2030, we want to reduce potentially harmful residues in our wastewater below the no-effect threshold; this is a scientifically defined limit below which no negative environmental impacts are expected.

Our regular EHS audits at our production and development facilities also review site-specific water management practices. Our water management efforts focus more heavily on our manufacturing sites than on our administrative facilities because production generally poses a higher risk to aquatic ecosystems.

Roles and responsibilities

The Group function Corporate Sustainability, Quality and Trade Compliance (SQ) is responsible for water management. At our sites, engineers work in close collaboration with our EHS managers to lower water consumption and treat wastewater. Further information can be found under "**Environmental protection**".

Our commitment: Standards and procedures

Our Group-wide Sustainable Water Management Part 1 – Wastewater, Sustainable Water Management Part 2 – Water Use and Sustainable Management Part 3 – Water Risk Management standards detail how we integrate mechanisms of sustainable water management into our management system. All three standards are based on the commitments we made under the **Responsible Care®** initiative. At the same time, our **Sustainable water management principles** set the framework for the three aforementioned standards.

Our Wastewater Standard defines criteria for assessing our wastewater discharges into the ecosystem. It also helps us to achieve our target as regards trace substances in wastewater from our operations. The Water Use Standard sets out mandatory Group-wide requirements for the responsible consumption of water. The Water Risk Management standard establishes a way for us to manage the risks that arise from direct or indirect water extraction and also covers risks such as contaminated rainwater and flooding. We perform internal EHS audits to verify that our sites comply with our three standards. They are all required to measure and assess the risks and impacts of the hazardous substances in their wastewater. Moreover, they must also analyze withdrawal and wastewater risks and comply with the respective requirements of the local authorities.

Water withdrawn from our own sources

For the most part, we draw water used for our production processes from our own wells and source drinking water from local suppliers. In doing so, we do not want water extraction to impair any protected areas, sensitive ecosystems or habitats. Our aim is to extract less water from our own wells than the amounts approved in our permits. At the same time, we keep an eye on trends that could potentially lead to sources being reclassified in the future.

The cooling water used for our production processes generally runs in a circular system. Depending on regulatory standards and the energy footprint, we sometimes use freshwater for cooling in a once-through system. However, this is only done in regions with high freshwater availability. For certain applications, we treat production wastewater and reuse it. In 2022, we recycled a total of 20.7 million m³ of water (2021: 23.5 m³ of water).

Water withdrawal

millions of m^3	2019	2020	2021	2022 Merck Group	2022 Water stress areas
Total water withdrawal	**14.0**	**14.0**	**13.5**	**13.2**	**0.17**
Surface water (rivers, lakes)	1.9	1.8	1.9	1.8	0.004
Groundwater	6.8	6.7	6.3	6.3	0.003
Drinking water (from local suppliers)	5.2	5.4	5.2	5.0	0.160
Rain water and other sources	0.05	0.06	0.06	0.06	0.004

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.

Using water more efficiently

We seek to minimize our impact on water availability in the vicinity of our sites. In 2022, we withdrew 13.2 million m³ of water in total (2021: 13.5 million). Local conditions determine whether a sufficient water supply is available. In our water conservation efforts, we pay particular attention to sites in water-scarce areas. To improve our water efficiency, we have therefore defined an intensity score – the Merck Water Intensity Score. The score relates to the amount of water either purchased or withdrawn from our own wells at a site to the number of hours worked, while taking the local availability of water into account. The Gernsheim site (Germany) is excluded from both the score and our water conservation efforts because we must extract a minimum water quantity from our own wells in order to comply with regulatory requirements. In 2022, we lowered the Merck Water Intensity Score by 8.6% in comparison with the baseline year 2020 (2025 target: 10% reduction).

Our site in Rio de Janeiro conducted a project to reduce water consumption by upgrading the on-site wastewater treatment plant and reusing treated wastewater in the cooling towers. After two years of implementation, the average annual volume of water that is reused is approximately 20,000 cubic meter/year, which contributes together with other water saving measures to a reduction of 33% of total water intake compared to 2020.

Our wastewater

In 2022, we generated a total of 12.4 million m³ of wastewater (2021: 13.3 million). This consisted of around 8.6 million m³ of freshwater, which we discharged into surface waters. 3.8 million m³ was classified as “other water” and was treated at external treatment plants or disposed of in an ecologically sustainable manner.

Wastewater volume

	2019	2020	2021	2022 Merck Group	2022 Water stress areas
Total wastewater volume (millions of m^3)	**13.2**	**13.4**	**13.3**	**12.4**	**0.130**
Wastewater discharged directly	9.3	9.2	9.5	8.6	0.000
Wastewater discharged to third parties	3.8	4.1	3.8	3.8	0.110

We continuously work to optimize our production streams and purification processes in order to conserve water and minimize residues. An expert has been appointed for each of our business sectors to provide guidance for our sites. Apart from aiming to reduce the amount of pharmaceutical active ingredient residues in wastewater, we expanded our measures to include substances with water-hazardous properties in 2022. All the relevant sites have their own wastewater treatment plants and regularly analyze their wastewater to check for harmful substances.

Plant, process and transport safety

We seek to minimize manufacturing process hazards wherever possible in order to prevent workplace accidents, production outages and chemical spills, which is why we regularly review our approach to plant and process safety and continuously gauge it using our EHS performance indicators.

Moreover, all our shipments are to reach our customers and sites safely, undamaged and with the required safety information. Several of the materials we store and transport are classified as hazardous. The storage of such dangerous goods and the transport thereof – whether by road, rail, air, or water – are governed by global regulations. To minimize risks to people and the environment, we apply strict safety requirements across the Group that also comply with applicable laws. We conduct regular reviews to ensure our own warehouses as well as those of third parties comply with these regulations. In 2022, no third-party audits were conducted due to Covid-19.

Roles and responsibilities

Overriding responsibility for plant, process and transport safety lies with our Group function Corporate Sustainability, Quality and Trade Compliance (SQ), which coordinates plant and process safety for the company and defines Group-wide EHS standards and regulations.

Our commitment: Internal standards and international rules

To ensure safe operation throughout the lifetime of a plant, our Group-wide EHS standards contain specific rules for production plants and processes. These include specifications that determine how special risk analyses and hazard assessments are to be carried out. We have also defined measures for the event of accidental release of chemical substances and for fire protection.

Our Group-wide EHS standards stipulate the safety levels for the storage of hazardous materials at our sites. Along with supplementary standard operating procedures and best practice documents, these EHS standards describe the technology, equipment and organizational infrastructure needed to achieve the appropriate safety levels. Contract warehouses must also adhere to our strict safety requirements. Before we sign a contract with an operator, they must submit a statement detailing how they meet our prerequisites. Our Group-wide EHS standards also define the technical and organizational requirements for such warehouses.

Our Group Transport Safety Standard is based on the United Nations Recommendations on the Transport of Dangerous Goods. This guideline is especially important for sites in countries with inadequate local regulations covering the conveyance of hazardous materials.

Assessing potential risks

Before commissioning a plant, we draft a safety concept, which is subject to continuous review throughout the entire lifetime of the facility. It is updated as needed until the facility is decommissioned. This safety concept contains an overview of potential risks and specifies corresponding protective measures. In the event that alterations are made to a plant, we reassess the hazard and risk situation. Our Risk Management Process guides all our sites in identifying and assessing risks and serves to devise further measures to minimize them.

We use internal EHS audits to complement the inspections conducted by our EHS and dangerous goods managers in order to ensure that our sites comply with process, plant, transport, and storage safety regulations. Normally, these audits are conducted every three years at production sites and every four years at warehouse and distribution sites. If major shortcomings are identified, we re-audit the respective site the following year. Conversely, we may decide to extend the period between audits at facilities where, based on the findings from previous audits, we deem the potential risk to be low. Our sites are required to rectify any deficiencies discovered during the audit, with the auditor subsequently checking whether the specified corrective actions have been taken. In 2022, we conducted 41 EHS audits in accordance with our Group-wide EHS standards.

Keeping a close eye on safety

We track EHS performance indicators at all production and warehouse facilities, as well as at major research sites, including both accidents and near misses. We investigate each individual incident and then devise appropriate countermeasures in an effort to reduce the likelihood of such events reoccurring in the future. EHS performance indicator data are reported once a month within each business sector, with the Executive Board receiving reports on the topic once per year. Four indicators are particularly important to us:

- Under our EHS Incident Rate (EHS IR), we track and evaluate all major and minor accidents and incidents as well as further EHS-relevant incidents. The EHS IR covers both our own employees as well as those of contractors. To calculate it, we state the number of incidents and the severity of the event in relation to the number of hours worked. The lower the EHS Incident Rate, the safer the site is. In 2022, the ratio was 2.8 (2021: 3.9). The significantly lower rate is attributable to the fact that we have now fully included all office sites in the assessment.
- The EHS IR also includes our Loss of Primary Containment (LoPC) indicator. In 2022, we recorded two significant incident-related spills. One took place at a production site in Germany, the other one in the United States. In neither case were people injured nor were negative environmental impacts expected, which is why it was not necessary to communicate these incidents to the public.
- The EHS Leading Rate (EHS LR) reflects the number and the results of the analyses of near misses and critical situations.
- For the Lost Time Injury Rate (LTIR) we set ourselves the goal of bringing our Group-wide LTIR below 1.0 by 2025 (number of accidents Group-wide resulting in at least one missed day of work per million hours worked). In 2022, our LTIR of 1.2 remained unchanged in comparison with the previous year.

Chemical product safety

Product safety is one of our top priorities. During the product development phase, we investigate the potential adverse impacts of chemical substances. Along the entire value chain of our products – from raw materials to manufacture and commercialization – we provide relevant information on their hazardous properties and how to deal with them. These instructions facilitate the safe handling and use of our products in line with all regulatory requirements. We publish this information primarily on the relevant digital channels. As paper safety data sheets are still common in some countries, we can also provide these upon request through our customer service.

Roles and responsibilities

Our Life Science, Healthcare and Electronics business sectors have organizational structures to implement our product safety strategy in line with their respective business requirements and customer needs. This approach includes registering chemicals, classifying hazardous substances, and highlighting risks using safety data sheets, labels and digital communication tools.

Our Group standards provide a framework for governing the set-up of effective operational processes for product safety, hazard communication and chemicals regulatory compliance throughout our business sectors. In addition, the Group Chemicals Regulations Council fosters cross-sectoral alignment of strategic regulatory activities required for existing and emerging chemicals regulations as well as sustainability and identifies potential impacts for our company.

This approach also applies to innovative fields of development such as nanomaterials, which we use with the greatest of care in line with the precautionary principle. Furthermore, our Group-wide **Policy for Use and Handling of Nanomaterials** provides the necessary guidance on the use of these materials.

Legal requirements and internal guidelines

Our internal guidelines define the roles, responsibilities and basic processes required to comply with national and international regulations. In addition, we have also endorsed voluntary commitments of the chemical industry such as the **Responsible Care® Global Charter**. Using the **Globally Harmonized System** for Classification and Labelling of Chemicals (GHS) for hazard communication allows us to streamline our internal processes and provide consistent, harmonized, and high-quality information to our customers.

In 2022, there were no incidents of non-compliance with regulations specifically concerning potential health and safety impacts and the labeling of our chemical products.

Safety analysis of our products

Safe and sustainable by design implies that product safety starts during development. Therefore, at an early stage of our product development process, we analyze innovations in terms of their impacts on human health and the environment. We continuously evaluate the intrinsic hazards of both our existing and new products to create relevant product safety information in line with all applicable rules.

Product safety information

Chemical product safety is all about protecting human health and the environment from adverse impacts resulting from the use of chemical products throughout their life cycle. To achieve this, we provide all relevant information to our customers and the public, which helps to raise awareness of the hazards and build a greater understanding of how to mitigate risks and use the products safely.

To obtain all the relevant information on hazard profiles, we employ industry-standard digital tools that gather all information available on the substances we use.

Employee-related matters

Attracting and retaining talent

To ensure our ongoing success, we are focusing on the future by creating meaningful impacts and building needed capabilities. At the same time, we must respond to changing demographics and adapt to the behaviors and expectations of the highly competitive talent market. Therefore, in 2022, we enhanced our talent acquisition strategy with a more personal, employee-focused approach. Our goals include reinventing our talent sourcing approach to build targeted and integrated pipelines and effectively recruiting diverse talent to our organization.

We have designed our compensation structure to provide valuable benefits to our employees and their families. Our reward system recognizes the uniqueness of our employees while providing flexibility wherever possible. Through our competitive compensation structure, we aim to be attractive to future employees in particular. Additionally, our international employee mobility programs create an environment suited to the needs of a rapidly evolving workforce.

We have revised our talent retention approach by tailoring our retention efforts more strongly to different target groups and countries as well as striving to create an inclusive environment that sparks our employees' creativity and growth.

Total number of employees[1]

As of Dec. 31	2019	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total number of employees	57,071	58,127	60,348	64,243	8,485
Men	32,531	33,204	34,274	36,452	5,510
Women	24,540	24,923	26,074	27,791	2,975

[1] Merck also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by Merck and therefore may deviate from figures in the financial section of this report.

Employee age by region

As of Dec. 31

Number of employees	Worldwide	North America	Europe	Merck KGaA	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
2021							
Up to 29 years old	9,129	2,219	3,341	1,125	2,912	482	175
thereof: women	4,359	961	1,598	415	1,437	265	98
30 to 49 years old	36,157	6,939	15,653	4,288	10,260	2,404	901
thereof: women	15,888	2,958	7,224	1,550	4,081	1,225	400
50 or older	15,062	4,912	8,223	2,668	1,113	643	171
thereof: women	5,827	1,881	3,276	824	356	231	83
Average age	**41.6**	**43.9**	**43.1**	**43.1**	**37.1**	**40.8**	**39.7**
Total employees	**60,348**	**14,070**	**27,217**	**8,081**	**14,285**	**3,529**	**1,247**
2022							
Up to 29 years old	9,926	2,753	3,530	1,181	2,999	476	168
thereof: women	4,637	1,178	1,655	441	1,441	264	99
30 to 49 years old	38,423	7,811	16,216	4,549	11,174	2,333	890
thereof: women	16,909	3,278	7,528	1,664	4,498	1,196	409
50 or older	15,894	5,283	8,498	2,755	1,239	681	192
thereof: women	6,245	2,045	3,437	870	412	255	96
Average age	**41.6**	**43.3**	**43.1**	**43.1**	**37.3**	**41.1**	**40.3**
Total employees	**64,243**	**15,847**	**28,244**	**8,485**	**15,412**	**3,490**	**1,250**

Internationality of employees

As of Dec. 31	2019[1]	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Number of nationalities	139	141	142	139	83
Number of nationalities in management positions (Role 4 or above)	73	75	79	78	34
% of non-Germans in management positions (Role 4 or above)	64	66	66	66	13

[1] In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma.

New employees

As of Dec. 31	2019[1]	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total number of new employee hires	**7,924**	**6,669**	**8,960**	**10,682**	**647**
by age group					
up to 29 years old	3,432	2,889	3,679	4,314	318
30 to 49 years old	4,055	3,347	4,610	5,397	302
50 or older	437	433	671	971	27
by gender					
Women	3,622	3,016	4,101	4,569	252
Men	4,302	3,653	4,859	6,113	395
by region					
Europe	2,529	2,160	2,567	3,015	647
North America	1,733	1,789	2,855	3,971	not applicable
Asia-Pacific (APAC)	2,729	2,206	2,803	3,071	not applicable
Latin America	578	396	579	460	not applicable
Middle East and Africa (MEA)	355	118	156	165	not applicable
Rate of new employee hires[2] (%)	**14**	**11**	**15**	**17**	**8**
by age group[3]					
up to 29 years old	43	43	41	40	49
30 to 49 years old	51	50	51	51	47
50 or older	6	7	8	9	4
by gender[3]					
Women	46	45	46	43	39
Men	54	55	54	57	61
by region[3]					
Europe	32	32	29	28	100
North America	22	27	32	37	not applicable
Asia-Pacific (APAC)	34	33	31	29	not applicable
Latin America	7	6	6	4	not applicable
Middle East and Africa (MEA)	5	2	2	2	not applicable

[1] These figures exclude the approximately 2,400 Versum Materials and Intermolecular employees who are not classified as new hires because they joined Merck as part of the acquisitions.

[2] Formula for calculating the rate of new employee hires: Total number of new employee hires divided by number of employees at the end of the fiscal year.

[3] Formula for calculating the rate of new employee hires by age/gender/region: New employee hires of the focus group divided by the total number of new employee hires.

Staff turnover[1,2]

	2019	2020[3]	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total turnover rate	**9.07**	**8.22**	**10.82**	**10.16**	**2.58**
Turnover rate by gender					
Men	8.69	8.22	10.69	10.40	2.66
Women	9.54	8.22	11.00	9.93	2.44
Turnover rate by age group					
Up to 29 years old	13.13	11.30	16.64	15.91	2.99
30 to 49 years old	8.90	7.74	10.05	9.55	2.26
50 or older	7.03	7.52	9.22	8.05	2.94
Turnover rate by region					
Europe	5.72	5.64	6.00	5.91	2.58
North America	11.02	9.79	15.44	14.33	not applicable
Asia-Pacific (APAC)	13.18	10.60	14.66	12.84	not applicable
Latin America	13.47	11.40	12.95	13.38	not applicable
Middle East and Africa (MEA)	12.14	11.80	16.57	13.04	not applicable
Total number of leavers	**4,863**	**4,721**	**6,354**	**6,358**	**215**
by gender					
Men	2,621	2,697	3,575	3,673	144
Women	2,242	2,024	2,779	2,685	71
by age group					
Up to 29 years old	1,042	974	1,451	1,542	35
30 to 49 years old	2,898	2,677	3,545	3,569	100
50 or older	923	1,070	1,358	1,247	80
by region					
Europe	1,500	1,490	1,601	1,640	215
North America	1,264	1,281	2,078	2,182	not applicable
Asia-Pacific (APAC)	1,484	1,394	2,015	1,905	not applicable
Latin America	459	398	449	467	not applicable
Middle East and Africa (MEA)	156	158	211	164	not applicable

[1] The table contains unadjusted turnover rates. The rate excludes employees who pause 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] The employee turnover rate is calculated as follows: Total number of leavers from the past 12 months divided by the average employee headcount multiplied by 100.

[3] The figures do not reflect the approximately 500 Allergopharma employees, who were not included in the employee turnover rate due to the divestment of the business.

In 2022, the average length of service for employees Group-wide was 9.2 years (2021: 9.5 years), with 15.4 years (2021: 15.7 years) for Merck KGaA employees.

Roles and responsibilities

Group Human Resources (HR) supports and advises all business sectors and Group functions within our organization regarding our human capital, especially topics related to recruiting, vocational training and advanced training. Across all our sites, HR employees work with leaders from various functions and business sectors to employ strategies that engage our people in line with Group-wide HR guidelines and requirements, including attractive compensation models and benefits. Every two to three years, we conduct internal audits to ensure that we implement our guidelines effectively.

The Chair of the Executive Board and CEO is responsible for Group Human Resources. Our Chief HR Officer, who leads the HR function and oversees all our HR activities, reports directly to her. Our Business Services unit oversees the operational tasks of HR work, such as drafting contracts and payroll accounting. The Chief Financial Officer is responsible for this unit.

Our commitment: Group-wide policies and guidelines

As set down in our **Social and Labor Standards Policy**, we will respect our employees' legal rights to form and join worker organizations of their own choosing, including labor organizations and trade unions, and will not discriminate based on an employee's decision to join or not join a labor organization.

Our High-Impact Culture is founded on six behaviors (obsessed with customers and patients; act as the owner; be curious and innovate boldly; simplify and act with urgency; raise the bar; disagree openly, decide and deliver). We regularly inform executives and employees about these behaviors through global campaigns.

Our People Development and Learning Policy provides a Group-wide framework that guides employees in managing their professional growth. It defines requirements for our development opportunities, roles and responsibilities. The associated processes are described in our People Development and Learning Standards. Our flexible work guideline details our approach to evolving work environments and our aspiration to create a more agile organization.

A competitive compensation structure

We reward the performance of our employees in order to maintain a competitive edge in attracting qualified professionals. Within our Group, we base compensation on the requirements of each position and each employee's respective performance. We make no distinctions based on gender or any other diversity criteria.

To ensure we maintain a competitive compensation structure, we regularly review our compensation policy based on data analyses and industry benchmarks. This enables us to compare internal factors and market requirements in equal measure. Before making changes to our compensation structure, we consult with key stakeholders such as employee representatives. In 2022, we introduced a sustainability factor into our Long-Term Incentive Plan (LTIP). More information on the LTIP can be found in the **Compensation report**.

Strengthening our sustainability culture

We launched two e-learning courses in order to strengthen the sustainability culture in our company. The first one is for employees and was already rolled out at the end of 2021. The second one has been available since September 2022 and is targeted to managers with personnel responsibility. The two courses are mandatory for the relevant employees and are available in nine and seven languages, respectively. As of the end of 2022, 83% of all employees had completed the training.

Diversity, equity and inclusion

We are committed to promoting a strong sense of inclusion among our employees. Therefore, we approach diversity, equity & inclusion (DE&I) with the same purpose as our other global business objectives and aspirations. While we have always been a diverse organization – we currently span 66 countries and have over 64,000 employees from 139 nationalities – we recognize that our success depends on our ability to foster an environment that champions equity and inclusion. In addition, our DE&I approach fuels our efforts to make positive impacts in the communities where we live and work. We expect our leaders and managers to be mindful and considerate in how they attract, hire, retain, and promote their people. We aim to help every employee maximize their potential, regardless of their gender identity, culture, ethnicity, race, religion or creed, sexual orientation, nationality, socioeconomic and family status, language, disability status, age, mindset, faiths, military service, or political conviction.

We strive to create equitable outcomes and identify and eliminate any barriers that may hinder our employees' contributions or their access to opportunities or career advancement. Ultimately, we believe diversity inspires progress and strengthens our ability to innovate in all areas of our business.

Number of employees by hierarchical level[1]

As of Dec. 31	2019[2]	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total employees	**57,071**	**58,127**	**60,348**	**64,243**	**8,485**
Senior management (Role 6+)	190	193	194	191	66
Middle management (Role 4 & 5)	3,352	3,637	3,831	4,018	886
Low management (Role 3)	9,499	10,286	10,880	11,877	2,277
Other employees (below Role 3)	44,030	44,011	45,443	48,157	5,256
% of women (total)	**43**	**43**	**43**	**43**	**35**
thereof: in senior management (Role 6+)	39	42	49	51	18
thereof: in middle management (Role 4 & 5)	1,146	1,284	1,413	1,550	281
thereof: in low management (Role 3)	4,029	4,352	4,669	5,123	879
thereof: other employees (below Role 3)	19,326	19,245	19,943	21,067	1,797
% of men (total)	**57**	**57**	**57**	**57**	**65**
thereof: in senior management (Role 6+)	151	151	145	140	48
thereof: in middle management (Role 4 & 5)	2,206	2,353	2,418	2,468	605
thereof: in low management (Role 3)	5,470	5,934	6,211	6,754	1,398
thereof: other employees (below Role 3)	24,704	24,766	25,500	27,090	3,459
by age group					
Up to 29 years old (%)	**15**	**15**	**15**	**15**	**14**
thereof: in senior management (Role 6+)	0	0	0	0	0
thereof: in middle management (Role 4 & 5)	8	6	8	12	5
thereof: in low management (Role 3)	190	199	241	263	61
thereof: other employees (below Role 3)	8,362	8,365	8,880	9,651	1,115
30 to 49 years old (%)	**60**	**60**	**60**	**60**	**54**
thereof: in senior management (Role 6+)	69	68	63	58	24
thereof: in middle management (Role 4 & 5)	1,933	2,032	2,172	2,235	525
thereof: in low management (Role 3)	6,516	6,926	7,298	8,007	1,495
thereof: other employees (below Role 3)	25,859	25,948	26,624	28,124	2,505
50 years or older (%)	**25**	**25**	**25**	**25**	**32**
thereof: in senior management (Role 6+)	121	125	131	133	42
thereof: in middle management (Role 4 & 5)	1,411	1,599	1,651	1,771	356
thereof: in low management (Role 3)	2,793	3,161	3,341	3,607	721
thereof: other employees (below Role 3)	9,809	9,698	9,939	10,382	1,636

[1] Merck also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by Merck and therefore may deviate from figures in the financial section of this report.

[2] In 2019, the position assessment had not yet been carried out for employees of Versum Materials as well as of Allergopharma. In the figures, employees whose positions have not been assessed have been allocated to “other employees (below Role 3)”.

Roles and responsibilities

The Chief Diversity, Equity and Inclusion Officer is responsible for our global DE&I strategy and steering its related activities. In this role, she reports directly to the Chair of the Executive Board, whose Board responsibilities include Group Human Resources. In addition, we have established a centralized Diversity Council consisting of high-ranking executives from all our business sectors and selected Group functions.

Our commitment: Industry-wide initiatives and regulations

Our **Social and Labor Standards Policy** categorically states that our company does not tolerate any form of discrimination, physical or verbal harassment, or intolerance. To underscore our commitment to equality, fairness, inclusion, and tolerance in the workplace, we also participate in industry-wide initiatives:

- **Women’s Empowerment Principles**
- Inclusion Action Plan of the German Mining, Chemical and Energy Industrial Union (**IG BCE**)
- Equal Opportunity Charter
- German Diversity Charter, **Charta der Vielfalt e. V.**

Strategy rollout and new structure introduction

In 2022, we rolled out our DE&I strategy globally. We created a network comprising our 18 major countries, nominated dedicated representatives and developed tailored roadmaps for each country. We also streamlined the councils and working groups in the business sectors and major Group functions, renaming them Diversity, Inclusion, Community & Equity Councils.

In 2021, we pledged to our people, partners, patients, and industry to intensify our DE&I efforts and set robust aspirations to hold ourselves accountable. In 2022, we continued this strong focus and demonstrated that we are on track to advance toward our 2030 goals.

Gender equity

We developed measures to achieve a more balanced gender structure at various hierarchical levels of our business. We are steadily making progress and have increased the share of women in leadership (roles 4+) to 38% (2021: 36%) while maintaining a stable 43% proportion of women in our global workforce. Building on this effort, we are aiming for gender parity in leadership positions by 2030. Moreover, we are committed to fair and equitable pay for all employees.

Culture and ethnicity

With 24% of our employees based in the United States, it is crucial that we become an employer of choice among underrepresented racial and ethnic groups in this market. Therefore, we plan to increase the share of employees in U.S. leadership (roles 4+) who are members of underrepresented racial and ethnic groups from 21% to 30% by 2030.

Additionally, due to our current performance and future growth in Asia, Latin America and the Middle East and Africa (MEA), accounting for 40% of our Group sales, we aim to increase the global share of nationals from Asia, Latin America, and MEA in leadership positions (roles 4+) from 16% to 30% by 2030.

Inclusion

Beyond our aspiration to foster specific types of diversity and equity, we are accelerating our efforts to create a genuinely inclusive culture for all employees. To achieve this, we rolled out training courses to help leaders reflect on how they can lead more inclusively. All leaders will be encouraged to complete these courses over the coming years. At the end of 2022, 64% (2021: 37%) of our leaders had participated in this training program.

Committed to fair and equitable pay

Our commitment to pay equity is a critical aspect of our DE&I strategy. To create transparency around unexplained pay gaps and identify their underlying root causes, we conducted a pay equity analysis in 2021 with a focus on gender-based discrepancies. In this first step, we analyzed ten of our largest countries, covering approximately 80% of our total employees. Based on this analysis, we continued to improve our transparency by releasing pay data publicly for the first time: The identified adjusted (unexplained) gender pay gap is less than 1.5% in favor of men. While this is a good starting point and below the existing benchmark, we will continue to monitor pay data and take measured actions as needed. These include enabling our leaders to ensure we continue making equitable and unbiased pay decisions.

Ensuring fair treatment for all

We do not tolerate any form of discrimination in our company, as stipulated with binding effect in our **Code of Conduct** and **Social and Labor Standards Policy**. In 2022, we published two new position papers on **non-discrimination** and **non-harassment**, complementing our **position paper on DE&I**. In addition, we have established various reporting channels to ensure employees have a clear point of contact should they experience harassment or discrimination in the workplace, or any other violations of our standards. Their first

points of contact are their supervisors, HR or compliance teams. Alternatively, employees can also make anonymous calls to our compliance hotline. In 2022, 20 alleged cases of discrimination were reported via the compliance hotline and other channels, seven incidents were confirmed.

Health and safety

We seek to promote the health and well-being of our employees and sustain their long-term performance ability, which in turn necessitates a safe workplace. We are therefore constantly working to further strengthen our health and safety culture.

The lost time injury rate (LTIR) is the indicator used to gauge the success of our occupational safety efforts. It is a global measure of the number of accidents resulting in at least one day of missed work per one million hours worked. We determine the Group-wide LTIR both for our employees and supervised temporary staff. Our objective is to lower LTIR to below 1.0 by 2025.

Generally, before starting an activity anywhere in the world, we perform a hazard assessment to identify risks and do everything possible to eliminate them before commencing the activity or commissioning a plant. If this is not feasible, we put measures in place to minimize the likelihood of risks and their potential impacts. Hazard assessments are the responsibility of our individual sites and are therefore conducted by them.

Since the start of 2022, we have been developing a Group-wide health strategy for our employees to enable them to maintain and promote their health.

Roles and responsibilities

Our EHS (Environment, Health and Safety) management system is the responsibility of Corporate Sustainability, Quality and Trade Compliance, which in turn reports to the Chair of the Executive Board. This Group function sets objectives, oversees the respective initiatives globally and conducts internal EHS audits. Local EHS managers and their teams ensure that our individual sites comply with all occupational health and safety laws and regulations. They are also responsible for local projects, campaigns and programs.

Employees concerned about their health or safety are permitted to temporarily step back from their work until the issue has been resolved. Globally, across the Group, they are encouraged to report such concerns via our **compliance hotline**.

Our commitment: Standards and policies

Our Corporate **EHS Policy** (Corporate Environment, Health and Safety Policy) describes our fundamental approach to occupational health and safety. It is an integral part of our EHS management system and undergoes an external ISO 45001 audit every year. As part of a **Group certificate**, our occupational health and safety management system was ISO 45001-certified at 61 sites at the end of 2022.

Our Group-wide Health Policy specifies our approach to ensuring workplace safety for our employees while also promoting their health and well-being. In this policy, we set out our Group-wide approach to health and safety management, which is aimed at preventing workplace accidents and occupational illnesses.

It is our aim to ensure that environmental, health and safety aspects are also respected in our partnerships with contractors throughout the entire relationship, from starting a job to completion. This objective is reflected in our Contractor EHS Management Standard.

Accident rates

Our employees are required to immediately report any relevant occupational accidents to Corporate Sustainability, Quality and Trade Compliance, where the incidents are assessed. If necessary, we then implement additional safety measures at our sites. This procedure is now practiced across all of our production facilities around the world. We track the following occupational safety data across our sites worldwide:

- The LTIR measures the accidents resulting in at least one day of missed work per one million hours worked. In 2022, our LTIR of 1.2 remained unchanged in comparison with the previous year. The majority of incidents resulting in lost time were slips, trips and falls, along with contusions and lacerations from the operation of machinery and equipment. Once more, in 2022, we recorded no fatal accidents.
- We use our Environment, Health and Safety Incident Rate (EHS IR) to **track accidents**.
- Alongside this indicator, in the United States we also use the Occupational Illness Rate to monitor work-related illnesses and their long-term effects.

Work-related accidents[1]

	2019	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Lost Time Injury Rate (LTIR = workplace accidents resulting in missed days of work per one million hours worked)	**1.6**	**1.3**	**1.2**	**1.2**	**2**
by region					
Europe	2.6	2.4	2.1	1.7	2
North America	1.0	0.8	1.2	1.7	not applicable
Asia-Pacific (APAC)	0.2	0.1	0.1	0.3	not applicable
Latin America	1.7	0.8	0.4	0.6	not applicable
Middle East and Africa (MEA)	0.0	0.4	0.0	1.1	not applicable
Number of deaths	**0**	**0**	**0**	**0**	**0**
by region					
Europe	0	0	0	0	0
North America	0	0	0	0	not applicable
Asia-Pacific (APAC)	0	0	0	0	not applicable
Latin America	0	0	0	0	not applicable
Middle East and Africa (MEA)	0	0	0	0	not applicable
by gender					
Women	0	0	0	0	0
Men	0	0	0	0	0

[1] Including supervised temporary staff

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.

Clear rules of conduct

Group-wide, all new EHS managers must complete a three-day EHS onboarding that covers topics such as occupational health and safety as well as our BeSafe! safety culture program. Through this initiative, we raise employee awareness of occupational hazards and teach them rules for safe behavior. In addition, we regularly provide occupational safety training at our sites covering both legal requirements as well as the specific local risks.

Social matters and respect for human rights

Responsible supply chain

With our supplier management endeavors, we aim for compliance with fundamental environmental and social standards in addition to high quality, reliable delivery and competitive prices. Therefore, we have introduced relevant strategies, processes and guidelines to prevent violations of supply chain standards and continuously improving our sustainability performance. Unless stated otherwise, the approaches presented apply to direct suppliers. Furthermore, our supplier management activities include special measures particularly for indirect suppliers working in the area of conflict minerals.

To achieve our **sustainability goals**, our Group Procurement team is working closely with our suppliers. We aim to create transparency in all our sourcing regions and fully integrate sustainability into all our value chains. To this end, we have defined two key indicators to measure our journey towards increasing this transparency by evaluating the sustainability performance of our relevant suppliers with valid sustainability assessments. Our definition of valid sustainability assessment includes assessments carried out over the last three years and performed by a reliable, approved source. Relevant suppliers either indicate a specific country and industry risk or contribute to a significant percentage of our supplier spend (at least 50%). For the risk evaluation, we previously used the risk data provided by EcoVadis. For the country risk, we have developed our own more comprehensive country risk score in 2022.

In 2022, 46% (2021: 33%) of our relevant suppliers were covered by a valid sustainability assessment; 82% (2021: 74%) of our spend generated from these suppliers were covered by suppliers with a valid sustainability assessment. To achieve comparability of our key indicators over the years, we applied this new country risk score also retrospectively for 2021 data, the starting point of our measurement.

We consider all applicable legal requirements and initiate corresponding measures where necessary. For this purpose, in 2022, we implemented measures to operate compliant with **German Supply Chain Due Diligence Act.** Among other things, the Head of Corporate Sustainability, Quality and Trade Compliance has been appointed as Human Rights Officer.

Our Supplier Decarbonization Program is a key element of achieving our **Science Based Target**. Through the program, we aim to reduce greenhouse gas emissions associated with purchased goods and services as well as capital goods.

Risk management process

To ensure security of supply, we select our suppliers based on criteria such as country risk, material risk, supplier risk, and their strategic importance to the business. This process helps our sourcing managers identify potential mitigation actions with relevant suppliers and supports them in making improvements. The approach towards our strategic suppliers which account for approximately 49% of our total supplier spend includes the identification, monitoring and assessment of supply security risks. It comprises four main elements:

- Supplier Risk Assessments: to capture the overarching risks at the supplier level, considering multiple risk domains.
- Alert system: to notify our Procurement organization about risk events arising with any of our suppliers.
- Material Risk Assessments: to identify and mitigate the risks of the materials used in our most significant finished products.
- Risk Response Tracker: a system to create and monitor risk mitigation activities in inter-disciplinary teams.

We calculate risk factors for suppliers and raw materials by multiplying risk probability and risk impact. We have simplified our risk methodology to focus on the ten most relevant risk categories - including but not limited to economic freedom, social unrest, unfair business practices, and poor labor practices - grouped into three risk domains. We also include criteria for identifying supplier relationships impacted by key sustainability risks, such as mineral sourcing and animal welfare.

Due diligence process for responsible sourcing of minerals

We source and sell products that contain minerals commonly referred to as “3TG” (tin, tungsten, tantalum, gold – collectively also known as conflict minerals). These minerals involve the risk of being extracted, traded, handled, and exported from conflict-affected and high-risk areas where human rights are not always respected and violations thereof need to be prevented.

Our aim is to source materials in a responsible and conflict-free manner and not to contribute to adverse impacts through our activities. Therefore, we have a due diligence program that applies across all our business sectors and is in line with applicable laws and international standards.

In order to continuously improve our due diligence practices, we have a system to store and maintain supplier information across our business sectors. This system supports increased transparency of our supply chain. In addition, we are working on the integration of further control mechanisms into our due diligence framework for high-risk suppliers.

Roles and responsibilities

Group Procurement is responsible for integrating sustainability requirements into the relevant stages of our sourcing and supplier management processes. Our Center of Excellence for Supply Security coordinates the relevant measures, such as updating our guidelines where necessary, examining processes and coordinating our participation in external initiatives.

Our commitment: Guidelines and standards

We expect all our suppliers and service providers to comply with 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**. We expect our suppliers to ensure that their subcontractors respect the same rules. In the reporting year, we have developed a **Supplier Code of Conduct** which details our expectations towards suppliers and business partners regarding human rights, health and safety, business integrity, environmental protection, continuous improvement, and management of their respective suppliers more comprehensively. It replaces our Responsible Sourcing Principles as of January 2023.

Our **Responsible Minerals Sourcing Charter** demonstrates our commitment to responsible sourcing of minerals from conflict-affected and high-risk areas. It applies to all our legal entities and subsidiaries worldwide. The charter complements the requirements set out in our Supplier Code of Conduct.

To ensure that we work based on industry standards and can rely on comparable data analytics and expert analysis, we collaborate with our peer companies in industry initiatives. For example, we are a member of Together for Sustainability (**TfS**), the Pharma Supply Chain Initiative (**PSCI**), the Responsible Mica Initiative, and the Responsible Minerals Initiative (**RMI**). We call on our suppliers to let us or trusted partners conduct assessments or audits to increase our supply chain transparency and identify fields of activity to improve sustainability performance or mitigate infringement risks.

Together for Sustainability supplier assessments and audits

Through the TfS initiative, suppliers are assessed either based on information obtained during audits or based on self-reported and publicly accessible information provided by EcoVadis, an independent rating agency. **EcoVadis** assesses suppliers from more than 160 countries and 200 sectors across the four categories of

Environment, Labor and Human Rights, Ethics, and Sustainable Procurement. On top of the assessments, suppliers are also monitored through a 360-degree news watch. The results are shared among TfS member companies in compliance with all restrictions stipulated by antitrust law.

Through the TfS initiative alone, we have access to more than 1,700 valid scorecards on the assessment of our suppliers, more than 1,100 of which completed a new assessment or re-assessment in 2022. In some cases, these were initiated by us and in other cases by other TfS members.

Mica supply chain

Mica is an important raw material for our effect pigments, which are used in automotive, cosmetic and industrial coatings as well as plastics. We procure the majority of our mica from the Indian states of Jharkhand and Bihar. We have special measures in place to comply with high social and environmental standards in our mica supply chain. By procuring mica from the Indian states of Jharkhand and Bihar, where social and economic factors contribute to poor working conditions, including child labor, we are supporting this region by safeguarding local employment and livelihoods. We source the raw material only from suppliers operating in formal working environments and we monitor compliance with our standards, including the prohibition of child labor.

Our mica suppliers are informed of our standards and have confirmed that they adhere to the principles of our **Human Rights Charter** as well as the requirements of our **Supplier Code of Conduct** (formerly Responsible Sourcing Principles). In the event of non-compliance with our standards, we work with suppliers to ensure the appropriate implementation of corrective measures.

We do not tolerate child labor and contractually prohibit our suppliers from employing children. If one of our suppliers were found to be using child labor, Merck would terminate the business relationship immediately. We are driving initiatives and taking measures to improve the conditions of mica sourcing based on our high standards. We continuously review our monitoring processes to improve their effectiveness.

Auditing our mica supply chain

We have implemented a series of oversight mechanisms using a system that monitors and audits conformity with our social and environmental standards. In addition to visits by our company's employees, regular inspections are conducted by third parties, who conduct comprehensive announced audits as well as frequent, unannounced verification visits.

Environmental Resources Management (**ERM**), a leading global provider of environmental, health, safety, risk, and social consulting services, conducts external audits of mines and processing plants, investigating working conditions as well as environmental, health and safety issues. The audit reports document any identified shortcomings in this respect and propose corrective actions. Findings concerning the ventilation of workplaces and fire prevention were successfully addressed. Our employees in Kolkata (India) and Darmstadt (Germany) take action to address any identified issues. If the corrective measures are not respected, we may suspend or even terminate our business relationship.

Since 2013, IGEP Consult, an Indian non-governmental organization, has conducted regular unannounced inspections to review labor standards throughout our supply chain. During these visits, IGEP officials monitor occupational safety and compliance with laws preventing child labor. In 2022, its inspections focused on checking the availability of physical examinations for workers and conducting mock fire drills. Additionally, we regularly optimize the escalation process together with IGEP, which holds bi-weekly review meetings with representatives of our company to assess suppliers. These meetings help to identify any required actions, which our sourcing teams then discuss and implement with our suppliers. As a result, our suppliers have successfully improved the working conditions at these sites.

Evaluating and tracking mica sources

We use a tracking system to help ensure that the mica we purchase is derived from sources qualified by our company. We also use this tracking system to monitor productivity of our mica sources. Based on written records of the daily extraction quantities, we review the volumes of mica reported and supplied to the processing facilities. Furthermore, we use a digital traceability solution to increase transparency in the mica supply chain.

To maintain accuracy, our processes undergo constant review and improvement. We are also evaluating other mica sources in accordance with our quality, social and environmental standards, both in India and other regions. For example, in 2022, we sourced a considerable amount of mica in Brazil, where we have also established oversight mechanisms to monitor and audit adherence to these standards.

Human rights

We are committed to upholding human rights, which is why we became a signatory to the **UN Global Compact** back in 2005. We endeavor to prevent the risk of human rights violations as far as possible, not only at our own sites but also along our entire supply chain. That is why we integrate human rights due diligence into our business processes.

We view our human rights due diligence as a continuous process, which we constantly adapt and improve. This also prompts us to continually review our approach. We closely monitor regulatory developments – for example, the planned EU directive on human rights due diligence.

Roles and responsibilities

Our Executive Board has ultimate responsibility for human rights within our sphere of influence. The Executive Board exercises this responsibility by requiring our Managing Directors to respect human rights.

Our Group Corporate Sustainability unit is responsible for coordinating all human rights due diligence activities across the Group. The persons responsible for these issues in the respective Group functions, business sectors and local units implement the specific measures, for instance by integrating human rights due diligence into existing processes.

Our commitment: Guiding principles, charters and laws

Our **Human Rights Charter** aligns with the **UN Guiding Principles on Business and Human Rights**. It is our overarching human rights governance document and defines the relevant requirements for our company. We expect our employees as well as our suppliers and all companies with which we have business ties to comply with this charter.

In 2022, we further developed our existing approach to human rights due diligence, prompted by the specific requirements of the new German Supply Chain Due Diligence Act. Among other things, we appointed the Head of Corporate Sustainability, Quality and Trade Compliance as human rights officer to monitor compliance with human rights due diligence requirements and the implementation of processes throughout the Group in the future.

Identifying actual and potential impacts on human rights

We perform risk assessments to understand the potential impacts our operations and business relationships could have on human rights. For instance, we investigate human rights risks at our sites as well as risks related to product and service sourcing. These risk assessments enable us to derive the corresponding strategies and measures. We track human rights risks through our strategic supplier risk process. More information on how we engage with suppliers can be found under **Responsible supply chain**.

We also meet our human rights due diligence obligations when deploying new technologies. Our **Code of Digital Ethics** defines digital ethics principles and forms the basis for the work of the Digital Ethics Advisory Panel. More information can be found under **Digital ethics**.

Auditing our suppliers and sites

Our **Global Social and Labor Standards Policy** stipulates the social and labor standards at our sites. We regularly check compliance with the requirements using a risk-based approach. Among other things, this takes into account risks that may arise if relevant laws and regulations change or if there are violations of internationally recognized labor rights by governments and companies, as assessed by the **International Trade Union Confederation** and documented in the annual ITUC Global Rights Index. If we identify a violation during the audit, we define remedial actions together with the responsible Managing Director and/or local HR staff.

In addition, we review human rights aspects at our sites through security audits. The audits are one control mechanism of our security governance framework. Increased risk transparency and centralized CAPA tracking allows us to ensure that our sites meet security-relevant human rights aspects.

Through the Together for Sustainability (**TfS**) initiative, we determine whether our strategically important **suppliers** comply with human rights standards.

Creating awareness among our employees

To train our Managing Directors and senior management, we offer an e-learning course on implementing the requirements of our Social and Labor Standards Policy in their areas of responsibility. Our onboarding training for all new EHS managers continues to cover the topic of human rights, with a particular focus on the issue of modern slavery. In addition, the Supervisory Board received training on the requirements and implementation of the new German Supply Chain Due Diligence Act in 2022.

Our reporting practices

We inform the public about our approaches, measures and results of human rights due diligence. We provide information on this annually in our Sustainability Report. Additionally, legislation in Australia and the United Kingdom requires us to publish the steps we are taking to counter forced labor and human trafficking. Apart from the **UK Modern Slavery Statement,** we also published our first **Merck Australia Modern Slavery Statement** in 2022. Both have been signed by the Chair of the Executive Board and published on our website.

Our complaint mechanism

Our **compliance hotline** is the most important channel for reporting complaints about potential human rights violations. Our employees as well as external stakeholders can report suspected cases via this Group-wide whistleblowing system in their respective national language, free of charge and anonymously, either by telephone or a web-based application. We thoroughly investigate all complaints that we receive and take countermeasures if necessary. More information on the compliance hotline can be found under **Compliance management**.

In 2022, there were no indications from our compliance hotline of child or forced labor or violations of the right to collective bargaining or freedom of association within our own global business operations. Regarding forced labor, we were informed that we offered rubber gloves for which a manufacturer is accused of labor abuses including forced labor in Malaysia. The matter is being investigated further. Our supplier has already terminated business relations with the manufacturer. Consequently, our company also no longer has any business ties to the manufacturer in the affected supply chain.

Human rights violations[1]

	2019[2]	2020	2021	**2022**
Number of reported violations of Social and Labor Standards Policy	-	108	121	136
Number of confirmed Violations of Social and Labor Standards Policy	-	29	41	68
thereof: number of incidents of discrimination	-	2	6	7

[1] In 2020, we modified our reporting structure for human rights violations. Previously, we reported on such violations in the "Reported compliance violations" table. Since 2020, we report on violations of our Social and Labor Standards Policy, which was implemented across the entire Group in 2019.

[2] Due to our revised reporting practices, we have decided not to report the data from previous years.

Patient safety

Through a rigorous benefit-risk management process, we help to ensure that the benefits of our medicinal products always outweigh the risks for patients. Every new medicine goes through a series of precisely defined development stages. Before any medicinal product is administered to human subjects, we conduct extensive preclinical testing both in vitro and in vivo.

During clinical development, we diligently use all the collected data to continuously evaluate the medicinal product's benefit-risk profile. If we consider the medicinal product's benefit-risk profile to be positive, we then submit an application for marketing authorization to the relevant regulatory authorities.

Continual monitoring of product safety risk profiles

Once we launch a new medicinal product, the number of patients being treated with the product increases significantly. In rare circumstances, there may be adverse and potentially serious effects that were not detected during clinical development, which is why we continuously monitor risks and assess the benefit-risk profiles of the products after their market launch. Pharmacovigilance includes the process of monitoring a medicinal product on an ongoing basis to detect and assess safety signals as part of signal management activities. Our pharmacovigilance system and our pharmacovigilance business continuity management ensure continuous monitoring of adverse effects, allowing us to proactively and transparently minimize and communicate any risks. Emergency response procedures for business continuity are managed in accordance with global and local business continuity plans, tested in regular, defined intervals or with mock scenarios. In addition, we always provide healthcare professionals and patients with the latest information on the safety of all our marketed medicinal products. The scope of continuous safety monitoring includes the entire life cycle of a product, ranging from development, market launch and commercialization to expiration of the marketing authorization.

Roles and responsibilities

Our Global Patient Safety unit is responsible for pharmacovigilance. It continuously collects current safety data from a wide variety of sources across the globe, including clinical studies, early access programs, spontaneous reports on adverse effects, patient support programs, and articles published in medical and scientific journals. Our vision is to embed a deep knowledge of safety into early decision-making as we evolve to practice predictive safety.

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

Our Global Patient Safety unit hosts a Pharmacovigilance Intelligence Council that focuses on changes in pharmacovigilance legislation and its impacts on our global and local pharmacovigilance systems. This initiative enables us to make strategic decisions and govern changes in pharmacovigilance requirements, which fosters our target to ensure continuous compliance with regulatory requirements.

Our Medical Safety and Ethics Board

Our Medical Safety and Ethics Board (MSEB) oversees the safety and benefit-risk assessments of our medicinal products throughout their clinical development and commercialization. This internal board is chaired by our Chief Medical Officer and comprises experienced physicians, scientists and experts from our company. Throughout a medicinal product's entire life cycle, the MSEB reviews and assesses important medical safety risks and benefit-risk issues and endorses appropriate measures to minimize risks, such as updates to product information. The MSEB furthermore reviews human-related ethical issues as appropriate.

Our commitment: Guidelines and statutory requirements

Our aim is to follow international guidance and standard procedures, such as the International Council for Harmonisation (**ICH**) guidelines and the Good Pharmacovigilance Practices (GVP) established by the European Medicines Agency (**EMA**) and national health authorities. Furthermore, we aim at complying with all new statutory pharmacovigilance regulations in the countries where we market our products.

Inspections and audits for drug safety monitoring

Regulatory authorities conduct periodic inspections to verify that we comply with statutory requirements as well as our own internal pharmacovigilance standards. We follow up on the findings of health authority inspections and take necessary actions to ensure the ongoing compliance of our pharmacovigilance system. In 2022, we had four pharmacovigilance inspections.

Furthermore, we perform audits to ensure that all our units and subsidiaries involved in pharmacovigilance consistently meet all global requirements. In 2022, we conducted a total of 19 pharmacovigilance audits and found no significant deviations in our pharmacovigilance systems from these requirements and standards. We also conducted 16 external audits at our vendors and licensing partners involved in pharmacovigilance, helping us improve our pharmacovigilance processes and comply with regulatory requirements.

Applying our proactive safety strategy to benefit-risk assessments

With regard to product safety risk assessments, we have implemented an improved benefit-risk management strategy in order to become a proactive and benefit-risk-focused organization. In this context, we developed in 2021 the concepts and principles for conducting benefit-risk assessments at each stage of product development and post-marketing. Along with the implementation of the redesigned benefit-risk strategy, the new Benefit Risk Action Team co-leadership model was rolled out in 2022. This redesigned approach will enable us to understand in even greater detail the benefit-risk profiles of our products, enabling early decision-making within the organization to protect patient safety. Ultimately, the aim is to be able to provide the right medicine to the right patient at the right time.

Up-to-date labeling and product information

Our product information explains to healthcare professionals and patients how to correctly use the respective product and make informed treatment decisions. We review and update all product information documents, such as package leaflets, to ensure our medicinal products contain the latest information on safety, efficacy and pharmaceutical formulation. In accordance with regulatory requirements, we submit all modifications to our leaflets to the respective regulatory authorities for approval. In 2022, there were no significant reportable incidents of non-compliance with regulations concerning the labeling of our medicinal products.

Internal and external training

Our pharmacovigilance experts are regularly trained so that they gain and maintain the required experience and knowledge to carry out their activities. We manage our training via a global learning platform and verify compliance with our training requirements by producing training completion reports.

Our approximately 24,000 Healthcare employees receive basic pharmacovigilance training once a year that covers the procedure for reporting adverse effects or special circumstances associated with the use of our products.

Prices of medicines

To help ensure that all patients have access to the most effective medicines for their needs, we are working to prevent cost from becoming a barrier to treatment. Therefore, we adapt our medicine prices according to people's ability to pay in different geographic and socioeconomic segments.

We are committed to fair, flexible and sustainable pricing – both within and across countries. We therefore adapt our prices based on local market considerations, such as unmet medical and treatment needs, health system capacity, infrastructure and socioeconomic standards. This approach involves working closely with governments and other stakeholders. In addition, we continuously monitor dynamic healthcare environments and markets, pricing and reimbursement systems as well as legal and regulatory guidelines, adjusting our prices as necessary.

We conduct price analyses annually to validate price thresholds and provide guidance on local pricing to our subsidiaries for the following year. The aim is to ensure they meet patient access needs, taking a consistent, data-driven approach. We also make our products affordable to patients in low- and middle-income countries with an equitable value and access strategy that includes participating in government tenders, providing flexible pricing, establishing high-quality affordable brands or branded generics and operating patient access programs.

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

Roles and responsibilities

Our Global Market Access and Pricing (GMAP) unit evaluates market launch prices in coordination with the respective franchises. The team reports directly to a member of our Healthcare Executive Committee. The GMAP unit systematically evaluates our medicine portfolios and applies equal access initiatives to them. Our local affiliates are responsible for managing prices and adapting them to evolving local conditions in compliance with our pricing governance and the defined price approval process.

Our commitment: Medicine price guidelines and principles

The affordability of our health solutions is part of our broader patient value proposition. Our medicine pricing adheres to the stipulations of our overarching **Access to Health Charter** and is defined in detail in an internal guideline. Additionally, our Patient Access Programs Policy sets out standards for offering medicines at affordable prices.

Value-based contracting models

We are committed to advancing value-based healthcare through pricing and contracting mechanisms that fully comply with all applicable local laws and regulations. In collaboration with payers, such as health insurance companies, we have developed various product- and market-specific reimbursement and contracting models. These help to provide patients with prompt access to our innovations. In addition, we aim to pilot outcome-based contracting models in one or two markets for our Fertility product portfolio in 2023.

Equitable value and access approaches to serve low- and middle-income patients

We work in close partnership with governments and other stakeholders on innovative, differential medicine pricing schemes. In addition, we supply products at affordable prices to certain countries in Africa, Asia, Latin America, and the Middle East.

Our pharmaceutical tender excellence initiative offers a strategic tender framework. This includes a web-based system that helps country teams increase quality and agility in tender decisions, while improving performance tracking and collaboration.

For some of our existing high-quality products, we have created second brands at affordable prices, particularly in countries with a large percentage of patients with very low incomes. We operate patient access programs that enable us to offer certain products at affordable prices in several countries.

Clinical studies

Our aim is to conduct high-caliber clinical research that always is in compliance with applicable laws and regulations. As a responsible company, we set Group wide requirements to ensure that the highest ethical and scientific standards worldwide are met when conducting clinical trials.

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

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

Based on our Standard on Human Research we aim to design and plan our studies to ensure that diverse patient populations who are expected to use a product when approved are adequately represented. Study participants shall not be discriminated against due to e.g. gender, ethnic origin, religion, disabilities, sexual orientation or socio-economic status.

Patient-focused drug development

We are improving our approach to research and development by committing to patient-focused drug development that more actively involves patients, caregivers, and their advocates in our work. Their valuable insights into disease and treatment management will help us make more informed decisions at each stage of the medicine development process. We aim to make our studies easy for patients to understand while ensuring all participants have positive experiences as they contribute to our understanding of the particular disease and its treatment. At every level of our organization, we are additionally educating staff about the value of a close, more consistent patient interaction and the requirements to protect our patients' independence and privacy.

We conduct all our clinical studies in accordance with local laws and regulations, and we adhere to all relevant international scientific and ethical standards, irrespective of the region or country.

Roles and responsibilities

Clinical drug development, including clinical studies and the related governance process, are the responsibility of our Global Development unit. The Head of Global Research & Development reports to the CEO Healthcare, who is a member of the Executive Board.

We have established two internal committees to oversee our clinical studies. The Integrated Protocol Review Committee is responsible for the studies performed by the company on medicines that are under clinical development, while the Global Medical Decision Board is responsible for our own studies with approved medicines, as well as for all studies performed by independent investigators and supported by us (so-called investigator-sponsored studies). Both bodies consist of medical-scientific experts and executives with long-standing experience in clinical research.

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

We continuously analyze potential risks for study participants before and during our clinical studies. Our Medical Safety and Ethics Board (MSEB) oversees the safety of the participants in our clinical studies and, as necessary, reviews the benefit-risk profiles of investigational drugs.

Our commitment: International guidelines and requirements

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

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

Regular supervision of clinical studies

Our clinical study processes and procedures are regularly inspected by relevant regulatory authorities to verify their compliance with applicable laws and guidelines.

The Research & Development Quality unit applies a risk-based identification strategy to determine areas that need to be audited. Quality assurance audits are performed internally within Healthcare R&D (for example, process audits) and externally (for example, at vendors' sites and investigational sites). We respond immediately to observations during audits by investigating their root causes and, according to their criticality, defining and implementing corrective and preventive actions to improve processes, prevent reoccurrence of irregularities and ensure compliance.

A hybrid auditing approach combining remote and on-site audits was successfully implemented and most of the audits of the Annual Audit Plan 2022 were completed as planned.

Conducting clinical studies responsibly

Every clinical study follows defined procedures to ensure it is conducted to the highest quality standards in line with good working practices (GxP) for the development and manufacturing of drugs, the ethical principles of the **Declaration of Helsinki** and other international guidelines and regulations. In 2022, regulatory authority inspections did not unveil issues which had a significant impact on patient rights, patient safety, or the data integrity of a study.

Disclosure of clinical studies and publication of results

We are obligated to disclose findings from our clinical studies. We do this publicly in a complete, accurate, balanced, transparent, and timely manner as laid out in our Clinical Trial Disclosure Policy. We publish results from our clinical studies in medical journals in line with applicable laws and industry codes. In this way, we adhere in particular to the current version of the Good Publication Practice (**GPP3**) and follow the recommendations of the International Committee of Medical Journal Editors (**ICMJE**). Our **Standard on Clinical Trial Data Transparency** underscores our strong commitment in this matter.

Enabling early access to new medicines

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

Bioethics

Our goal is to conduct research in an ethically responsible manner and to develop ethical frameworks that guide us in making forward-looking business decisions. Patient benefit and well-being are always our top priority, whether in clinical studies, treatment with our medicines, or the distribution of our products to academic researchers and the biopharmaceutical industry. We carefully evaluate our positions when it comes to controversial topics.

Roles and responsibilities

Since 2010, the Merck Ethics Advisory Panel for Science and Technology has been issuing clear recommendations on scientific and technology topics involving ethical questions as well as issues extending beyond pure bioethics, in line with our transformation into a science and technology company. Co-chaired by two of our leading scientific experts from our senior management team, the MEAP provides recommendations that guide our actions and business activities. In addition to renowned international experts from the fields of bioethics, medicine, philosophy, law, and the natural sciences, the panel also consists of technology and sustainability experts. The MEAP receives its mandate from the Executive Board.

The MEAP meets multiple times a year and can also be convened on an ad-hoc basis in response to emerging urgent ethical issues. The meeting minutes can be accessed on our intranet, along with the recommendations issued by the MEAP. Our employees can also submit topics for discussion to the panel. In addition, they may report ethical concerns through our **compliance hotline** or by reaching out to our Bioethics team.

Our Stem Cell Oversight Committee (SCROC) was established on the recommendation of the MEAP back in 2013. This committee reviews and approves all planned in-house research activities involving the use of human stem cells, ensuring compliance with legal requirements as well as our ethical guidelines. This also includes joint projects with external partners. The committee consists of internal experts from our business sectors as well as external professionals from the fields of bioethics, medicine and law.

In 2022, we expanded the range of consulting services on ethics issues. Our goal is to also take ethics perspectives into account when making forward-looking business decisions. To this end, we launched the Ethics Foresight project, in which external experts and selected MEAP members support our employees from the business units on strategically relevant ethical issues.

Our commitment to policies and standards

Our **Genome Editing Principle** provides a mandatory ethical and operational framework for our employees. This is complemented by additional guidelines that define how we conduct research and business in an ethical manner. Our **Stem Cell Principle** sets the ethical boundaries for the use of human stem cells in our research. Our **Fertility Principle** regulates our research in fertility treatment and in-vitro-fertilization.

Use of genome-editing technologies

CRISPR/Cas9 opens up new possibilities in genetic engineering research that could bring about major advances in the treatment of serious diseases. Laws in different countries allow for a varying degree of latitude in applying this technique. Bioethical positions on germline editing have been evolving for years through academic and social discourse. Our position on human germline editing is as follows:

“In accordance with the German Embryo Protection Act, we do not support the use of genome editing in human embryos and clinical applications of germline interventions in humans. We recognize that there may be value in responsibly conducted related research.”

Stem cell research

We neither participate in clinical programs that utilize human embryonic stem cells or cloned human cells for the treatment of diseases, nor do we pursue such approaches ourselves. However, we use human embryonic stem cells in our research and offer our customers several select stem cell lines. In both applications, we only allow the use of human embryonic stem cells if clearly defined conditions have been met. For instance, we only utilize stem cells for research purposes if our SCROC has reviewed the respective project and given approval. In 2022, review and approval were granted in one case. We exclusively make use of cell lines that have been approved by the United States National Institutes of Health (**NIH**) and are allowed under the German Embryo Protection Act as well as the German Stem Cell Law.

Digital ethics

As it is our aim to develop and use new digital technologies responsibly, we promptly identify any ethical issues that may arise from algorithm-driven and data-based business models. Since 2021, the Merck Digital Ethics Advisory Panel (DEAP) has been focusing on complex ethical issues surrounding digital technologies and supports that our digital business model follows a holistic, ethical approach.

Roles and responsibilities

The DEAP discusses ethical issues arising from our digital applications and business activities, especially in the healthcare sector. One of its main tasks is to help ensure that we develop digital innovations responsibly while addressing potential digital ethics questions that could result from collecting and processing data as well as from the use of these digital technologies.

The panel, which issues recommendations on our actions as a company, consists of external international science and industry experts from the fields of digital ethics, law, Big Data technologies, digital health, medicine, and data governance. In addition, we involve bioethics experts as well as representatives from patient organizations as needed. The DEAP receives its mandate from the Executive Board and our employees may submit topics for the panel to discuss. Summary minutes of DEAP meetings and the recommendations made will be available on our intranet from 2023 onwards, provided that they do not contain any confidential business information. The panel held four meetings in 2022, focusing on ethical challenges that could result from our business model for bioelectronics.

Our commitment: Guidelines and standards

As a company, we want to position ourselves with respect to digital ethics. We are therefore developing clear ethical standards in this new field, primarily for critical areas, for instance handling health data, doing so in collaboration with various stakeholders and experts.

Together with the DEAP, we apply our Code of Digital Ethics (**CoDE**), in order to address issues pertaining to the ethical use of data and algorithms. The CoDE serves as a guideline for our digital business models, a tool for analyzing ethical challenges and a basis for practical DEAP recommendations. As one of our overarching governance documents, the CoDE applies to all employees and is publicly accessible. In 2022, we developed an employee training course on the CoDE, which we plan to roll out in 2023.

Data privacy and cyber security

The mandate and goal of our Group Data Privacy unit is to mitigate risks and create a global framework for data privacy-compliant business operations. This unit helps to train our employees to handle data responsibly and with clear accountability. It safeguards our company by providing data privacy risk assurance and ensuring compliance with relevant data privacy laws globally. Group Data Privacy also contributes to creating value for the development of digital business models.

It is of critical importance for our business that we protect our information systems, their contents, and our communication channels against any criminal or unwanted activities. These include e-crime and cyberattacks, such as unauthorized access, information leakage and misuse of data or systems. Our goal is to complete the implementation of a global and consistent data privacy management system by mid-2023.

Roles and responsibilities

Group Data Privacy is an independent function, organizationally integrated into Group Compliance and Data Privacy. We have a Group Data Privacy Officer and a network of local Data Privacy Officers at various sites Group-wide. In line with external regulations, the Data Privacy Officers and their respective teams act independently and without receiving internal or external instructions. Group Data Privacy regularly prepares data privacy updates and a comprehensive data privacy report. This report is submitted to the Executive Board and the Supervisory Board.

Cyber Security is part of our Group Corporate Security Office. In addition, we have a Group Chief Information Security Officer and a network of Information Security Officers within the business sectors, each in turn supported by dedicated networks. The individual sectors hold risk ownership and act as our first line of cyber security defense. Our Global Cyber Security function acts as a second line of defense and has responsibilities regarding cyber security risk governance and oversight. Our third line of defense comprises internal audits.

New Cyber Security organization

At the beginning of 2022, we created a new Cyber Security organization with a mandate to improve trust and strengthen resilience against cyberattacks and data breaches.

Our Cyber Security team defines policies and standards for cyber security (including data security) while providing oversight, tools and systems to manage and monitor our overall cyber security risk exposure. The team is also responsible for providing 24/7 cyber security monitoring and incident response capabilities across the entire company environment as well as training employees across the organization on how to protect data appropriately.

Our commitment: Guidelines and standards

Our Data Privacy Policy and the corresponding standards and procedures define our principles for processing personal data. This approach allows us to achieve a high level of data protection for our employees, contract partners, customers, and suppliers as well as patients and participants in clinical studies. Our Group-wide understanding of data privacy is based on European legislation, in particular the European Union General Data Protection Regulation (EU GDPR). We are also taking steps to meet local data privacy requirements, where these are stricter than our Group-wide standards.

Our Group Cyber Security governance framework comprises organizational, process-related and technical information security countermeasures based on recognized international standards. In addition, we apply harmonized electronic and physical security controls (e.g. access control and security monitoring) to bolster our ability to handle sensitive data, such as trade secrets.

Training and IT tools

In line with the EU GDPR and our global approach to data privacy, we regularly conduct e-learning training courses in ten languages. In 2022, the completion rate for our e-learning courses was 98%.

We maintain a central IT tool to provide a single source for data privacy processes, such as registering data processing activities and reporting potential data privacy incidents. In 2022, we rolled out a new data privacy tool. In the reporting year, we registered no sanctioned complaints or incidents concerning breaches of customer privacy, data leaks, theft, or loss of customer data. In three out of 57 cases, minor personal data breaches were reported to the supervisory authority. These were not sanctioned.

Data Privacy

	2019	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Reported violations of Data Privacy Guidelines	1	3	3	4	1
Customer Privacy[1]					
Total number of substantiated complaints received from outside parties	0	0	0	0	0
Total number of complaints from regulatory bodies	1	0	0	0	0
Total number of identified leaks, thefts, or losses of customer data	1	0	0	0	0

[1] These data only reflect incidents classified as significant.

Anti-corruption and anti-bribery

Compliance management

As a global company, we have stringent requirements for effective compliance management. Importantly, we seek to emphasize compliance by acting in line with our **company values** and believe that profitable business operations should go hand in hand with the highest ethical standards.

Roles and responsibilities

Our Group Compliance function is responsible for the framework of the following core topics: the Merck Code of Conduct, anti-corruption and anti-bribery (including healthcare compliance, third-party due diligence, transparency reporting), anti-money laundering, antitrust, and conflicts of interest.

To cover these topics, we have Group-wide policies, standards and procedures in place that ensure our business activities comply with the relevant laws, regulations and international ethical standards. Other compliance-related issues, including the respective internal regulations and guidelines, such as **Pharmacovigilance**, Export and Import Controls, and **Environment, Health, Safety, Security, Quality**, are managed by the responsible functions.

Our Group Compliance function is responsible for our compliance portfolio, which consists of the following elements:

- Risk Assessment: Identifying internal and external critical risks in regular business operations
- Policies & Procedures: Global policies, procedures and standards to mitigate identified risks
- Compliance Committee/Forums: Platform for compliance-related discussion and decision-making, including relevant key functions
- Training & Awareness: Appropriate training and additional measures to educate and keep awareness high
- Programs & Tools: Comprehensive compliance programs and supporting tools contributing to internal controls and overall governance
- Monitoring & Reporting: Tracking of compliance-related data; perform internal and external reporting
- Case Management: Timely response to reports of misconduct and implementation of corrective actions
- Continuous Improvement: Based on and applying to all compliance program elements

Our Chief Compliance Officer reports on the status of our compliance activities, potential risks and serious compliance violations to the Executive Board and Supervisory Board twice a year at a minimum. As part of our regular reporting processes, we compile a comprehensive compliance and data privacy report annually for the Executive Board. This includes the status of our compliance program, continuous improvement initiatives and key figures on compliance and data privacy cases. Additionally, we prepare a mid-year update to highlight ongoing developments and the status of relevant projects and initiatives.

Our Chief Compliance Officer oversees all Compliance departments and the underlying Compliance Officers and Compliance experts around the world. The Compliance Officers implement our compliance program within their respective areas of responsibility (adapting to local regulations) and receive guidance from our Group Compliance Center of Expertise. This is a centralized body that drives the design and evolution of our compliance program across all business sectors and Group functions.

Our commitment: Guidelines and standards

Our compliance program builds on our company values and integrates these into our compliance framework, which consists of Group-wide policies, standards and procedures for entrepreneurial conduct. The following are mandatory for all our employees:

- **Merck Code of Conduct**
- **Human Rights Charter**
- Anti-Corruption Standard
- Anti-Money Laundering Group Standard
- Conflict of Interest Policy
- Antitrust and Competition Law Policy
- Compliance Reporting and Investigation Policy
- Dawn Raid Policy
- Standard on Local Compliance Standards
- **Supplier Code of Conduct** (formerly Responsible Sourcing Principles)

Risk assessment

Proper compliance risk management is crucial to identify undetected risks and ensure our company remains protected. For this purpose, we are implementing a compliance risk identification process. We started this initiative by launching a global compliance risk process for all our business sectors to improve objectivity and enable a more data-driven risk approach. In addition, we established a comprehensive risk matrix that focuses on bribery and corruption risks, illustrated through in-depth risk categorization and risk scenarios. As a next step, in 2022, we started conducting country-based risk assessments. This approach considers gross and net risks while looking at tangible risk scenarios for the respective business. During this process, Group Compliance works closely with the businesses to enhance their risk awareness and create a better understanding of compliance risks. The first round of this process includes high-risk countries. By 2022, we rolled out a risk identification process to get a better risk overview on bribery and corruption related risks.

Conflicts of interest

We take all potential conflicts of interest seriously. Employees must avoid situations where their professional judgment may come into conflict with their personal interests. They must also disclose every potential conflict of interest to their supervisor and document the disclosure. Such issues are typically resolved directly between the employee and the supervisor but can also be routed to Human Resources, Legal, Compliance, or other relevant functions.

Management and requirements of third parties

For compliance management to be effective, it must not be restricted to the boundaries of our own company. While our **supplier management processes** focus on vendor compliance with our standards, our global Third Party Risk Management process governs interactions with sales parties, such as commercial agents, distributors and dealers. We expect our third parties worldwide to adhere to our compliance principles. We collaborate only with parties who pledge to comply with relevant laws, reject all forms of bribery, and adhere to environmental, health and safety guidelines.

We apply a risk-based approach to select the third parties with whom we do business. The greater the estimated risk regarding a particular country, region, or type of service, the more in-depth we examine the third party before entering into a business relationship. We also explore background information from various databases and information reported by third parties.

If we encounter compliance concerns, we further analyze and verify the relevant information. Based on the outcome, we decide whether to reject the potential third party, impose conditions to mitigate identified risks or terminate the existing relationship. By end of 2023, we plan that all subsidiaries of our company will have a new Third Party Risk Management process and tool, for due diligence of all high risk third parties – to conduct business only with those that are legally compliant.

Compliance training

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

We introduced a new Conflicts of Interest e-learning module that explains what conflicts of interests are and how these should be managed within our company. The course is available in nine languages. Furthermore, we launched a new e-learning course to provide an overview of our Third-Party Risk Management and to emphasize the importance of Third-Party Risk Assessments.

Anti-money laundering

We have implemented a global anti-money laundering (AML) program consisting of a global Anti-Money Laundering Group Standard, training and a dedicated process to report and investigate red flags as well as any high-risk transactions. Suspicious transactions are reported to the German Financial Intelligence Unit or other authorities as required.

We aim to continuously improve our AML program. Following a worldwide risk assessment in 2021 to identify jurisdictions imposing the strictest legal and regulatory frameworks applicable to our businesses, we initiated in-depth AML risk assessments for higher-risk jurisdictions. Based on these assessments and constant review of changes in the legal environment, we are implementing stricter local AML programs where required.

Reporting potential compliance violations

We encourage all employees worldwide to report potential compliance violations to their supervisors, Legal, HR or other relevant departments. Globally, they can also use our central whistleblowing compliance hotline free of charge and anonymously to report violations in their local language by telephone or via a web-based application. Reports of potential compliance violations that we receive via our compliance hotline are reviewed by the Compliance Investigations and Case Management team.

Cases with a certain risk profile are presented to the Compliance Case Committee, which comprises senior representatives from our Compliance, Corporate Security, Data Privacy, Human Resources, Internal Auditing, and Legal departments. The Committee’s duties include assessing and classifying certain compliance issues, investigating their background, and addressing these issues using appropriate measures.

Based on the investigation outcome and recommendations from the compliance investigation team or the Compliance Case Committee, appropriate disciplinary action may be taken against employees who have committed a compliance violation. If, during the investigation, a root cause is identified that could lead to the risk of further compliance violations, we take preventive and corrective actions.

The compliance hotline is also available to external stakeholders. The relevant information can be found in the Compliance and Ethics section of our **website**.

The number of suspected compliance violations reported remained stable compared with the previous year, while the number of confirmed compliance violations decreased. In 2022, we received 79 compliance-related reports via the compliance hotline and other channels that were processed as cases. 28 violations of the Code of Conduct or other internal and external rules were confirmed.

Reported compliance violations

	2019	2020	2021	2022 Merck Group	2022 thereof: Merck KGaA
Total number of reported compliance violations					
Number of reported compliance incidents	75	81	79	79	3
Number of confirmed cases	30	41	42	28	0
Confirmed cases by category					
Bribery and corruption	9	6	1	2	0
Violation of cartel laws and fair competition rules	0	0	0	1	0
Fraudulent actions against Merck	8	11	6	11	0
Other violations of the Merck Compliance Principles for the relations with business partners	4	0	0	2	0
Other violations of Merck values, internal guidelines or legal requirements	9	24	35	12	0

Compliance audits

Compliance is ensured by Group Compliance and Group Internal Auditing as the second and third lines of defense. As part of the audits, Group Internal Auditing regularly reviews functions, processes and legal entities worldwide. These reviews include an assessment of the effectiveness of the respective compliance guidelines, processes and structures in place. The units also check for violations of our Code of Conduct and our Anti-Corruption Standard.

Our audit planning aims to provide comprehensive risk assurance through the best possible audit coverage of our processes. We take a risk-based approach to our annual audit planning process, considering factors such as sales, employee headcount, systematic stakeholder feedback and the Corruption Perceptions Index (**CPI**) published by the non-governmental organization **Transparency International**. If an internal audit gives rise to recommendations, Group Internal Auditing performs a systematic follow-up and monitors the implementation of the recommended corrective actions. In 2022, Group Internal Auditing conducted 79 internal audits involving bribery and corruption-related risks, including 52 operational and 24 IT audits and 3 special audits which may, for example, be initiated as part of incident-specific internal investigations.

Interactions with health systems

We support health systems by providing information to our healthcare stakeholders, such as professional medical associations, patient advocacy groups, university clinics and other institutions that provide healthcare. We follow clearly defined internal approval requirements and procedures for each type of interaction, in line with applicable laws and codes. In countries with statutory or industry obligations on the disclosure of transfers of value to healthcare stakeholders, we aim to comply with these obligations.

Direct-to-consumer advertising only in certain countries

Direct-to-consumer (DTC) advertising for prescription medicines is permitted in some countries, such as the United States. In line with applicable local laws, we use DTC advertising in these countries to help increase people’s awareness of certain diseases and the available therapies.

Roles and responsibilities

For all interactions with healthcare stakeholders, we have established internal policies and review processes and tools, such as record-keeping systems, to ensure adherence to statutory requirements and transparency obligations.

Our Global Regulatory Affairs unit has established a dedicated standard and corresponding process document on the review and approval of our promotional materials for our Healthcare business sector. At the operational level, the relevant business and all employees involved in our sales and marketing activities must adhere to our internal policies, standards and procedures.

To ensure that all promotional materials meet our standards as well as local regulations end-to-end, we apply a harmonized Group-wide review and approval system.

Our commitment: Group-wide guidelines and industry standards

In addition to applicable laws and our own internal standards, we comply with the codes of conduct of various international and local industry organizations, such as the **Code of Practice** published by the International Federation of Pharmaceutical Manufacturers & Associations (**IFPMA**) and the Code of Practice of the European Federation of Pharmaceutical Industries and Associations (**EFPIA**) or the regulations of the U.S. Pharmaceutical Research and Manufacturers of America (**PhRMA**).

Moreover, we apply various specific internal rules and regulations:

- Pharma Code for Conducting Pharmaceutical Business and Pharmaceutical Operations (Pharma Code)
- Healthcare Ethical Guiding Principles
- Standard on Medical Activities
- Policy on Interactions with Patients, Patient Opinion Leaders, and Patient Organizations
- Guideline Good Practice and Process Guidance: Engagement with Patients, Patient Opinion Leaders, and Patient Organizations.

Transparent reporting

We publish the financial and non-financial contributions we make to healthcare stakeholders in the healthcare industry, such as healthcare professionals and healthcare organizations, as appropriate and in accordance with local laws and codes. The published information includes the names of individual recipients, their addresses, the purpose, and the contributed amount or value as required by the applicable laws and codes. In addition, before publishing, we secure all necessary informed consent forms, as required by the applicable data privacy regulations.

Regular employee training

We are continuing our Code of Conduct training curriculum on managing dilemmas in sector-specific situations. Employees who are responsible for the promotion of our pharmaceutical products receive regular training on current guidelines. Depending on their roles and responsibilities, new employees, participate in onboarding training dealing with the review and approval of promotional materials. Based on their roles and responsibilities and to remain up-to-date, employees participate in mandatory e-learning courses and classroom training on our policies and guidelines, as well as important changes to the reporting requirements for transfers of value.

Other topics

Sustainable innovation and technology

The sustainable innovation that we envision or drive forward must align with and support the three goals of our **sustainability strategy**. We define sustainable innovation as new or improved products, services, technologies, or processes that generate economic benefits and have positive environmental and social impacts. Therefore, we develop long-term solutions for our innovation and research activities that consider the entire value chain and evaluate each product's impact over its lifecycle.

Today, our products already have a positive impact on human progress and global health, namely our medicines and our biological and chemical innovations that utilize the latest technologies. We want to continuously improve the way we measure our progress by adapting and integrating sustainability criteria into our product development processes across the business sectors.

In 2022, we continued our partnership with the well-established patent information platform LexisNexis® PatentSight®. In this context, we created a framework to evaluate the sustainability impact of our intellectual property. For 2022, we evaluated the baseline for the first time and identified that 27% of our patent families published that year have a positive sustainability impact based on LexisNexis® PatentSight®.

Roles and responsibilities

The organizational set-up of our R&D activities reflects the overall structure of our company. All three of our business sectors operate independent R&D units that pursue their own innovation strategies. Group Corporate Sustainability supports our business sectors and Group functions to advance and integrate sustainability within the R&D and innovation processes in line with our shared goals. We developed a methodology for creating a Group-wide overview of the potential contribution of our R&D portfolio towards sustainable solutions that went live in December 2022.

Our Group Science & Technology Office leads the implementation of our combined strategy for innovation, data and digital, enabling innovation across our business sectors while harnessing the power of advanced data and digital capacities. It aims to identify and integrate transformative, strategically relevant technology trends into our business sectors while maintaining a Group-wide view of our tech roadmap and innovation portfolio. Fostering data and digital capacities is key to accelerating sustainable innovation and enabling rapid action and personalized offerings. Innovation projects are incubated either through our corporate innovation teams or in the business sectors.

Our venture capital fund, **M Ventures**, prioritizes sustainable innovations through equity investments. The fund's mandate is to invest in innovative technologies and products that have the potential to significantly impact our core business areas. In addition, the fund focuses on investments in two areas of high strategic relevance to our company: digital technology and sustainability.

M Ventures' sustainability investment strategy follows two fundamental approaches. First, it invests in sustainable solutions relevant to our three business sectors, such as novel solutions for reducing emissions and waste, green life science technologies and green electronics technologies. These solutions may be more energy- or resource-efficient or may create products designed for circularity or with a lower carbon footprint. The second approach involves making investments that leverage our core competencies to drive sustainability in other markets. These may include start-ups addressing sustainable foods, bio-manufacturing, or carbon capture and utilization.

Our commitment: Aiming for circularity

Within our R&D processes, we are committed to continuously improving and integrating sustainability and circular economy criteria to assess the sustainability performance of our products and portfolio. For example, our Life Science business sector developed Design for Sustainability (DfS) and the DOZN™ tool to create more sustainable products for our customers. In 2022, we tailored and rolled out the DfS concept to our two other business sectors and integrated an overarching company dashboard. In 2023, we aim to generate an understanding of our R&D portfolio and use the insights to steer future R&D activities. Therefore, we have developed an indicator to track our progress. In addition, we have dedicated corporate resources for our circular economy strategy and we are driving several circular economy pilots and initiatives throughout the organization.

Reporting in accordance with the EU Taxonomy Regulation

Fundamentals

The EU taxonomy for sustainable activities (hereinafter “EU Taxonomy”) is a classification system that translates the climate and environmental objectives of the European Union (EU) into criteria for sustainable economic activities. For this purpose, the EU Taxonomy defines various key performance indicators and qualitative information that Merck must disclose. The disclosure obligation under Article 8 of Regulation (EU) 2020/852 of the European Parliament and of the European Council dated June 18, 2020 on establishing a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088 (hereinafter “EU Taxonomy Regulation”) and the Delegated Acts adopted in this regard is being carried out in multiple phases:

- For the 2021 reporting period, key performance indicators were stated only for so-called taxonomy-eligible economic activities and were limited to those that make a substantial contribution to climate change mitigation or climate change adaptation as defined by the EU Taxonomy Regulation. An economic activity qualifies as taxonomy-eligible if it is within the scope of the EU Taxonomy.
- For the 2022 reporting period, apart from the degree of taxonomy-eligible economic activities making a substantial contribution to climate change mitigation or climate change adaptation within the meaning of the EU Taxonomy Regulation, it is also necessary to report the taxonomy-aligned share of the identified economic activities. According to the EU Taxonomy, an economic activity qualifies as taxonomy-aligned if it is taxonomy-eligible and makes a substantial contribution to one or more of the environmental objectives without doing significant harm to the other objectives or failing to fulfill minimum social standards.
- As of the 2023 reporting period, four further environmental objectives of the EU are likely to be included in the disclosure obligation: 1) sustainable use and protection of water and marine resources, 2) transition to a circular economy, 3) pollution prevention and control, and 4) protection and restoration of biodiversity and ecosystems.

Approach

To ensure the legally compliant fulfillment of its disclosure obligations, in 2020 Merck established an interdisciplinary project team that is continuously analyzing the existence of taxonomy-eligible and taxonomy-aligned activities in close coordination with the representatives of the business sectors and various Group functions.

The identification of the taxonomy-eligible economic activities for the environmental objectives “climate change mitigation” and “climate change adaptation” proceeded in line with a top-down approach using structured inquiries submitted to the relevant specialist departments. The results of this analysis were confirmed by supplementary big data-supported analyses as part of a bottom-up approach. Among other things, information was used that can also be found in connection with the requirements of the REACH regulation as well as in the context of customs declarations.

The three key performance indicators (KPIs), namely net sales, capital expenditure and operating expenditure, were mainly derived from existing financial reporting systems; for capital expenditure inquiries were made to the Investment Controlling unit in some instances.

Methodology for determining the taxonomy KPIs requiring publication

The EU Taxonomy Regulation and the corresponding Delegated Acts contain wording and requirements which, even taking into account the supplementary publications of the EU Commission and the "EU Platform on Sustainable Finance", are subject to interpretation and for which clarifications have not yet been published in every case. The most significant interpretive issues arising in this context are presented below.

Taxonomy-eligible economic activities of Merck

To check the taxonomy eligibility of an economic activity, Merck applies an end-product oriented approach for manufacturing-related activities. This means that the end product must result from one of the economic activities specified in the Delegated Act in order to qualify as being taxonomy-eligible. In the case of organic basic chemicals, the corresponding economic activities only qualify as taxonomy-eligible in the interpretation of Merck if the manufacturing activities of the named chemical products involve a significant transformation process. In our interpretation, products that are merely passed on for sale, repackaged or mixed do not qualify as taxonomy-eligible within the meaning of the EU Taxonomy Regulation.

In the course of implementing the EU Taxonomy requirements, the business model of Merck underwent a comprehensive analysis. The core business activities of Merck are not mentioned in the economic activities set forth by the Delegated Act. Consequently, taxonomy-eligible activities were only identified to a very small extent in conjunction with the production of energy-efficient building equipment in the Electronics business sector. By contrast, neither the manufacture nor the distribution of pharmaceutical products or the distribution of specialty chemicals, which form the core of the business activities of the Life Science and Electronics business sectors, qualify as application areas of the EU Taxonomy Regulation for the first two environmental objectives. Furthermore, ancillary activities that are operationally necessary for our core business also do not qualify as independent taxonomy-eligible economic activities. This applies, for example, to the acquisition or construction of production buildings, the transport of our products to our customers as well as to research and development activities that cannot be allocated to a taxonomy-eligible economic activity for the first two environmental objectives "climate change mitigation" and "climate change adaptation".

With respect to capital expenditure, the EU Taxonomy Regulation differentiates between three categories of capital expenditure:

- Capital expenditure that relates to assets or processes associated with taxonomy-aligned economic activities (Category A),
- Capital expenditure that is part of a plan to expand taxonomy-aligned economic activities or to transform taxonomy-eligible economic activities into taxonomy-aligned economic activities (Category B), and
- Capital expenditure related to the acquisition of products from taxonomy-eligible economic activities and individual measures that carry out the target activities in a low-carbon manner or reduce greenhouse gas emissions (Category C).

Because Merck only engages in taxonomy-eligible economic activities in the area of manufacturing energy-efficient building equipment to a very small extent owing to its business model, it has no significant capital expenditure in category A. Furthermore, Merck has no capital expenditure in category B since it does not prepare any capital spending plans to transform the taxonomy-eligible economic activities for the first two environmental objectives "climate change mitigation" and "climate change adaptation" into taxonomy-aligned economic activities. This is attributable to the fact that there are hardly any taxonomy-eligible activities due to the business model of the Group.

Consequently, Merck only has capital expenditure for the first two environmental objectives resulting from the acquisition of products classified as taxonomy-eligible economic activities or are attributable to qualifying individual measures (Category C). In order to be taxonomy-eligible, this capital expenditure must correspond to one of the economic activities named in the Delegated Acts and be implemented and operational within 18 months. At Merck, such capital expenditure exists especially in connection with

- transport by motorbikes, passenger cars and light commercial vehicles (activity 6.5)
- construction and real estate (activities 7.2 to 7.7).

In order to exclude double counting, capital spending on products from taxonomy-aligned economic activities and individual measures that have already been checked under category A are only included under category A. Against this background, capital expenditure for production buildings, for example, is only subject to a taxonomy-eligibility check under category A, while capital expenditure for administrative buildings is included under category C.

Taxonomy alignment of the economic activities of Merck

In order to check the taxonomy alignment of the taxonomy-eligible economic activities, the relevant regulations for the technical screening criteria under which certain economic activities qualify as contributing substantially to the environmental objective as well as for determining whether the activity causes no significant harm to any of the other environmental objectives were systematically analyzed. The basis for this was the Delegated Acts on the EU Taxonomy, which were used for the identification of taxonomy-eligible economic activities. In these, corresponding requirements are defined for the respective economic activities, which must be fulfilled for a classification as taxonomy-aligned. For this purpose, interviews were conducted with business and project managers and physical climate risk analyses were carried out at the sites. Furthermore, operating permits, product data sheets, environmental product declarations, energy performance certificates and internal training documents were inspected, among other things.

Minimum safeguards

The minimum protection frameworks include the OECD Guidelines for Multinational Enterprises, the United Nations Guiding Principles on Business and Human Rights, the fundamental conventions of the International Labour Organization, and the International Bill of Human Rights. The requirements profile of the frameworks was systematized and compared with internal documents. This included an analysis of the Code of Conduct, work instructions, guidelines and training documents. Compliance with the due diligence process required by the framework in the area of human rights is ensured with respect to the individual business activities. Risk analyses are carried out with regard to the minimum protection requirements and appropriate measures are derived from these.

Taxonomy KPIs

Net sales

The KPI net sales represents the ratio of net sales from taxonomy-eligible or taxonomy-aligned economic activities in a fiscal year to the total net sales of the same fiscal year. The definition of relevant net sales for the purposes of the EU Taxonomy Regulation corresponds to the definition of net sales in the consolidated financial statements (see Note (9) “**Net sales**" in the Notes to the Consolidated Financial Statements).

Capital expenditure

The share of capital expenditure on assets or processes associated with economic activities classified as taxonomy-eligible or taxonomy-aligned is determined as follows: Share of total capital expenditure that is taxonomy-eligible or taxonomy-aligned divided by total capital expenditure according to the EU Taxonomy Regulation. At Merck and within the meaning of the EU Taxonomy Regulation, capital expenditure in the

reporting period comprises additions to property, plant and equipment (IAS 16), rights of use from leases (IFRS 16), and intangible assets (IAS 38) with the exception of goodwill. Apart from the additions, advance payments for the named assets are also included. The denominator also includes additions to property, plant and equipment and intangible assets resulting from business combinations. The additions can be seen in the changes in property, plant and equipment and intangible assets disclosed in the consolidated financial statements (see Note (20) "**Property, Plant and Equipment**" and Note (19) "**Other Intangible Assets**" in the Notes to the Consolidated Financial Statements)

Operating expenditure

The share of operating expenditure for assets or processes associated with economic activities classified as taxonomy-eligible or taxonomy-aligned is determined as follows: Share of total operating expenditure that is taxonomy-eligible or taxonomy-aligned divided by total operating expenditure according to the EU Taxonomy Regulation. Operating expenditure relevant within the scope of reporting under the EU Taxonomy Regulation includes direct, non-capitalized research and development costs, low-value leases, building renovations, maintenance and repair, and all other direct internal and external expenses related to the day-to-day maintenance of property, plant and equipment that are necessary to ensure the continuous and effective functioning of these assets.

Fossil gas-related activities

Merck operates a gas turbine and a co-generation unit to generate electricity and heat from fossil gaseous fuels. The unit serves to generate our own power and heat. The activities in the area of electricity generation from fossil gaseous fuels as well as the operation of co-generation units with fossil gaseous fuels are not significant at Merck. Additional activities in the field of nuclear energy and fossil gas are not performed.

Key performance indicators and qualitative information

The following tables present the share of sales, capital expenditure and operating expenditure attributable to taxonomy-eligible and taxonomy-aligned economic activities in respect of the environmental objective “climate change mitigation”.

				Criteria for a substantial contribution		DNSH criteria (“Do no significant harm")									
Economic activities	Codes	Absolute net sales	Share of net sales	Climate change mitigation	Climate change adaptation	Climate change mitigation	Climate change adaptation	Water and marine resources	Circular economy	Environmental pollution	Biodiversity and ecosystems	Minimum safeguards	Share of net sales aligned with the EU taxonomy 2022	Category (enabling activities)	Category (transitional activities)
		€ million	%	%	%	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	%		
A. TAXONOMY-ELIGIBLE ACTIVITIES															
A.1. Taxonomy-eligible, taxonomy-aligned activities															
Manufacture of energy efficiency equipment for buildings (A.1)	3.5	7	0.03	0.03	0.00		Y	Y	Y	Y	Y	Y	0.03	E	
A.2 Taxonomy-eligible, non-taxonomy-aligned activities															
Net sales for taxonomy-eligible, non-taxonomy-aligned activities (A.2)		**0**	**0.00**												
Total (A.1 + A.2)		**7**	**0.03**												
B. NON-TAXONOMY-ELIGIBLE ACTIVITIES															
Net sales for non-taxonomy-eligible activities (B)		**22,225**	**99.97**												
Total (A + B)		**22,232**	**100.00**												

				Criteria for a substantial contribution		DNSH criteria ("Do no significant harm")									
Economic activities	Codes	Absolute operating expenditures	Share of operating expenditure	Climate change mitigation	Climate change adaptation	Climate change mitigation	Climate change adaptation	Water and marine resources	Circular economy	Environmental pollution	Biodiversity and ecosystems	Minimum safeguards	Share of operating expenditure aligned with the EU taxonomy 2022	Category (enabling activities)	Category (transitional activities)
		€ million	%	%	%	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	%		
A. TAXONOMY-ELIGIBLE ACTIVITIES															
A.1. Taxonomy-eligible, taxonomy-aligned activities															
Manufacture of energy efficiency equipment for buildings	3.5	0	0.00	0.00	0.00		Y	Y	Y	Y	Y	Y	0.00	E	
Renovation of existing buildings	7.2	0	0.00	0.00	0.00		Y	Y	Y	Y	Y	Y	0.00		T
OpEx of eligible Taxonomy-aligned activities (A.1)		**0**	**0.00**	**0.00**	**0.00**								**0.00**		
A.2 Taxonomy-eligible, non-taxonomy-aligned activities															
Operating expenditure for taxonomy-eligible, non-taxonomy-aligned activities (A.2)		0	0.00												
Total (A.1 + A.2)		**0**	**0.00**												
B. NON-TAXONOMY-ELIGIBLE ACTIVITIES															
Operating Expenditures of non-eligible Taxonomy activities (B)		**2,861**	**100.00**												
Total (A + B)		**2,861**	**100.00**												

				Criteria for a substantial contribution		DNSH criteria ("Do no significant harm")									
Economic activities	Codes	Absolute capital expenditure amount	Share of capital expenditure	Climate change mitigation	Climate change adaptation	Climate change mitigation	Climate change adaptation	Water and marine resources	Circular economy	Environmental pollution	Biodiversity and ecosystems	Minimum safeguards	Share of operating expenditure aligned with the EU taxonomy 2022	Category (enabling activities)	Category (transitional activities)
		€ million	%	%	%	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	%		
A. TAXONOMY-ELIGIBLE ACTIVITIES															
A.1. Taxonomy-eligible, taxonomy-aligned activities															
Manufacture of energy efficiency equipment for buildings	3.5	1	0.06	0.06	0.00		Y	Y	Y	Y	Y	Y	0.06	E	
Renovation of existing buildings	7.2	10	0.51	0.51	0.00		Y	Y	Y	Y	Y	Y	0.51		T
CapEx of eligible Taxonomy-aligned activities (A.1)		**12**	**0.58**	**0.58**	**0.00**								**0.58**		
A.2 Taxonomy-eligible, non-taxonomy-aligned activities															
Capital expenditure for taxonomy-eligible, non-taxonomy-aligned activities (A.2)															
Transport by motorbikes, passenger cars and light commercial vehicles (A.2)	6.5	26	1.26												
Total (A.1 + A.2)		**38**	**1.84**												
B. NON-TAXONOMY-ELIGIBLE ACTIVITIES															
Capital expenditure for non-taxonomy-eligible activities (B)		**2,004**	**98.16**												
Total (A + B)		**2,042**	**100.00**												

The low share of taxonomy-eligible net sales, capital expenditure and operating expenditure in connection with the environmental objective “climate change mitigation” is mainly due to the very limited conformity of the business activities of Merck with the economic activities set forth in the EU Taxonomy Regulation.

Research and development expenses accounted for € 2,521 million (2021: 2,426 million) of the reported operating expenditure, with € 1,694 million (2021: € 1,712 million) of this being attributable to the Healthcare business sector.

No additional taxonomy-eligible and taxonomy-aligned net sales, capital expenditure or operating expenditure were identified for the environmental objective “climate change adaptation”.

Outlook

For the environmental objective “pollution prevention and control,” which is likely to be disclosed for the first time for the 2023 reporting period, Merck expects a higher share of taxonomy-eligible economic activities than for the objectives “climate change mitigation” and “climate change adaptation”, which are already subject to the reporting requirement. This assessment is based on proposals for technical screening criteria by the “Technical Working Group of the EU Platform on Sustainable Finance”, which, with respect to the environmental objective “pollution prevention and control”, list to a vast extent the production of chemicals, pharmaceutical and chemical products, and pharmaceutical products as taxonomy-eligible economic activities. These proposals will flow into the development of the Delegated Act through which the European Commission will define the technical screening criteria. As regards the degree of taxonomy alignment of the relevant economic activities for the environmental objective “pollution prevention and control”, a reliable estimate is not possible at the present time due to the uncertain legal situation.

Compensation Report

This compensation report describes the structure and application of the compensation system for the Executive Board of Merck KGaA, Darmstadt, Germany, in the fiscal year 2022. It provides a transparent overview of the relationship between compensation and performance, and presents the compensation awarded or due to the members of the Executive Board and the Supervisory Board in the 2022 fiscal year. The compensation report has been jointly prepared by the Supervisory Board and the Executive Board in accordance with the provisions of Section 162 of the German Stock Corporation Act (AktG) and the recommendations of the German Corporate Governance Code in the version dated April 28, 2022. It has formally and materially been audited by KPMG AG Wirtschaftsprüfungsgesellschaft in line with the requirements of Section 162 (3) AktG as part of the combined management report. The compensation report and the corresponding audit opinion as part of the audit opinion on the annual financial statements of Merck KGaA, Darmstadt, Germany, can be found on our website.

The legislation and regulations relating to the compensation report are geared toward the situation at a German stock corporation ("Aktiengesellschaft" or "AG") and do not take into consideration the special characteristics of a corporation with general partners ("Kommanditgesellschaft auf Aktien" or "KGaA"), such as our company. Major differences between the two legal forms exist in terms of liability and management. In the case of an AG, only the AG is liable as a legal entity, whereas the general partners of a KGaA also have unlimited personal liability for the company's obligations (Section 278 (1) AktG). Unlike the management board members of an AG, the members of the Executive Board of our company are personally liable partners of both Merck KGaA, Darmstadt, Germany, and the general partner E. Merck KG, Darmstadt, Germany, and not merely employed members of a corporate board. Given the structural differences between an AG and a KGaA, several recommendations of the German Corporate Governance Code apply to a KGaA only in a modified form.

Review of the 2022 fiscal year

The fiscal year 2022 was a year of continued growth, both financially and in terms of value creation for patients, customers, and investors. At the same time, the market environment was characterized by tensions due to the war in Ukraine, Covid-19, the progressive effects of climate change and geopolitical tensions. This was also reflected on the stock markets. The Merck share price has been influenced by major fluctuations over the fiscal year 2022.

All three business sectors, Life Science, Healthcare and Electronics, contributed significantly to Merck's success in the fiscal year 2022. Our "Big 3", Process Solutions and Life Science Services, new Healthcare products, and Semiconductor Solutions, were key to growth, combined with the strong performance of established portfolio products. Thanks to the strong growth, we now have excellent financial flexibility, enabling the implementation of our very ambitious investment and growth plans.

In addition to commercial success, we strongly focused on sustainability as integrated component of our strategy in 2022. We set clear sustainability goals, which were linked to the LTIP 2022 by the sustainability factor. In 2022, the independent Science Based Targets Initiative (SBTi) confirmed that our 2030 emissions targets are in line with the current state of climate science. Merck is thus contributing to limiting global warming to 1.5 °C and thus fulfilling the requirements of the Paris Climate Agreement.

In the fiscal year 2022, severe inflation, the energy crisis and ongoing disruptions to global supply chains were a major challenge for us. Rising costs impacted our business, our customers, and our employees. Regarding employee compensation, we continuously monitor the markets and take appropriate targeted action as needed to ensure that our compensation remains competitive. We are aware of the pressures and significant social impacts on our employees –particularly those with lower incomes. We closely monitored inflation and wage trends and took proactive measures in selected markets by adjusting salaries during the year. We also introduced other supportive benefits for our employees. This is an ongoing process, and we will continue to ensure that we provide appropriate salary adjustments to all employees. We will look for ways to protect our lower-income employees who are most affected by the rising cost of living.

In the fiscal year 2022 there was no increase of the contractually agreed compensation of the Executive Board. We have met the challenges with strong economic performance which is reflected in the payouts of the variable compensation components. This follows the “pay for performance” principle of the compensation system, which means that excellent performance is rewarded while missed targets are taken into account accordingly. Further details can be found in the Compensation System approved by the Annual General Meeting 2021 and published on our **website**.

Furthermore, during the fiscal year 2022 the composition of the Executive Board remained unchanged and stable. There were no personnel changes. In the Supervisory Board there was one change of mandate. Effective May 15, 2022, Edeltraud Glänzer left the Supervisory Board and as of July 14, 2022 Birgit Biermann took over.

Approval of the Compensation Report 2021

At the Annual General Meeting 2022, the Compensation Report 2021 was approved with a voting result of 84.73%. Only shares traded in the free float are entitled to vote at the Annual General Meeting.

In relation to the Annual General Meeting 2022 and in ten investor meetings after the Annual General Meeting, Merck obtained feedback from investors and all relevant shareholder associations and proxy advisors regarding the compensation of the Executive Board and its presentation in the Compensation Report 2021. Similar to the voting results, we received mostly positive feedback to last year’s revision of the Compensation Report. In particular, the increasingly transparent presentation was positively highlighted.

We have implemented the suggestion to present the individual maximum amount of the profit sharing and to explain the adjustment factor for increasing or reducing the profit sharing in this compensation report. While the criteria of the adjustment factor are already described in the Compensation System, we are additionally including them again in this Compensation Report to increase transparency even more. With this in mind, this year we are also publishing the target corridor of the respective indicators of the sustainability factor in the Long-Term Incentive Plan (LTIP) already at the beginning of the performance period for the first time.

We received further suggestions related to the LTIP. Regarding the performance indicator, which measures the relative performance of the share price compared to the DAX®, a more ambitious definition of the targets and, in isolated cases, a longer performance period overall are desired. The current tranches show a strong share performance, which according to the system leads to a performance-related payout. Furthermore, the current plan design reflects common market practice in Germany. However, we will consider such advice in the regular review of the compensation system and discuss them as part of a possible adjustment to the LTIP.

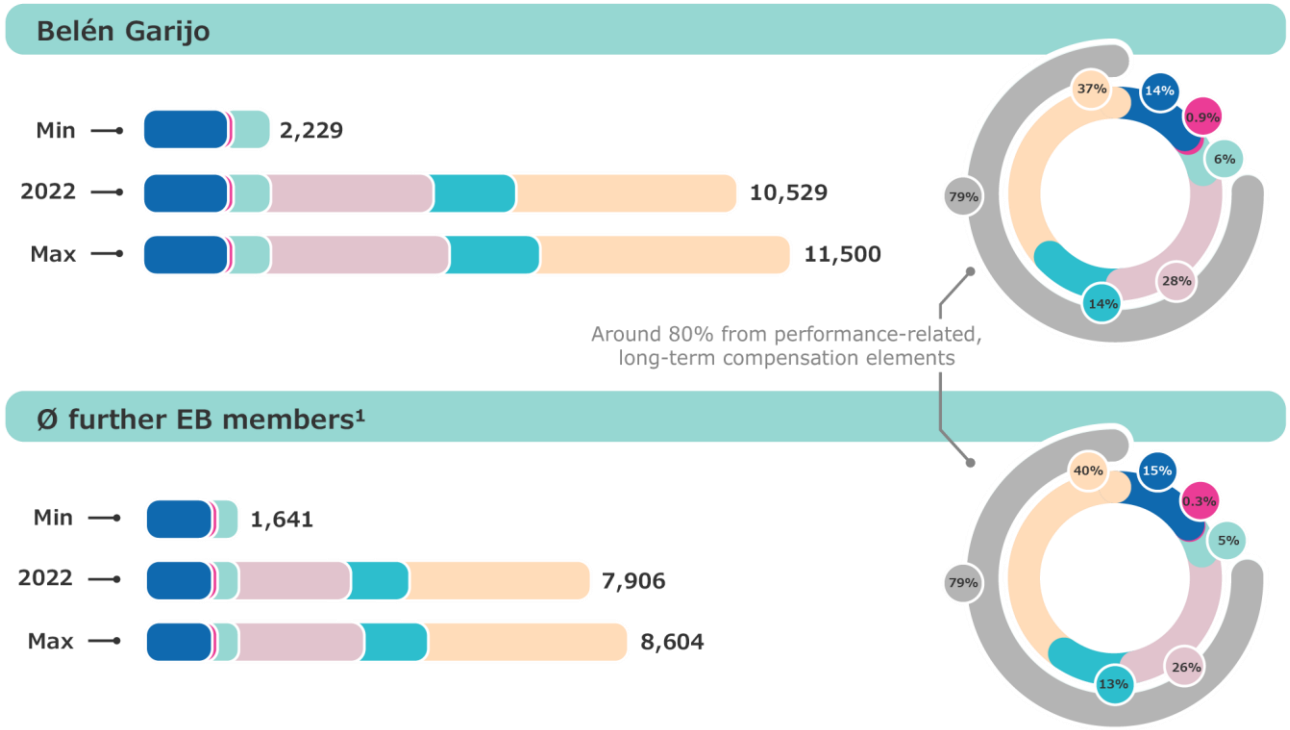
It was also made clear that potential adjustments of the Executive Board compensation as well as payments compensating forfeited compensation from a previous employment (sign-on payment) should be explained appropriately. In this regard, we will ensure an even more transparent explanation in the future. In the fiscal year 2022 there were no compensation adjustments.

Concerning the compensation tables, we follow the same approach as last year with the same interpretation of Section 162 (1) of the German Stock Corporation Act (AktG). In this context, we observe the practice of other companies and actively follow the decisions in connection with possible model tables of the EU Commission.

Involving our investors is an important and ongoing process. We will continue to maintain dialogue with investors in relation to the Annual General Meeting 2023 and beyond. Consequently, we can ensure that we receive constructive and valuable feedback which can be incorporated into both the design of the compensation system and the decisions of the Personnel Committee. Accordingly, we will report on the feedback received in the next Compensation Report.

Compensation for fiscal year 2022 – Summary

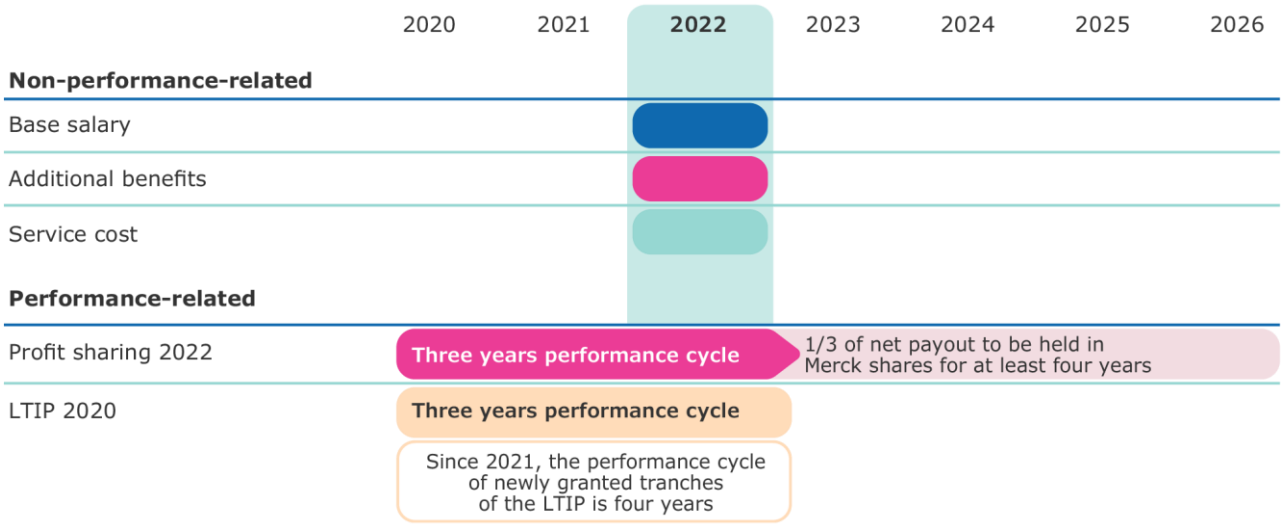
Summary of the compensation for the Executive Board members' performance up to December 31, 2022 – voluntary diclosure



- Base salary
- Additional benefits
- Service cost
- 2/3 of profit sharing 2022 (free disposal)
- 1/3 of profit sharing 2022 (to be held in shares for 4 years)
- LTIP 2020

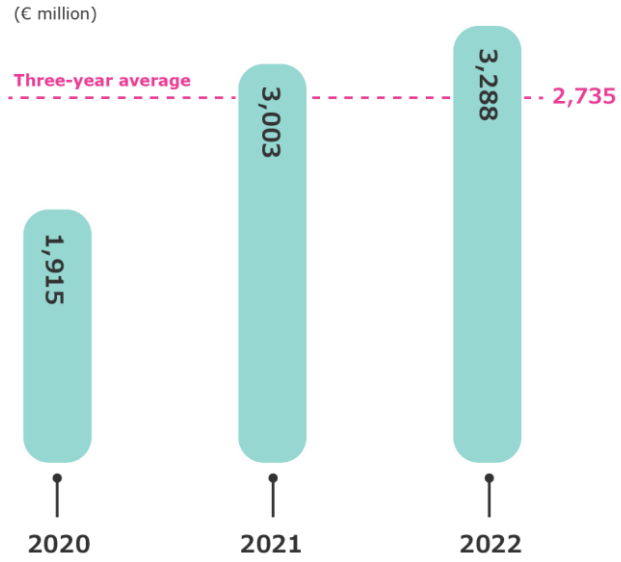
[1] The compensation of Kai Beckmann and Marcus Kuhnert is included in the average calculation of the further members of the Executive Board. Peter Guenter and Matthias Heinzel joined the Executive Board in the fiscal year 2021 and therefore did not receive any compensation from the LTIP 2020. Taking their compensation into account would therefore lead to a distorted presentation.

Compensation for fiscal year 2022 – Chronological overview

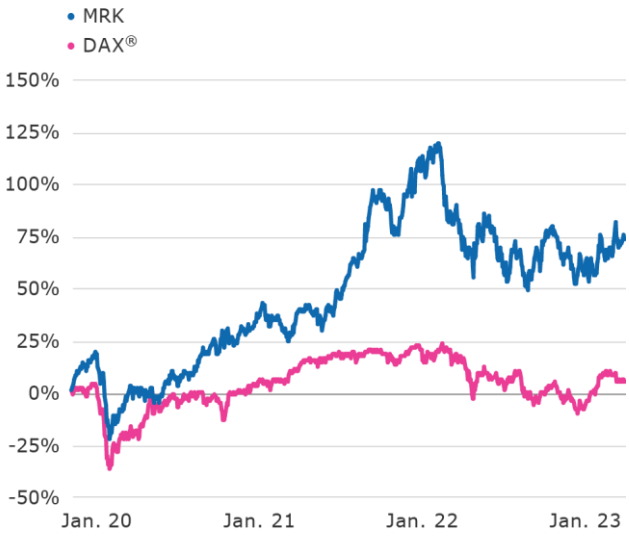


Relevant key performance indicators for profit sharing and Long-Term Incentive Plan (LTIP)

Profit after tax of E. Merck Group



Share price development



LTIP 2020

Performance indicator	Target corridor	Actual value	Target achievement
Share price performance relative to DAX® (Weighting: 50%)	Lower limit -20% · Target value 0% · Upper limit 50%	**58.6%**	**150.0%**
EBITDA pre margin (Weighting: 25%)	Lower limit 25.6% · Target value 28.6% · Upper limit 31.6%	**30.5%**	**131.7%**
Organic sales growth (Weighting: 25%)	Lower limit 5.1% · Target value 8.1% · Upper limit 11.1%	**8.7%**	**110.0%**

● Actual value

Total target achievement: 135.4%

Determining the compensation of the Executive Board

At our company, unlike at publicly listed German stock corporations, it is not the Supervisory Board but the Board of Partners of E. Merck KG, Darmstadt, Germany, that is responsible for designing and reviewing the compensation system and deciding on the amount and composition of compensation received by the Executive Board members. The Board of Partners has assigned this task to its Personnel Committee. As a result, the Personnel Committee is responsible for the development and regular review of the compensation system, i.e., for the structure and examination of the performance-independent and performance-related compensation elements. The Personnel Committee also considers the compensation system for managers and employees below Executive Board level to ensure consistency and a uniform steering effect between the compensation systems. Furthermore, the Personnel Committee is responsible for defining the annual targets and thresholds of the key performance indicators for the performance-related compensation elements.

In addition to the structure of the Executive Board compensation system, the Personnel Committee is responsible for defining the specific amounts of compensation paid to the members of the Executive Board. The compensation paid to the members of the Executive Board considers the responsibilities and duties of the individual Executive Board members, and in particular their status as personally liable partners, their individual performance, and the economic situation, as well as the performance and future prospects of the company.

Furthermore, Executive Board compensation is oriented toward the external peer environment of our company, which comprises the DAX® companies as well as a group of selected international competitors:

The international peer group was defined considering the size, business area and geographic location of the headquarters of the respective competitors. Overall, the peer group offers an appropriate ratio of companies headquartered in Europe and the United States as well as a balanced coverage of the Life Science, Healthcare and Electronics business sectors. Based on the size criteria of sales, number of employees and market capitalization, Merck positions itself around the median of this international peer group.

The relationship between Executive Board compensation and the compensation of top management and the workforce as a whole continues to be taken into account, also in a multi-year assessment. Top management is defined as encompassing the senior levels of management below the Executive Board. The compensation of the remaining workforce as a whole is based on typical employee compensation.

The Personnel Committee reviews the amount and structure of the Executive Board compensation by reference to the peer groups described and with the assistance of an independent compensation consultant.

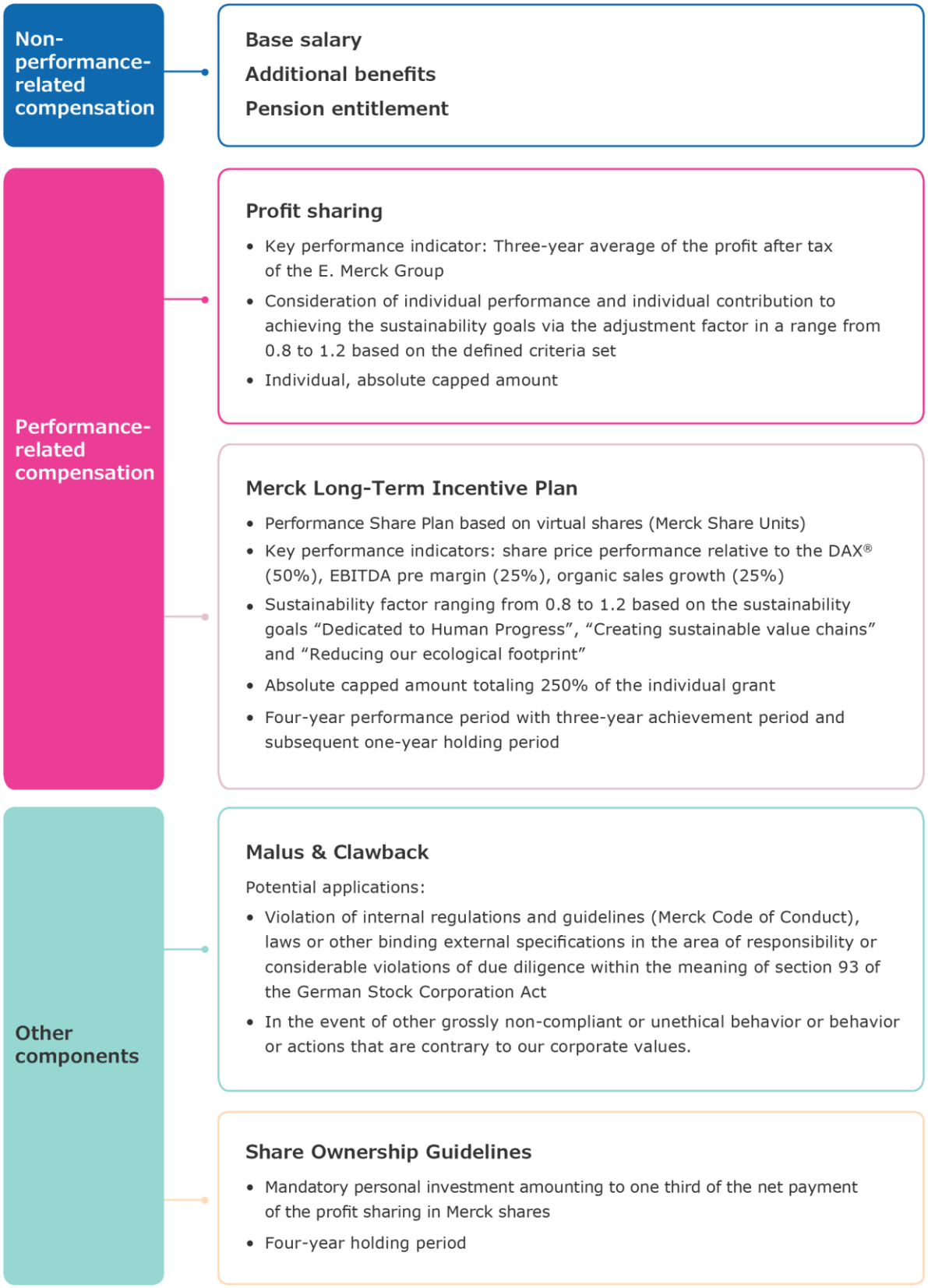
Overview of the structure of the compensation system

Compensation components

Executive Board compensation fundamentally comprises three main components: base salary, profit sharing, and the Long-Term Incentive Plan. This is complemented by contributions to the company pension plan as well as additional benefits. There are also additional compensation arrangements for the members of the Executive Board, in particular malus and clawback provisions and a Share Ownership Guideline.

The performance-related compensation elements – profit sharing and the Long-Term Incentive Plan – are based on a multiyear performance period and are completely oriented toward the company's long-term development. In addition, the two variable compensation components are designed to be tied to the company's share price to a large extent, thereby ensuring that our shareholders' interests are particularly considered. The key performance indicators selected for variable compensation are derived from the corporate strategy and form part of our central controlling system. Like this, the variable compensation of the Executive Board members is used as a strong controlling tool in order to ensure a focus on our objective of long-term profitable growth accompanied by strong cost discipline.

The following diagram shows an overview of all the elements of the compensation system for the Executive Board members:



Executive Board compensation for 2022

The performance-related and performance-independent compensation components of the compensation system of the Executive Board in the fiscal year 2022 are fully consistent with the Executive Board compensation system approved by the 2021 Annual General Meeting with a voting result of 87.08%. Compliance with the compensation system is ensured by the Personnel Committee. The compensation system for the Executive Board is published on our **website**. The Personnel Committee decides by resolution about the parameter of the compensation elements (e.g. setting of targets, determination of target achievement, etc.) as well as about the amounts to be paid out.

The following section reports on the compensation awarded or due in accordance with Section 162 (1) AktG. Accordingly, the following sections contain all amounts received by the individual members of the Executive Board (active and former members) in the fiscal year (compensation awarded) as well as all amounts legally due but not yet received (compensation due).

In addition, compensation is disclosed on a voluntary basis for which the members of the Executive Board have provided the underlying service completely by December 31, 2022, but for which payment will be made in the following year. This relates to the profit sharing for fiscal year 2022, as well as the 2020 LTI tranche, whose performance period ended on December 31, 2022. These amounts have been provisionally determined by the Personnel Committee by way of a resolution and subsequently communicated to the members of the Executive Board. The final amount will be paid to the members of the Executive Board after the preparation of the consolidated financial statements of E. Merck KG. This enables transparent information and ensures the link between performance and compensation in the fiscal year.

Performance-independent compensation

Base salary

As base salary, the members of the Executive Board receive contractually fixed performance-independent amounts that are paid in the form of 12 equal monthly installments.

Additional benefits

The additional benefits mainly include company cars with private use, contributions to insurance policies and expenses for personal protection.

In addition, as compensation for the loss of entitlements to variable compensation from his previous employment, Peter Guenter received upon the initial appointment in the fiscal year 2021 a commitment to compensation totaling € 1,500,000.00 as a sign-on payment. The entitlement has been verified in the context of his initial appointment on the basis of supporting documents, and the amount has been determined accordingly. The compensation is to be paid in cash in four equal installments. The first installment was paid on July 1, 2021, and the second installment on July 1, 2022. The further installments will be paid on July 1, 2023, and July 1, 2024, provided the employment relationship continues.

Pension entitlement

The members of the Executive Board are granted a pension obligation as a direct commitment.[1] A fixed amount is paid into a benefit account every year, and interest is paid at the applicable statutory maximum technical interest rate for the life insurance industry in accordance with Section 2 (1) of the Regulation on the Principles Underlying the Calculation of the Premium Reserve (DeckRV). Once a member retires, the amount in the

[1] For accounting purposes, this corresponds to a defined-benefits obligation within the meaning of IAS 19.8.

benefit account is paid out either in ten annual installments or as a one-time payment. In the fiscal year 2022 there was no increase of any pension contribution.

Pension obligations

		IAS 19			
		Service cost		Present value of the pension obligation as of December 31	
€ thousand	Contribution level	**2022**	2021	**2022**	2021
Belén Garijo[1]	650	638	572	7,057	6,308
Kai Beckmann	450	439	441	6,309	5,823
Peter Guenter	450	437	452	893	451
Matthias Heinzel	450	462	387	832	376
Marcus Kuhnert	400	401	406	4,717	4,290
Total	**2,400**	**2,377**	**2,258**	**19,808**	**17,248**

[1]On appointment as Chair of the Executive Board effective May 1, 2021, the annual pension contribution for Belén Garijo was increased to € 650 thousand.

Performance-related compensation

Performance-related compensation comprises profit sharing as well as the Long-Term Incentive Plan (LTIP). Both compensation elements are based on multi-year performance periods and are tied to the company's share price to a large extent.

Profit sharing

Regarding the profit sharing, an individual profit-sharing rate is defined for the members of the Executive Board as a per mille rate of the three-year average of the consolidated profit after tax of E. Merck KG, Darmstadt, Germany. The fiscal year 2022 and the two preceding fiscal years are included in the calculation.

The use of profit after tax as the key performance indicator, which also serves as the basis for dividend payments, ensures very close alignment with shareholder interests.

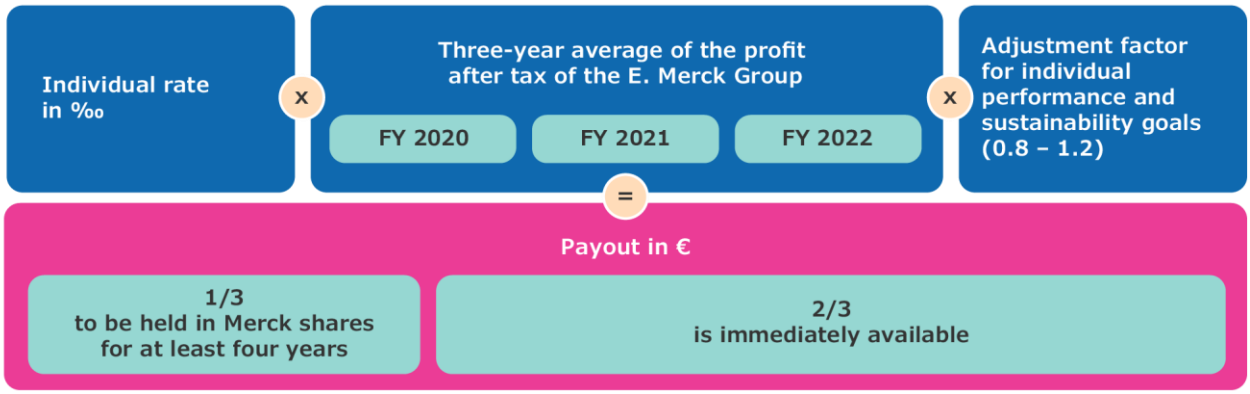
To appropriately consider the individual performance of the Executive Board members, the Personnel Committee may modify the payment by applying a factor ranging from 0.8 to 1.2. In determining the level of this factor, the Personnel Committee applies the following criteria that also include ambitious sustainability targets.

Bonus criteria for increasing profit sharing	Malus criteria for decreasing profit sharing
• Extraordinary contributions to the Sustainability goals and performance criteria "Human Progress", "Creating sustainable value chains " and "Reducing our ecological footprint" (e.g. CO_2 reduction, employee satisfaction, customer satisfaction, Corporate Social Responsibility, diversity)	• Significantly failing to meet the Sustainability goals and performance criteria "Human progress", "Creating sustainable value chains" and "Reducing our ecological footprint" (e.g. CO_2 reduction, employee satisfaction, customer satisfaction, Corporate Social Responsibility, diversity)
• Extraordinary success in connection with M&A activities of the Merck Group	• Violations of internal rules and regulations (for instance the Merck Code of Conduct), laws or other binding external requirements in the area of responsibility
• Extraordinary success in the sustainable strategic, technical, product-related or structural further development or reorganization of the Merck Group	• Significant breaches of duty of care within the meaning of Section 93 of the German Stock Corporation Act or other grossly non-compliant or unethical behavior
• Extraordinary performance in the execution of especially important projects or the achievement of other exceptionally important objectives in the area of responsibility	• Behaviors or actions that are contradictory to our company values
• Extraordinary performance leading to a clear overachievement of targets for relevant key performance indicators in the area of responsibility	• Failure to execute especially important projects or failing to achieve other exceptionally important objectives in the area of responsibility
	• Clear failure to achieve targets for relevant key performance indicators in the area of responsibility

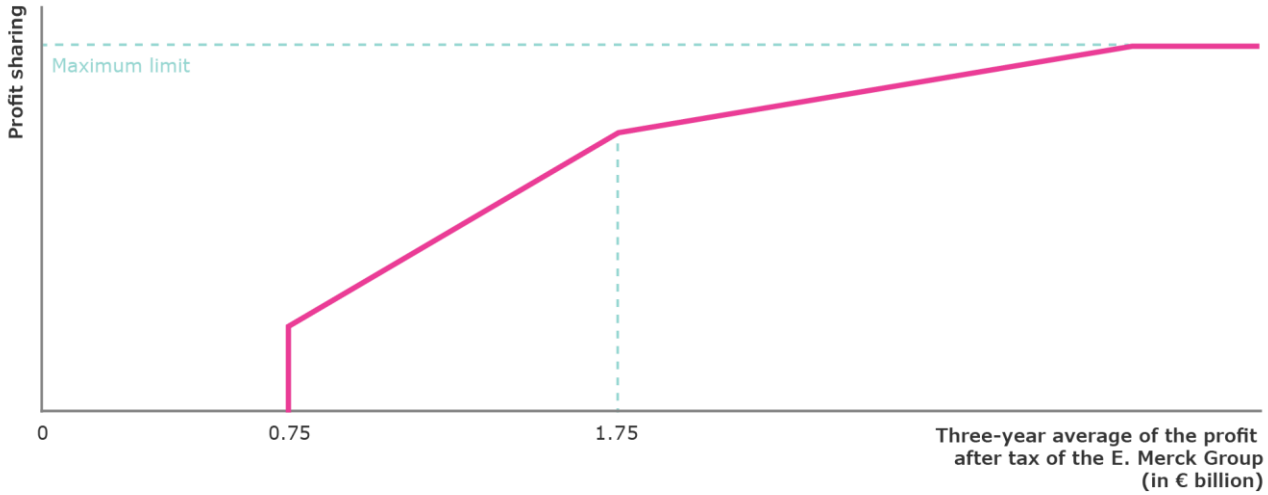
The performance factor makes it possible to recognize outstanding performance by a member of the Executive Board by multiplying profit sharing by a value greater than 1.0 up to 1.2. Similarly, multiplying by a value less than 1.0 down to 0.8 can reduce profit sharing if the circumstances call for it.

The members of the Executive Board are obligated to hold one-third of the yearly total net amount from profit sharing in shares of Merck KGaA, Darmstadt, Germany, for at least four years. Further details are provided under the heading "**Share Ownership Guideline**".

The following illustration shows the profit sharing for the 2022 fiscal year:



An average profit of at least € 0.75 billion must be generated for the profit-sharing payment to be made. This minimum threshold reflects the "pay-for-performance" approach of the compensation system. If the profit exceeds such threshold, the individual profit sharing rates are staggered. The maximum profit-sharing payment is capped individually. It amounts to € 4,810 thousand for Belén Garijo, € 3,500 thousand for Kai Beckmann, € 3,900 thousand for Peter Guenter, € 3,900 thousand for Matthias Heinzel and € 3,300 thousand for Marcus Kuhnert.



The three-year average that is relevant for the 2022 fiscal year was based on the profit after tax generated by E. Merck Group in 2020, 2021 and 2022:

Profit after tax of the E. Merck Group

€ million	2019	2020	2021	**2022**
Profit after tax of the E. Merck Group	1,255	1,915	3,003	3,288
Three-year average profit after tax of the E. Merck Group (2019-2021)		2,058		
Three-year average profit after tax of the E. Merck Group (2020-2022)			2,735	

The Personnel Committee has set the adjustment factor at 1.0 for all members of the Executive Board, taking into account individual performance as well as the contribution to the sustainability targets based on the agreed criteria. This recognizes the performance of the members of the Executive Board which resulted in the successful fiscal year 2022.

The Executive Board faced the many challenges resulting from the war in Ukraine, Covid-19, and geopolitical tensions. The Personnel Committee recognizes that through the efforts of the Executive Board members, fiscal year 2022 was successfully concluded both in financial terms and value creation. All three business sectors, Life Science, Healthcare and Electronics, contributed significantly to Merck's success in fiscal 2022. In addition to economic success, an equally strong focus was placed on sustainability. In this context, the decisions and actions of the Executive Board members were positively acknowledged.

Taking into account the relevant three-year average of the E. Merck Group's profit after tax, the individual sharing rates and the performance factor, the profit sharing for fiscal year 2022 is as follows:

Profit sharing 2022 summary

	Three-year average profit after tax of the E. Merck Group (€ million)	Average profit-sharing rate 2022 (in per mill)	Performance factor for individual performance	Payout amount (€ thousand)	thereof mandatory personal investment (1/3) (€ thousand)[1]
Belén Garijo		1.60	1.0	4,390	1,463
Kai Beckmann		1.17	1.0	3,193	1,064
Peter Guenter	2,735	1.30	1.0	3,552	1,184
Matthias Heinzel		1.30	1.0	3,552	1,184
Marcus Kuhnert		1.09	1.0	2,993	998

[1] Gross amount - investment is based on net amount.

The profit-sharing payout will be made in cash in April 2023. One-third of the net payout amount must be held in shares of Merck KGaA, Darmstadt, Germany, for at least four years. Further details of the investment obligation can be found in the "**Share Ownership Guideline**" section.

In the fiscal year 2022, the profit sharing for the fiscal year 2021 already explained in detail in the Compensation Report 2021 was paid out, which was thus reported as compensation awarded or due in the fiscal year 2022 in accordance with Section 162 of the German Stock Corporation Act (AktG). Further details can be found in the following table from the previous year:

Profit sharing 2021 summary

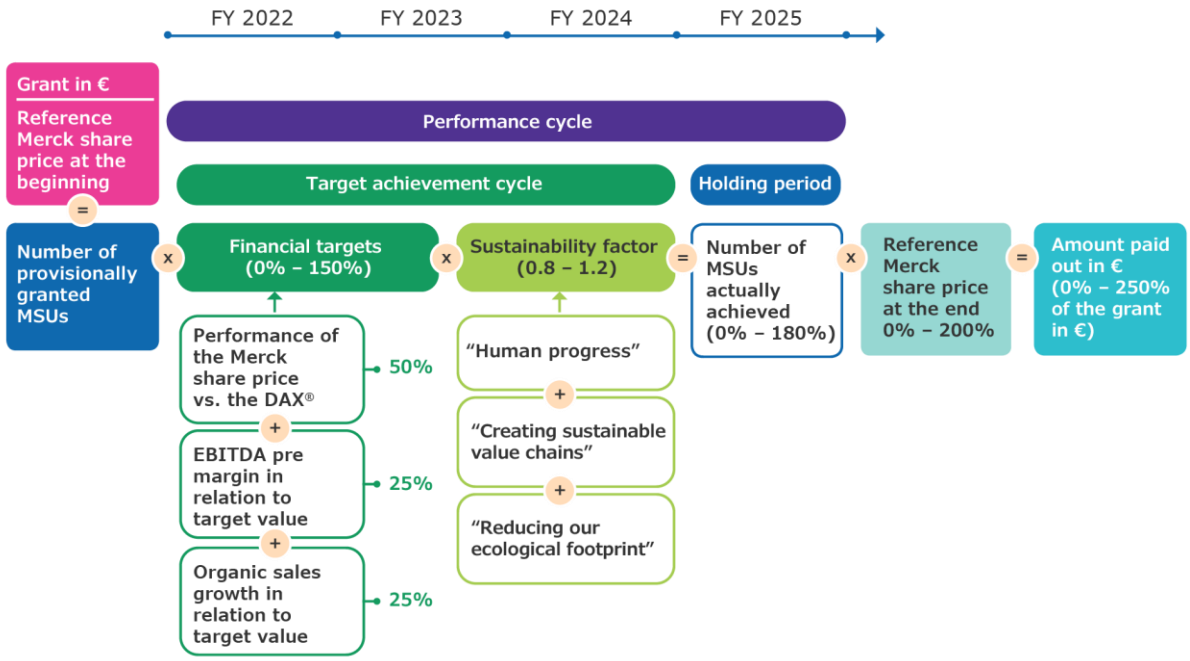
	Three-year average profit after tax of the E. Merck Group (€ million)	Average profit-sharing rate 2021 (in per mill)	Performance factor for individual performance	Payout amount (€ thousand)	thereof mandatory personal investment (1/3) (€ thousand)[1]
Belén Garijo (Chair since May 1, 2021)		1.78	1.0	3,671	1,224
Stefan Oschmann (until April 30, 2021)		0.63	1.0	1,287	429
Kai Beckmann		1.39	1.0	2,854	951
Peter Guenter (since January 1, 2021)	2,058	1.54	1.0	3,165	1,055
Matthias Heinzel (since April 1, 2021)		1.16	1.0	2,385	795
Marcus Kuhnert		1.29	1.0	2,654	885

[1] Gross amount - investment is based on net amount.

Long-Term Incentive Plan (LTIP)

Long-Term Incentive tranche for the fiscal year 2022

The Long-Term Incentive Plan is designed as a virtual performance share plan. It is based on a four-year future-oriented performance cycle that is composed of a three-year target achievement cycle and, since the 2021 tranche, a subsequent one-year holding period. As of fiscal year 2022, sustainability targets are taken into consideration by supplementing the LTIP by a sustainability factor in addition to three financial performance indicators. The sustainability factor has a range of 0.8 to 1.2 and can increase or reduce the target achievement resulting from the financial key performance indicators by up to 20%. The following graphic illustrates the calculation of the Merck Share Units (MSUs) as well as the functionality of the sustainability factor.



Calculation of the MSUs

The members of the Executive Board are provisionally granted a certain number of virtual shares, so-called share units of Merck KGaA, Darmstadt, Germany ("MSUs"). The number of MSUs is calculated as follows: An individual grant in Euros is set for each Executive Board member. Every year, this grant is divided by the definitive reference share price at the beginning of the performance cycle, resulting in the number of MSUs that the respective member is provisionally entitled to receive.

In fiscal year 2022, the allocation of the LTIP tranche 2022 was made on the basis of the following parameters:

LTIP Tranche 2022 allocation

	Grant amount (€ thousand)	Reference Merck share price at the beginning (in €)	Number of provisionally granted MSUs	Maximum payout (€ thousand)
Belén Garijo	2,300		10,841	5,750
Kai Beckmann	1,715		8,084	4,288
Peter Guenter	1,900	212.16	8,956	4,750
Matthias Heinzel	1,900		8,956	4,750
Marcus Kuhnert	1,400		6,599	3,500

The number of MSUs actually allocated to the Executive Board members after the end of the target achievement cycle depends on the development of the financial performance indicators and the sustainability factor during the three-year target achievement period.

Based on the three financial performance indicators, the number of MSUs allocated may be between 0% and 150% of the provisionally granted MSUs. The resulting number of MSUs will then be multiplied by the sustainability factor.

The sustainability factor target achievement can range between 0.8 and 1.2 and is determined by the predefined sustainability key indicators. Thus, the total number of MSUs actually allocated can amount to a maximum of 180% of the provisionally granted MSUs.

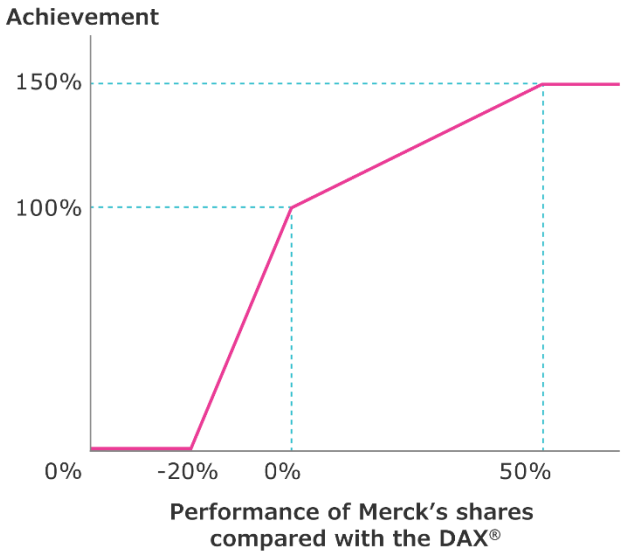
The target achievement period is followed by a one-year holding period. The final payout amount may be between 0% and a maximum of 250% of the amount originally granted and depends on the number of MSUs actually allocated and the reference share price at the end of the performance cycle.

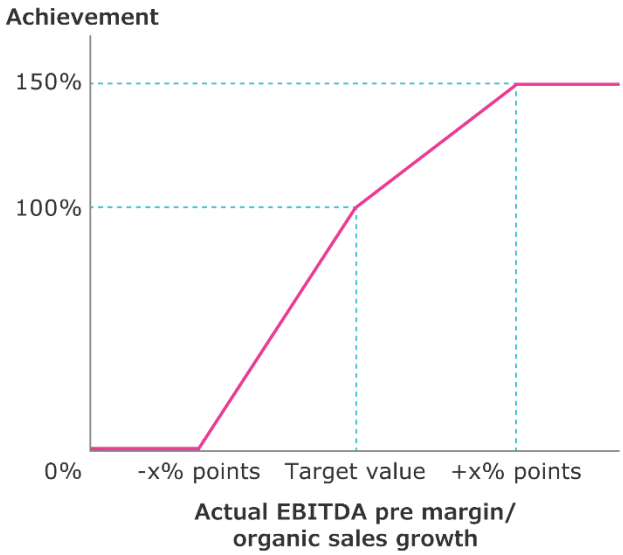
Financial key performance indicators

The relevant financial key performance indicators are:

- The performance of the Merck KGaA, Darmstadt, Germany share price compared with the performance of the DAX® with a weighting of 50%,
- The EBITDA pre margin as a proportion of a defined target value with a weighting of 25%, and
- The organic sales growth of the Merck Group as a proportion of a defined target value with a weighting of 25%.

The number of MSUs actually allocated after the end of the target achievement cycle is based on the following target achievement curves. The targets and thresholds for the key performance indicators of EBITDA pre margin and organic sales growth are defined by the Personnel Committee at the start of the performance period and subsequently published in the compensation report.





Non-financial key indicators of the sustainability factor

As a result of implementing the sustainability factor starting from fiscal year 2022, our sustainability strategy will be even more firmly incorporated into the compensation system for the members of the Executive Board. On the basis of the sustainability goals (“Human Progress” “Creating sustainable value chains” and “Reducing our ecological footprint”), the Personnel Committee defines corresponding concrete and measurable sustainability key indicators as well as associated target and threshold values at the beginning of each tranche of the LTIP. These values are used to calculate target achievement at the end of the relevant target achievement cycle. The following criteria were defined for the selection of the sustainability key indicators:

- Relevance and influence of the sustainability key indicators on the three overarching sustainability goals of the sustainability strategy
- Internal and external influence of the sustainability key indicators by management
- Good measurability and operationalization
- Sustained impact to support long-term solutions and not incentivize short-term actions

In addition, the Personnel Committee determines the weighting of the individual sustainability goal for each tranche of the LTIP in order to emphasize priorities.

The Personnel Committee has defined the following sustainability key indicators and weightings for the 2022 tranche of the LTIP:

Sustainability Goal	Weighting	Sustainability Key Indicator
Dedicated to Human Progress	20%	People treated with our Healthcare products
Creating sustainable value chains	40%	Percentage of relevant suppliers (in terms of number and supplier spend) that are covered by a valid sustainability assessment
Reducing our ecological footprint	40%	Greenhouse gas emissions Scope 1+2

The following table shows the target corridor ex ante for the respective sustainability key indicators of the three overarching goals for the 2022 LTI tranche.

Sustainability Goal/Key Indicator	Minimum	Target	Maximum
Human Progress			
Number of people treated with Merck HC products (in million)	165.5	189.0	200.5
Number of people treated as part of the schistosomiasis program (in million)			
Creating sustainable value chains			
Relevant suppliers with a valid sustainability assessment (% of all relevant suppliers)	60%	70%	80%
Relevant suppliers with a valid sustainability assessment (% of supplier spend)	80%	90%	100%
Reducing our ecological footprint			
Greenhouse gas emissions in Scope 1+2 worldwide (in kt)	1,200.0	1,000.0	800.0

- "Dedicated to Human Progress"

  We are convinced that, with the help of science and technology, we can make a contribution to solving many global challenges. In our Healthcare business sector, we measure the number of people worldwide who can be treated with our company's medical products. This includes measuring the number of people who can be treated with Healthcare products in general and particularly with praziquantel against schistosomiasis as part of Merck's donation program. We plan to continuously increase this number and thus contribute to a significant improvement in medical care and the health status of as many people as possible. It is planned to also include a sustainability key indicator for the Life Science business sector for the LTIP 2023. This is intended to cover patients treated with medical products that are enabled by key Merck Life Science technologies.

- "Creating sustainable value chains"

  We measure our progress in embedding sustainability in our supply chains. We achieve this by increasing the transparency of our supply chains and subjecting more suppliers to a sustainability assessment. We are focusing particularly on suppliers where we see a sustainability risks in the supply chain and those suppliers who cover a relevant share of our supplier spend. In connection with this sustainability assessment, it is important for us to increase the number of suppliers audited.

- "Reducing our ecological footprint"

  On our path to climate neutrality, we have already joined the Science Based Targets Initiative and aim to reduce both direct (Scope 1) and indirect emissions (Scope 2) by 50% by 2030 compared to 2020. This target is to be achieved through the reduction of process-related emissions, energy efficiency measures, and the increased purchase of electricity from renewable sources. Particularly in the case of process emissions (Scope 1), we aim to significantly reduce emissions through the use of new technologies.

LTI tranches allocated prior to fiscal year 2021

The tranche allocated in fiscal year 2021 is already designed with the one-year holding period but still without the sustainability factor introduced with the 2022 LTIP tranche. Accordingly, the performance period is four years and comprises the target achievement period of three years and the holding period of one year. Consequently, the performance period of the LTI 2021 runs from January 1, 2021 to December 31, 2024, with payment in April 2025.

The 2019 and 2020 tranches were structured according to the former model without a one-year holding period and without a sustainability factor. Accordingly, the performance period of the 2019 and 2020 tranches is still three years without a subsequent one-year holding period. This means that the 2019 LTIP was paid out in April of fiscal year 2022, with the performance period running from January 1, 2019, to December 31, 2021. The performance period of the 2020 LTIP ended in fiscal year 2022, with the performance period running from January 1, 2020 to December 31, 2022. It will be paid out in April 2023.

The targets and thresholds, the actual amounts, and the resulting target achievement for the 2019 and 2020 tranches can be summarized as follows:

LTIP 2019 target achievement

	Lower target corridor limit	Target	Upper target corridor limit	Actual achieved value	Target achievement[1]
Share price performance relative to the DAX® (weighting: 50%)	-20.0%	0.0%	50.0%	87.6%	150.0%
EBITDA pre margin (weighting: 25%)	24.5%	27.5%	30.5%	29.2%	128.4%
Organic sales growth (weighting: 25%)	4.3%	7.3%	10.3%	8.0%	111.7%
Total target achievement					**135.0%**

[1] Cap of relative share price development was reached.

LTIP 2020 target achievement

	Lower target corridor limit	Target	Upper target corridor limit	Actual achieved value	Target achievement[1]
Share price performance relative to the DAX® (weighting: 50%)	-20.0%	0.0%	50.0%	58.6%	150.0%
EBITDA pre margin (weighting: 25%)	25.6%	28.6%	31.6%	30.5%	131.7%
Organic sales growth (weighting: 25%)	5.1%	8.1%	11.1%	8.7%	110.0%
Total target achievement					**135.4%**

[1] Cap of relative share price development was reached.

The resulting payouts are as follows:

LTIP 2019 summary

	Grant amount (€ thousand)	Reference Merck share price at the beginning (in €)	Number of provisionally granted MSUs	Total target achievement	Final number of MSUs	Reference Merck share price at the end (in €)	Payout amount (€ thousand)[1]
Stefan Oschmann (until April 30, 2021)	2,255	93.75	24,054	135.0%	32,479	212.16	4,377
Udit Batra (until July 13, 2020)	1,705		18,187		24,557		2,131
Kai Beckmann	1,530		16,320		22,036		3,825
Belén Garijo	1,870		19,947		26,933		4,629
Marcus Kuhnert	1,320		14,080		19,012		3,300

[1] Payout capped at 250% of the grant value. A pro-rata payout has been made for Stefan Oschmann and Udit Batra. The payout for Belén Garijo was reduced to ensure compliance with the cap on direct compensation.

LTIP 2020 summary

	Grant amount (€ thousand)	Reference Merck share price at the beginning (in €)	Number of provisionally granted MSUs	Total target achievement	Final number of MSUs	Reference Merck share price at the end (in €)	Payout amount (€ thousand)[1]
Stefan Oschmann (until April 30, 2021)	2,255	105.53	21,371	135.4%	28,942	173.46	2,226
Udit Batra (until July 13, 2020)	1,705		16,159		21,883		633
Kai Beckmann	1,530		14,500		19,637		3,406
Belén Garijo	1,970		18,670		25,284		3,910
Marcus Kuhnert	1,320		12,510		16,942		2,939

[1] Payout for Stefan Oschmann and Udit Batra is based on a pro-rate basis. The payout for Belén Garijo will be reduced to ensure compliance with the cap on direct compensation.

Share Ownership Guideline

Since 2017, the members of the Executive Board are obliged to invest in and hold shares of Merck KGaA, Darmstadt, Germany, as part of the Share Ownership Guideline (SOG) valid until fiscal 2021. Since the introduction of the new compensation system at the beginning of fiscal 2021, the share ownership obligation has been linked to the variable compensation element of profit sharing. Under the revised SOG, members of the Executive Board are required to hold one-third of the net profit-sharing payout in shares for at least four years. The shareholding obligation thus builds up gradually over the first four fiscal years after the introduction of the new compensation system. A corresponding investment was made for the first time after payment of the 2021 profit sharing in the fiscal year 2022 as part of an automated purchase via an external provider.

The following table illustrates the investment volume of the members of the Executive Board in accordance with the revised SOG. The numbers are the gross investment amounts from the corresponding profit sharing payout. No conclusions can be drawn as to the actual individual shareholdings.

Share Ownership Guideline

	Mandatory personal investment based on SOG (in € thousand)[1]					
	From profit sharing 2021	From profit sharing 2022[2]	From profit sharing 2023	From profit sharing 2024	Total	In % of Base Salary
Belén Garijo (Chair since May 1, 2021)	1,224	1,463	Investment is made after payout of profit sharing for fiscal year 2023 and 2024		2,687	179%
Kai Beckmann	951	1,064			2,015	168%
Peter Guenter (since January 1, 2021)	1,055	1,184			2,239	187%
Matthias Heinzel (since April 1, 2021)	795	1,184			1,979	165%
Marcus Kuhnert	885	998			1,883	157%

[1] Gross amounts of mandatory investment from profit sharing. Investment is made on net amounts.

[2] Investment is made after payout of the profit sharing for the fiscal year 2022 in 2023.

The Share Ownership Guideline promotes an even stronger alignment of the interests of the members of the Executive Board with the sustainable interests of our shareholders and additionally increases the corporate responsibility of the members of the Executive Board in addition to their status as general partners.

Malus and clawback provisions

Through their status as personally liable general partners of Merck KGaA, Darmstadt, Germany, and E. Merck KG, Darmstadt, Germany the Executive Board members bear a unique entrepreneurial responsibility. This is also reflected by the penalty criteria set forth in profit sharing and by the German statutory regulations on liability for damages stipulated in section 93 AktG. In order to take even greater account of the prominent position of entrepreneurial responsibility in compensation, a clawback provision is implemented for the LTIP. Cases in which the clawback provision may be applied include violations of internal rules and regulations (Code of Conduct), legislation, other binding external requirements in responsibility, significant breaches of duty of care within the meaning of section 93 AktG, and other grossly non-compliant or unethical behavior or actions that are contradictory to our company values. In these cases, amounts that have already been allocated under the Long-Term Incentive Plan may be retained. The Personnel Committee is entitled to demand the repayment of profit sharing and LTIP payouts from a member of the Executive Board if it subsequently transpires that the payout was made wrongfully, either in full or in part. For example, this is the case when targets are not actually met or are not met to the extent assumed when the payout was calculated due to incorrect information being applied. The extent of these claims for restitution is based on section 818 of the German Civil Code (BGB). The Personnel Committee may agree deadlines for the assertion of claims for restitution with the members of the Executive Board.

Neither the malus provision nor the clawback provision were exercised in the fiscal year 2022.

Compensation-related transactions

Contracts with the members of the Executive Board are usually concluded for a period of five years. When an employment contract begins or ends during the year, the fixed compensation, profit sharing and individual LTIP tranches are paid on a pro rata basis. In fiscal year 2022 no adjustments or changes have been made to the contracts of the members of the Executive Board.

Should members of the Executive Board be held liable for financial losses while executing their duties, this liability risk is covered by a D&O insurance policy under certain circumstances. The D&O insurance policy has a deductible in accordance with the legal requirements.

Post-contractual non-competition clause

Post contractual non-competition clauses have been agreed with all Executive Board members except for Marcus Kuhnert. With him it has been agreed to conclude an agreement about a post-contractual non-competition clause if required. The post-contractual non-competition clause involves the payment of compensation amounting to 50% of the member's average compensation within the last twelve months and is paid for a period of two years. Other earnings, pension payments and any severance payments are offset against this amount.

A post-contractual non-competition clause was agreed with Stefan Oschmann. As compensation there is a monthly payment of € 343,184 in the period from May 1, 2021, to April 30, 2023. His monthly pension of € 46,667 was taken into account in determining the amount of this compensation. During the period of the non-competition clause, further income of other work is offset against this amount.

Obligations in connection with the cessation of Executive Board membership

The contracts of the Executive Board members do not provide for ordinary termination. The right to extraordinary termination for good cause in accordance with section 626 BGB is available to both parties without observing a notice period.

The contracts of the Executive Board members may provide for the continued payment of fixed compensation to surviving dependents for a limited period in the event of death. Above and beyond existing pension obligations, no further obligations are provided for in the event of the termination of the contractual relationships of the Executive Board members.

There is a cap on the amounts payable to Executive Board members in the event of the early termination of the contract without good cause justifying such termination. Pursuant to this, payments in connection with the termination of an Executive Board member's duties shall not exceed twice the annual total compensation or constitute compensation for more than the remaining term of the employment contract (severance cap). If an Executive Board member's duties cease due to the termination of the employment contract either by the company or the Executive Board member before the four-year performance cycle of an open tranche in the Long-Term Incentive Plan expires, the obligations resulting from the plan continue to apply if there are specific grounds for the termination, e.g., if the employment contract is not renewed after it expires or if the Board of Partners determines this to be appropriate at its own discretion; otherwise, the obligations no longer apply. Should obligations resulting from the plan continue to apply any early payout is excluded. If the compensation in the fiscal year in which the Executive Board member's duties cease is expected to be significantly higher or lower than in the previous fiscal year, the Board of Partners may decide to adjust the amount applied as the member's total compensation at its own discretion.

Loans, advances, payments by affiliates of Merck Group

None of the members of the Executive Board received any loans or advances, nor any payments by affiliates of the group in fiscal year 2022.

Payments to former Executive Board members and their surviving dependents

Payments to former members of the Executive Board and their surviving dependents are made as pension payments, as temporary continuation of basic compensation in the event of death, as part of the profit-sharing and the LTIP, and as compensation for a post-contractual non-competition clause. They amounted to € 21.7 million in the fiscal year 2022 (previous year: € 30.7 million). Provisions for defined benefit pension commitments in accordance with IAS 19 amounted to € 123.1 million as of December 31, 2022 (December 31, 2021: € 155.1 million).

Individual disclosure of the compensation of the Executive Board

Compensation awarded or due to current members of the Executive Board in the fiscal year 2022

In accordance with the revised section 162 (1) of the German Stock Corporation Act (AktG), the compensation awarded or due to each member of the Executive Board in fiscal year 2022 and the respective relative share of total compensation are presented transparently in the tables below. This includes all compensation elements which were paid out or became legally due in fiscal year 2022.

To ensure a transparent presentation of the relation between business performance and the resulting compensation, compensation for fiscal year 2022 is also disclosed on a voluntary basis, with the variable compensation components being allocated to the year in which the final performance was rendered, irrespective of the actual date of payment or the legal due date.

In order to provide a complete picture of the total compensation of the Executive Board members, pension expense is also reported on a voluntary basis.

The compensation of the current members of the Executive Board is shown in the following tables.

In fiscal year 2022 pursuant to Section 162 AktG	**For fiscal year 2022 as voluntary disclosure**
Base salary	
Additional benefits	
Profit sharing for fiscal year 2021, payout in fiscal year 2022: - Payout in cash - Investment (in shares; 4-year holding period according to Share Ownership Guideline)	Profit sharing for fiscal year 2022, payout in fiscal year 2023: - Payout in cash - Investment (in shares; 4-year holding period according to Share Ownership Guideline)
LTIP tranche 2019 (Jan 1, 2019-Dec 31, 2021), payout was in fiscal year 2022	LTIP tranche 2020 (Jan 1, 2020-Dec. 31, Dec 2022), payout will be in fiscal year 2023[1]
Other compensation	
Service cost as voluntary disclosure	

[1] Subject to verification of compliance with the maximum compensation

The figures presented in the table have been rounded in accordance with standard commercial practice. This may lead to the consequence that individual values cannot be added to the totals.

Compensation awarded or due

	Belén Garijo Chair of the Executive Board (since May 1, 2021; previously member of the Executive Board)				
	In the fiscal year (pursuant to Section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2022		2021	**2022**	2021
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,500	15%	1,433	1,500	1,433
Additional benefits	91	1%	169	91	169
Profit sharing					
Profit sharing 2020	–		3,299	–	–
Profit sharing 2021					
Payout in cash	2,447	25%	–	–	2,447
Investment (in shares; 4-year holding period)	1,224	12%	–	–	1,224
Profit sharing 2022					
Payout in cash	–	–	–	2,927	–
Investment (in shares; 4-year holding period)	–	–	–	1,463	–
LTIP[1]					
LTI 2018 (2018 to 2020)	–		3,196	–	–
LTI 2019 (2019 to 2021)	4,629	47%	–	–	4,629
LTI 2020 (2020 to 2022)	–		–	3,910	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**9,891**	**100%**	**8,097**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**9,891**	**9,902**
Service cost	638	–	572	638	572
Total compensation incl. service cost	**10,529**	**–**	**8,669**	**10,529**	**10,474**

[1] Reduction of LTI 2019 and LTI 2020 payout due to maximum amount of direct compensation.

	Kai Beckmann Member of the Executive Board				
	In the fiscal year (pursuant to Section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2022		2021	**2022**	2021
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	15%	1,200	1,200	1,200
Additional benefits	16	0%	30	16	30
Profit sharing					
Profit sharing 2020	–	–	2,640	–	–
Profit sharing 2021					
Payout in cash	1,903	24%	–	–	1,903
Investment (in shares; 4-year holding period)	951	12%	–	–	951
Profit sharing 2022					
Payout in cash	–	–	–	2,128	–
Investment (in shares; 4-year holding period)	–	–	–	1,064	–
Merck LTIP					
LTI 2018 (2018 to 2020)	–		2,444	–	–
LTI 2019 (2019 to 2021)	3,825	48%	–	–	3,825
LTI 2020 (2020 to 2022)	–		–	3,406	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**7,895**	**100%**	**6,314**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**7,815**	**7,909**
Service cost	439	–	441	439	441
Total compensation	**8,334**	**–**	**6,755**	**8,254**	**8,350**

	Peter Guenter Member of the Executive Board (since January 1, 2021)				
	In the fiscal year (pursuant to Section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2022		2021	**2022**	2021
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	25%	1,200	1,200	1,200
Additional benefits[1]	21	0%	95	21	95
Profit sharing					
Profit sharing 2020	–	–	–	–	–
Profit sharing 2021					
Payout in cash	2,110	44%	–	–	2,110
Investment (in shares; 4-year holding period)	1,055	22%	–	–	1,055
Profit sharing 2022					
Payout in cash	–	–	–	2,368	–
Investment (in shares; 4-year holding period)	–	–	–	1,184	–
Merck LTIP					
LTI 2018 (2018 to 2020)	–		–	–	–
LTI 2019 (2019 to 2021)	–	–	–	–	–
LTI 2020 (2020 to 2022)	–		–	–	–
Others	375	8%	375	375	375
Compensation awarded or due pursuant to § 162 AktG	**4,761**	**100%**	**1,670**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**5,148**	**4,835**
Service cost	437	–	452	437	452
Total compensation	**5,198**	**–**	**2,122**	**5,585**	**5,287**

[1] In fiscal year 2021, Peter Guenter received the amount of € 62,168 connected to his relocation to Germany.

	Matthias Heinzel Member of the Executive Board (since April 1, 2021)				
	In the fiscal year (pursuant to Section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2022		2021	**2022**	2021
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	33%	900	1,200	900
Additional benefits	12	0%	25	12	25
Profit sharing					
Profit sharing 2020	–	–	–	–	–
Profit sharing 2021					
Payout in cash	1,590	44%	–	–	1,590
Investment (in shares; 4-year holding period)	795	22%	–	–	795
Profit sharing 2022					
Payout in cash	–	–	–	2,368	–
Investment (in shares; 4-year holding period)	–	–	–	1,184	–
Merck LTIP					
LTI 2018 (2018 to 2020)	–		–	–	–
LTI 2019 (2019 to 2021)	–	–	–	–	–
LTI 2020 (2020 to 2022)	–		–	–	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**3,597**	**100%**	**925**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**4,764**	**3,310**
Service cost	462	–	387	462	387
Total compensation	**4,059**	**–**	**1,312**	**5,226**	**3,697**

	Marcus Kuhnert Member of the Executive Board				
	In the fiscal year (pursuant to Section 162 AktG)			For the fiscal year (voluntary disclosure)	
	2022		2021	**2022**	2021
	€ thousand	in %	€ thousand	€ thousand	€ thousand
Base salary	1,200	17%	1,200	1,200	1,200
Additional benefits	26	0%	42	26	42
Profit sharing					
Profit sharing 2020	–	–	2,640	–	–
Profit sharing 2021					
Payout in cash	1,769	25%	–	–	1,769
Investment (in shares; 4-year holding period)	885	12%	–	–	885
Profit sharing 2022					
Payout in cash	–	–	–	1,995	–
Investment (in shares; 4-year holding period)	–	–	–	998	–
Merck LTIP					
LTI 2018 (2018 to 2020)	–		2,256	–	–
LTI 2019 (2019 to 2021)	3,300	46%	–	–	3,300
LTI 2020 (2020 to 2022)	–		–	2,939	–
Others	–	–	–	–	–
Compensation awarded or due pursuant to § 162 AktG	**7,180**	**100%**	**6,138**	**–**	**–**
Compensation for the fiscal year	**–**	**–**	**–**	**7,157**	**7,196**
Service cost	401	–	406	401	406
Total compensation	**7,581**	**–**	**6,544**	**7,558**	**7,602**

Compensation awarded or due to former members of the Executive Board in the fiscal year

The compensation awarded or due to former members of the Executive Board during the fiscal year is also presented below. Tranches of the LTIP already allocated before a member of the Executive Board left the company continue to run until the end of the originally contractually agreed term and are settled and paid out after the end of the performance period. In addition, some members who have already left the Executive Board receive fixed payments from pension plans.

The following tables show the compensation awarded or due to former members of the Executive Board in fiscal year 2022 in accordance with section 162 (1) of the German Stock Corporation Act (AktG) and the respective relative share of total compensation. For former members of the Executive Board who left the Executive Board in the last ten years, the information is given by name. In accordance with the provisions of Section 162 (5) of the German Stock Corporation Act (AktG), no personal information is provided on former members of the Executive Board who left the Executive Board more than ten years ago, i.e. before December 31, 2012.

Compensation awarded or due

	Stefan Oschmann Chair of the Executive Board (until April 30, 2021)		
	2022		2021
	€ thousand	in %	€ thousand
Base salary	–	–	500
Additional benefits	–	–	13
Profit sharing			
Profit sharing 2020	–	–	4,069
Profit sharing 2021			
Payout in cash	858	8%	–
Investment (in shares; 4-year holding period)	429	4%	–
LTIP			
LTI 2018 (2018 bis 2020)	–	43%	3,854
LTI 2019 (2019 bis 2021)	4,377		–
Others	3,953	39%	2,745
Pensions	572	6%	373
Compensation awarded or due pursuant to § 162 AKtG	**10,189**	**100%**	**11,554**

	Udit Batra Member of the Executive Board (until July 13, 2020)		
	2022		2021
	€ thousand	in %	€ thousand
Base salary	–	–	–
Additional benefits	–	–	–
Profit sharing	–		–
Profit sharing 2020	–	–	1,364
Profit sharing 2021	–		–
Payout in cash	–	–	–
Investment (in shares; 4-year holding period)	–	–	–
Merck LTIP	–		–
LTI 2018 (2018 to 2020)	–	100%	2,428
LTI 2019 (2019 to 2021)	2,131		–
Others	–	–	–
Pension	–	–	–
Compensation awarded or due pursuant to § 162 AKtG	**2,131**	**100%**	**3,792**

	Walter Galinat Member of the Executive Board (until September 30, 2018)		
	2022		2021
	€ thousand	in %	€ thousand
Merck LTIP			
LTI 2018 (2018 to 2020)	–	52%	998
LTI 2019 (2019 to 2021)	361		–
Others	–	–	–
Pension	334	48%	313
Compensation awarded or due pursuant to § 162 AKtG	**695**	**100%**	**1,311**

Former members of the Executive Board who only received pension payments in the 2022 fiscal year are shown in the following table. The compensation granted and owed in the 2022 fiscal year in accordance with section 162 (1) AktG consists entirely of non-performance-related compensation elements.

Pension payments

€ thousand	**2022**	2021
Karl-Ludwig Kley	695	630
Bernd Reckmann	443	459

Compliance with the defined maximum compensation

The maximum compensation limits the compensation awarded or due in the fiscal year, i.e., the total of all non-performance-related and performance-related compensation elements awarded or due in a fiscal year. Pension payments are not included in the maximum compensation.

The maximum compensation for the fiscal year is € 11,500,000 for the Chair of the Executive Board and € 9,500,000 each for ordinary members of the Executive Board. The sum of the compensation awarded or due in accordance with Section 162 of the German Stock Corporation Act (AktG) less any pension payments and plus pension expenses is below the defined maximum compensation in accordance with section 87a of the German Stock Corporation Act (AktG) for all members of the Executive Board.

In addition to the maximum compensation, there is a separate payment cap for each of the performance-related compensation elements. A maximum amount has been set for the amount of profit sharing for all members of the Executive Board (please find more details in the paragraph “profit sharing”). The payout from the Long-Term Incentive Plan cannot exceed 2.5 times the individual award value, even in the case of exceptional performance.

In addition, there is a contractually agreed maximum limit on the direct compensation, i.e. the sum of base salary, profit-sharing, and LTI. In this context, it is stipulated that capping, if necessary, shall be applied first to the LTI and then to profit sharing. To ensure compliance with this cap, the 2019 LTIP payment for Belén Garijo was reduced by € 46 thousands accordingly.

Compliance with the defined maximum compensation is ensured by the Personnel Committee setting the amounts of the variable compensation components by resolution. The defined maximum compensation and the maximum limit for the direct compensation of the members of the Executive Board are shown in the following table.

Overall compensation limit

€ thousand	Maximum limit for Direct Compensation	Maximum compensation pursuant to Section 87a AktG
Belén Garijo	9,800	11,500
Kai Beckmann	8,000	9,500
Peter Guenter	8,000	9,500
Matthias Heinzel	8,000	9,500
Marcus Kuhnert	8,000	9,500

Compensation for the Supervisory Board members in fiscal year 2022

The compensation of the Supervisory Board members is defined by article 20 of the Articles of Association of Merck KGaA, Darmstadt, Germany, and corresponds to the compensation system for the Supervisory Board that was adopted by the 2022 Annual General Meeting with 99.64% of the votes cast.

Accordingly, the members of the Supervisory Board receive fixed compensation of € 47,000 per year. The Chairman receives double, and the Vice Chairman receives one and a half times this amount. In addition to their fixed compensation, Supervisory Board members who are also members of the Audit Committee, which has been established in the meeting of the Supervisory Board on February 26, 2021, receive annual compensation of € 15,000. The Chair of the Audit Committee receives an additional annual compensation of € 30,000. Moreover, the members receive an additional compensation of € 750 per meeting they attend.

The compensation awarded or due and the respective relative share of the total compensation for the current members of the Supervisory Board is presented in the following table. During the fiscal year, Edeltraud Glänzer resigned from the Supervisory Board effective May 15, 2022, and Birgit Biermann joined the Supervisory Board effective July 14, 2022. There were no payments to former members of the Supervisory Board in the fiscal year.

Compensation awarded or due

	2022							2021						
	Fixed compensation		**Compensation for committee duties**		**Meeting fees**		**Total compensation**	Fixed compensation		Compensation for committee duties		Meeting fees		Total compensation
	€ thousand	in %	€ thousand	in %	€ thousand	in %	€ thousand	€ thousand	in %	€ thousand	in %	€ thousand	in %	€ thousand
Wolfgang Büchele	94.0	84%	15.0	13%	3.0	3%	112.0	94.0	86%	12.7	12%	3.0	3%	109.7
Sascha Held	70.5	80%	15.0	17%	3.0	3%	88.5	70.5	82%	12.7	15%	3.0	4%	86.2
Gabriele Eismann	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Edeltraud Glänzer (until May 15, 2022)	17.4	71%	5.5	23%	1.5	6%	24.4	47.0	75%	12.7	20%	3.0	5%	62.7
Birgit Biermann (since July 14, 2022)	22.0	94%	–	–	1.5	6%	23.5	–	–	–	–	–	–	–
Jürgen Glaser	47.0	79%	9.5	16%	3.0	5%	59.5	47.0	95%	–	–	2.3	5%	49.3
Michael Kleinemeier	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Renate Koehler	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Anne Lange	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Peter Emanuel Merck	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Dietmar Oeter	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Alexander Putz	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Christian Raabe	47.0	72%	15.0	23%	3.0	5%	65.0	47.0	75%	12.7	20%	3.0	5%	62.7
Helene von Roeder	47.0	59%	30.0	38%	3.0	4%	80.0	47.0	62%	25.4	34%	3.0	4%	75.4
Helga Rübsamen-Schaeff	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0
Daniel Thelen	47.0	72%	15.0	23%	3.0	5%	65.0	47.0	75%	12.7	20%	3.0	5%	62.7
Simon Thelen	47.0	94%	–	–	3.0	6%	50.0	47.0	94%	–	–	3.0	6%	50.0

Supervisory Board member Wolfgang Büchele received an additional € 140,000 (2021: € 140,000) for 2022 in this function as a member of the corporate bodies of E. Merck KG.

Supervisory Board member Helga Rübsamen-Schaeff received an additional € 150,000 (2021: € 150,000) for 2022 in this function as a member of the corporate bodies of E. Merck KG and an additional € 6,000 (2021: € 6,000) for 2022 as a member of the Supervisory Board of Merck Healthcare KGaA.

Supervisory Board member Michael Kleinemeier received an additional € 140,000 (2021: € 140,000) as a member of committees of E. Merck KG for 2022 in this function.

Supervisory Board member Helene von Roeder received an additional € 150,000 (2021: € 150,000) for 2022 in this function as a member of the corporate bodies of E. Merck KG.

Supervisory Board member Peter Emanuel Merck received an additional € 80,000 (2021: € 80,000) for 2022 in this function as a member of the corporate bodies of E. Merck KG.

Supervisory Board member Daniel Thelen received an additional € 140,000 for 2022 in this function as a member of the corporate bodies of E. Merck KG (2021: € 140,000).

Supervisory Board member Simon Thelen received an additional € 140,000 (2021: € 140,000) for 2022 in this function as a member of the corporate bodies of E. Merck KG and an additional € 3,000 (2021: € 3,000) for 2022 as a member of the Supervisory Board of Merck Healthcare KGaA.

Comparative presentation of compensation and earnings development

The comparative presentation in accordance with Section 162 (1) no. 2 of the AktG shows the annual change in the compensation of the members of the Executive Board and the members of the Supervisory Board, the development of earnings of the Merck Group as well as the development of the average compensation of a full-time employee of Merck KGaA over the last five years.

For employee compensation, the average personnel expenses excluding company pension costs are used. This reflects the total compensation of employees worldwide.

For members of the Executive Board, the compensation awarded or due in fiscal years 2020, 2021 and 2022 is used in accordance with Section 162 of the German Stock Corporation Act (AktG). For the years 2019 and 2018, the allocated compensation is used excluding the service costs according to the German Corporate Governance Code (DCGK) sample table in the compensation report of the respective fiscal year.

Comparative presentation

in € thousand/change in %	**2022**	2021	**Change 2022/2021**	Change 2021/2020	Change 2020/2019	Change 2019/2018
Member of the Executive Board						
Belén Garijo (Chair since May 1, 2021)	9,891	8,097	22.20%	43.30%	-6.90%	7.20%
Kai Beckmann	7,895	6,314	25.00%	37.90%	-11.00%	26.20%
Peter Guenter (since January 1, 2021)	4,761	1,670	185.10%	–	–	–
Matthias Heinzel (since April 1, 2021)	3,597	925	288.90%	–	–	–
Marcus Kuhnert	7,180	6,138	17.00%	43.20%	-9.70%	27.40%
Former Member of the Executive Board						
Stefan Oschmann (until April 30, 2021)	10,189	11,554	-11.80%	41.80%	-11.30%	58.90%
Udit Batra (until July 13, 2020)	2,131	3,792	-43.80%	-19.40%	-16.30%	34.90%
Walter Galinat (until September 30, 2018)	695	1,311	-47.00%	22.30%	-10.10%	-59.30%
Karl-Ludwig Kley (until August 31, 2016)	695	630	10.30%	–	67.10%	-25.50%
Bernd Reckmann (until April 29, 2016)	443	459	-3.50%	6.70%	-43.00%	184.50%
Further former members	6,999	20,572	-66.00%	85.00%	0.50%	-0.30%
Member of the Supervisory Board						
Wolfgang Büchele	112.0	109.7	2.10%	13.10%	–	–
Sascha Held	88.5	86.2	2.70%	17.30%	110.00%	–
Gabriele Eismann	50.0	50.0	–	–	-1.60%	1.60%
Edeltraud Glänzer (until May 15, 2022)	24.4	62.7	-61.10%	25.40%	–	–
Birgit Biermann (since July 14, 2022)	23.5	–	–	–	–	–
Jürgen Glaser	59.5	49.3	20.70%	-1.40%	42.00%	–
Michael Kleinemeier	50.0	50.0	–	–	45.30%	–
Renate Koehler	50.0	50.0	–	–	42.00%	–
Anne Lange	50.0	50.0	–	–	45.30%	–
Peter Emanuel Merck	50.0	50.0	–	–	42.00%	–
Dietmar Oeter	50.0	50.0	–	–	-1.60%	1.60%
Alexander Putz	50.0	50.0	–	70.10%	87.30%	-68.60%
Christian Raabe	65.0	62.7	3.70%	25.40%	42.00%	–
Helene von Roeder	80.0	75.4	6.10%	50.80%	42.00%	–
Helga Rübsamen-Schaeff	50.0	50.0	–	–	–	–
Daniel Thelen	65.0	62.7	3.70%	25.40%	42.00%	–
Simon Thelen	50.0	50.0	–	–	42.00%	–
Personnel expenses without pension expenses	6,184,000	5,572,000	11.00%	3.90%	8.90%	4.70%
Average number of employees	62,552	58,706	6.60%	2.00%	7.40%	-0.30%
Average compensation of an employee	99	95	4.20%	1.90%	1.40%	5.00%
Earnings development						
Profit after tax of the Merck KGaA (HGB)	241,958	288,600	-16.20%	59.40%	7.30%	4.30%
Profit after tax of the E. Merck Group (IFRS)	3,288,000	3,003,000	9.50%	56.80%	52.60%	-62.20%

Additional Information on Merck KGaA in Accordance with the German Commercial Code (HGB)

The management report of Merck KGaA has been combined with the Group management report. The Annual Financial Statements and the Combined Management Report of the Group and Merck KGaA for 2022 are filed with the electronic German company register and are available on its website.

Merck KGaA, headquartered in Darmstadt, Germany, is the parent company of the Group. In addition to its function as a holding company, Merck KGaA generates sales in the Life Science, Healthcare, and Electronics business sectors. Merck KGaA employs the majority of the 11,000-plus workforce in Darmstadt.

The financial statements of Merck KGaA have been prepared in accordance with the provisions of the German Commercial Code (HGB), as amended by the German Accounting Directive Implementation Act (BilRUG), and the German Stock Corporation Act (AktG). The full version of the Annual Financial Statements of Merck KGaA together with the unqualified auditor's opinion has been submitted to the electronic company register and published there.

Statement on Corporate Governance

For fiscal 2022, we exercise the option of publishing the Statement on Corporate Governance on the Group's website in accordance with section 315d HGB in conjunction with section 289f (1) sentence 2 of the HGB. It is available at **https://www.merckgroup.com/en/investors/corporate-governance/reports.html**.

Effects of material company agreements on the net assets, financial position, and results of operations

Hive-down of the operating activities of the business sectors and temporary leaseback of the hived-down business activities

As part of the strategic further development of Merck KGaA, the existing operating activities of the Life Science, Healthcare, and Electronics business sectors within Merck KGaA, together with the relevant assets and liabilities (hereinafter: "operating units"), were hived down at their carrying amounts into three separate legal entities (hereinafter: "OpCo" or plural "OpCos") with the legal form of a GmbH or German limited liability corporation and with economic effect from January 1, 2018 (operating hive-down).

Immediately after the operating hive-down took effect, all the shares held by Merck KGaA in the respective OpCos were transferred to holding companies via a further hive-down (holding company hive-down), as a result of which the OpCos are each held indirectly by Merck KGaA via an intermediate holding company (referred to individually as "HoldCo" irrespective of the business sector and jointly as "HoldCos").

Since the technical system requirements for the rollout of the business sector-specific enterprise resource planning systems (hereinafter "ERP") were not in place at the OpCos at the time of the hive-down, the business activities hived down to the OpCos have been temporarily leased back by the relevant OpCos to Merck KGaA. Under the terms of a business lease agreement, Merck KGaA leased the entire operations from the three OpCos

with economic effect from January 1, 2018. In this context, it also leased all fixed assets and acquired the current assets as well as certain liabilities and provisions at their carrying amounts under German commercial law. Once the relevant ERP systems have been rolled out for the respective OpCo, the business lease with this OpCo will be terminated and the previously leased business will be transferred to the OpCo.

Termination of the temporary business lease of the Healthcare and Electronics business sectors

In 2018, the Healthcare OpCo changed its legal form to that of a German corporation with general partners (Kommanditgesellschaft auf Aktien) and has since been trading under the name of Merck Healthcare KGaA, Darmstadt. The business leasing contract under which the Healthcare business sector was leased back to Merck KGaA was terminated with economic effect from March 21, 2019. As a result of the termination of the business leasing contract, the leased objects allocated to the Healthcare business sector at the end of the lease – comprising current assets as well as certain liabilities and provisions – were transferred to Merck Healthcare KGaA at their carrying amounts under German commercial law.

With the introduction of the specific ERP system for the distribution and sales function of the Electronics business sector on January 1, 2020, the business leasing contract between Merck Performance Materials Germany GmbH and Merck KGaA for the Electronics business sector was terminated for this function with economic effect from December 31, 2019. The business leasing contract for the other functions of the Electronics business sector remains in place. Accordingly, the distribution and sales function of the Electronics business sector moved to Merck Performance Materials Germany GmbH with economic effect from January 1, 2020. As a result, the contractual, process, procedural, and working relationships allocated to the function and the leased objects allocated to the function at their carrying amounts under German commercial law – comprising current assets as well as certain liabilities and provisions – were transferred to Merck Performance Materials Germany GmbH.

As a result of the aforementioned spin-off and restructuring measures and the business leasing contract that remains in place, Merck KGaA still continues to manage the operating business of the Electronics business sector with the exception of part of the distribution and sales function. Furthermore, as a result of the business leasing contract, Merck KGaA also runs the operating business of the Life Science business sector.

Construction of the Gernsheim Science and Technology Park (“Fluxum Gernsheim”)

As part of the strategic development of the Gernsheim site into a science and technology park, various operations at the Gernsheim site have been bundled and transferred to separate subsidiaries domiciled in Gernsheim.

Firstly, this relates to the transfer of site management functions based in Gernsheim (hereinafter referred to as “SM Gernsheim”) from Merck KGaA to Merck Site Management GmbH, which will act as an infrastructure service provider at the site in the future, by way of contribution. The transfer was based on the contribution agreement concluded between Merck KGaA and Merck Site Management GmbH in notarized form on September 21/22, 2021, which took economic effect from the end of September 30, 2021. The agreement provided for the transfer of the assets and liabilities attributable to SM Gernsheim to Merck Site Management GmbH at their current carrying amounts. This primarily related to the balance sheet items of fixed assets, inventories, other receivables, and pension provisions, as well as the transfer of 96 employees along with the associated personnel provisions.

Secondly, this relates to the transfer of the Gernsheim-based production operations of the Surface Solutions business unit within the Electronics business sector, including the Gernsheim-specific Electronics shared functions and the Gernsheim logistics operation (hereinafter referred to collectively as “SSG Production”), by way of their separation and transfer to Merck Gernsheim Holding GmbH under transformation law and their subsequent spin-off to Merck Surface Solutions GmbH with economic effect from July 1, 2021.

As Merck Performance Materials Germany GmbH was leasing SSG Production to Merck KGaA under a business leasing contract at this time, the separation involved not only the transfer of the assets and liabilities of SSG Production held by Merck Performance Materials Germany GmbH to Merck Gernsheim Holding GmbH at their current carrying amount, but also the transfer of the rights and obligations of Merck Performance Materials Germany GmbH relating to SSG Production under the aforementioned business leasing contract (the separated portion of the business leasing contract relating to SSG Production being hereinafter referred to as the "SSG business leasing contract").

Immediately after the separation took economic effect, all the assets and liabilities transferred to Merck Gernsheim Holding GmbH and the rights and obligations arising from the separated SSG business leasing contract were spun off to Merck Surface Solutions GmbH with economic effect from July 1, 2021.

As the technical system requirements for Merck Surface Solutions GmbH to commence operations were not yet fulfilled when the spin-off took place, the separated SSG business leasing contract between Merck Surface Solutions GmbH and Merck KGaA continued to be implemented as previously for a brief transitional period until the end of September 30, 2021. Merck Surface Solutions GmbH commenced operations via SSG Production with effect from October 1, 2021. As a result of the termination of the SSG business leasing contract, the leased objects allocated to SSG Production within the Electronics business sector at the end of the lease – largely comprising inventories as well as certain liabilities and provisions – were transferred to Merck Surface Solutions GmbH at their carrying amounts under German commercial law. The contractual, process, procedural, and working relationships (603 employees) allocated to SSG Production were also transferred to Merck Surface Solutions GmbH.

Transfer of Electronics production operations

To facilitate the implementation and operation of the new ERP systems for the LS OpCo and the EL OpCo, the EL OpCo transferred the Darmstadt-based "Organics" and "OLED" production operations, including the production-related Electronics shared functions ("EL Production"), to the LS OpCo on August 31, 2022, by way of a chain transformation pursuant to the German Transformation Act.

The first step of the chain transformation was the hive-down by absorption to Merck Electronics Darmstadt GmbH (Merck EL Darmstadt). The EL Production (ELP) hive-down became effective when it was entered in the commercial register of the EL OpCo on August 31, 2022. As ELP was leased to Merck KGaA as part of the operating unit Electronics before the hive-down from the EL OpCo became effective, the ELP hive-down involved not only the transfer of the assets and liabilities of ELP held by the EL OpCo to Merck EL Darmstadt, but also, with the approval of Merck KGaA, the transfer of the rights and obligations of the EL OpCo relating to ELP under the terms of the EL business lease agreement. The part of the contract that was hived down is referred to in the following as the ELP business lease agreement.

In the second step of the chain transformation, all the shares in Merck EL Darmstadt that were previously held by Merck Performance Materials Holding GmbH (EL HoldCo) were transferred to Merck Life Science Holding GmbH by way of a hive-down by absorption ("Merck EL Darmstadt hive-down"). The Merck EL Darmstadt hive-down became effective when it was entered in the commercial register of the EL HoldCo on August 31, 2022, immediately after the ELP hive-down became effective.

Lastly, the third step in the chain transformation involved the merger of Merck EL Darmstadt into the LS OpCo by way of a merger by acquisition ("Merck EL Darmstadt merger"). The Merck EL Darmstadt merger became effective when it was entered in the commercial register of the LS OpCo on August 31, 2022, immediately after the hive-down of the shares in Merck EL Darmstadt became effective. The ELP business lease agreement between Merck KGaA as the lessee and the LS OpCo as the lessor remained in place upon the Merck EL Darmstadt merger becoming effective. The chain transformation did not lead to any significant effects on the net assets, financial position and results of operations of Merck KGaA.

By way of entries in the commercial register on November 1, 2022 (LS OpCo) and December 29, 2022 (EL OpCo), the LS OpCo and the EL OpCo changed their legal form to that of a German corporation with general

partners (Kommanditgesellschaft auf Aktien) and have since been operating under the names Merck Life Science KGaA, Darmstadt, and Merck Electronics KGaA, Darmstadt.

Termination of the business lease of the Life Science and Electronics business sectors

The LS OpCo is scheduled to go live on January 1, 2023. The power of operational management for the Life Science operating business and ELP (referred to jointly as the Leased Operations) will be assumed by Merck KGaA at this date. On October 31, 2022, Merck KGaA therefore terminated the business leasing contracts giving due and proper notice with effect from midnight on January 1, 2023, in accordance with the LS business leasing contract and the ELP business leasing contract. The termination resulted in the transfer of around 3,400 employees from Merck KGaA to the LS OpCo and around 1,000 employees to the EL OpCo. The remaining around 4,000 employees in Group functions remained with Merck KGaA.

Business development

Merck KGaA's net sales decreased in 2022. The downturn of € 253 million was primarily attributable to the Healthcare and Electronics business sectors. The net sales of the Healthcare business sector relate to Group services oncharged to other companies in the Healthcare business sector.

			Change	
€ million	**2022**	2021	€ million	%
Life Science	1,591	1,537	54	3.5
Healthcare	445	531	-86	-16.2
Electronics	806	1,037	-232	-22.3
Other sales	338	327	11	3.2
Total	**3,180**	**3,433**	**-253**	**-7.4**

Other sales mainly included the intragroup oncharging of IT services, rent, and the umbrella brand, as well as other administrative services.

The share of sales with other Group companies (Group sales) amounted to 91.7% in the year under review (2021: 91.9%).

			Change	
€ million	**2022**	**2021**	€ million	%
Group internal product sales	1,548	1,944	-396	-20.4
Third party product sales	265	278	-13	-4.5
Group internal services	1,366	1,211	155	12.8
	3,180	**3,433**	**-253**	**-7.4**

At 68.7% (2021: 72.0%), the share of exports in 2022 was lower than in the previous year.

			Change	
€ million	**2022**	**2021**	€ million	%
Outside Germany	2,184	2,472	-288	-11.7
Germany	996	961	35	3.7
Total	**3,180**	**3,433**	**-253**	**-7.4**

Net sales in the Life Science business sector increased slightly compared with the previous year (+3.5%). This was primarily due to higher costs oncharged to subsidiaries in the Life Science business sector, especially in connection with IT services. On the other hand, product sales declined mainly as a result of the global business development of the Process Solutions business unit (-12.3%); further information can be found under "Course of Business and Economic Position". Increased net sales in the Life Science Services (+0.5%) and Science and Lab Solutions (+10.3%) business units were not sufficient to completely offset the downturn in product sales. The decrease affected the North America, Asia-Pacific and Europe regions, whereas sales growth was recorded in the regions of Latin America and the Middle East and Africa.

Net sales in the Electronics business sector declined substantially year-on-year (-22.3%). Despite the growth in OLED sales (+20.9%), net sales in the Display Solutions business unit fell by -37.6% on the back of weaker demand in end markets. The Surface Solutions business unit also recorded a double-digit downturn in sales (-44.5%). A large mid-eight-figure amount of the downturn in the Surface Solutions business unit was attributable to the transfer of the operations at the Gernsheim site to a separate company, Merck Surface Solutions GmbH, effective October 1, 2021. From a regional perspective, sales declined in Asia-Pacific and Europe in particular.

Results of operations

			Change	
€ million	**2022**	2021	€ million	%
Net sales	3,180	3,433	-253	-7.4
Other income	184	96	88	91.8
Cost of materials	-1,269	-1,412	143	-10.1
Personnel expenses	-1,256	-1,195	-61	5.1
Depreciation, amortization, and write-downs	-142	-144	1	-0.9
Other operating expenses	-1,150	-946	-204	21.6
Investment result	2,015	1,606	408	25.4
Financial result	-414	-294	-119	40.6
Profit before profit transfers and taxes	**1,148**	**1,145**	**3**	**0.3**
Profit transfers	-677	-743	65	-8.8
Taxes	-228	-113	-115	101.4
Profit after profit transfers and taxes	**242**	**289**	**-47**	**-16.2**

Profit after taxes and **profit transfers** decreased on the back of lower net sales, higher financial and tax expenses, and higher other operating expenses in particular. This was partially offset by an increase in investment income and a reduction in the cost of materials in particular.

The higher figure for **other income** resulted mainly from the increase in inventories.

The **cost of materials** decreased in line with net sales. The cost of materials in relation to sales remained largely unchanged at 39.9% (2021: 41.1%).

The higher level of **personnel expenses** was due in particular to increased pension expenses, which primarily resulted from adjustments to valuation parameters to reflect changes in interest rates and inflation, as well as salary increases for employees covered by and exempt from collective agreements. This was offset by a headcount reduction as a result of the employees transferred to Merck Site Management GmbH and Merck Surface Solutions GmbH in connection with the construction of the Gernsheim Science & Technology Park; see "**Effects of material company agreements on the net assets, financial position, and results of operations**".

Depreciation, amortization, and adjustments remained essentially unchanged as against the previous year.

The increase in **other operating expenses** was primarily due to higher sales and license expenses, expenses for IT services and consulting, research and development expenses, and expenses for fees, contributions and insurance premiums.

The **investment result** increased on the back of higher dividends from subsidiaries. This was offset by lower profit transfers from subsidiaries under existing profit and loss transfer agreements.

The higher level of interest expense in the **financial result** was due to higher interest expenses to the in-house bank Merck Financial Services GmbH, as well as losses on the fair value of the plan assets in connection with pension provisions. On the other hand, the repayment of bonds resulted in higher other interest and similar income in respect to third parties.

Net assets and financial position

Assets

			Change	
€ million	**Dec. 31, 2022**	Dec. 31, 2021	€ million	%
Fixed assets	**23,965**	**23,872**	**93**	**0.4**
Intangible assets	192	210	-18	-8.7
Tangible assets	969	857	112	13.1
Financial assets	22,804	22,805	-1	–
Current assets	**1,641**	**1,645**	**-4**	**-0.3**
Inventories	546	454	92	20.3
Trade accounts receivable	126	122	4	3.6
Other receivables and other assets	968	1,069	-101	-9.4
Cash and cash equivalents	0	0	–	–
Prepaid expenses	**74**	**53**	**21**	**40.3**
	25,680	**25,570**	**110**	**0.4**

Equity and liabilities

			Change	
€ million	**Dec. 31, 2022**	Dec. 31, 2021	€ million	%
Net equity	**5,479**	**5,576**	**-97**	**-1.7**
Provisions	**2,283**	**1,831**	**452**	**24.7**
Provisions for pensions and other post-employment benefits	1,509	1,187	321	27.1
Other provisions	774	643	131	20.3
Liabilities	**17,907**	**18,150**	**-243**	**-1.3**
Financial liabilities	2,751	3,000	-249	-8.3
Trade accounts payable	308	319	-11	-3.5
Other liabilities	14,848	14,831	17	0.1
Deferred income	**11**	**13**	**-1**	**-10.8**
	25,680	**25,570**	**110**	**0.4**

Net assets increased slightly by 0.4%. The main increase on the asset side of the balance sheet related to fixed assets (€ +93 million), while provisions saw the biggest increase on the equity and liabilities side (€ +452 million). On the other hand, liabilities declined by € -243 million and equity fell by € -97 million. The equity ratio decreased slightly to 21.3% (2021: 21.8%).

Fixed assets increased as a result of the investments in property, plant and equipment at the Darmstadt site in particular.

The growth in inventories was attributable to the higher volume as well as lower write-downs compared with the previous year.

Other receivables and other assets decreased mainly as a result of lower profit transfers from subsidiaries.

The increase in provisions was due in particular to the higher level of pension provisions, which primarily resulted from adjustments to valuation parameters to reflect changes in interest rates and inflation. The decline in financial liabilities was attributable to the repayment of bonds.

Research and development

In fiscal 2022, research and development expenditure increased by € 36 million (14.1%) year-on-year to € 289 million (2021: € 253 million). A large proportion of this figure was also incurred by companies outside the Merck Group.

Research and development expenses

			Change	
€ million	**2022**	2021	€ million	%
Life Science	73	66	7	10.9
Healthcare	4	6	-2	-27.2
Electronics	168	165	3	2.0
Other R&D spending that cannot be allocated to individual business sectors	43	17	27	162.9
Total	**289**	**253**	**36**	**14.1**

The ratio of research and development spending to sales was 9.1% (2021: 7.4%). Overall, the average number of employees working in research and development was 1,091.

Dividend

For fiscal 2022, we are proposing to the Annual General Meeting the payment of a dividend of € 2.20 per share.

Personnel

Merck KGaA had 8,485 employees as of December 31, 2022, representing an increase as against the previous year (2021: 8,081).

The average number of employees by functional area:

Personnel

Average number of employees during the year	**2022**	2021
Production	2,940	3,109
Administration	3,085	3,102
Research	1,091	1,098
Logistics	614	628
Marketing and sales	523	495
Other	122	36
Total	**8,375**	**8,468**

Risks and opportunities

Merck KGaA is largely subject to the same opportunities and risks as the Group. More information can be found in the **Report on Risks and Opportunities**.

Forecast for Merck KGaA

Deviations of actual business development in fiscal 2022 from the previously reported guidance

The Combined Management Report for 2021 initially stated that Electronics was expected to see a low nine-figure downturn in sales in fiscal 2022 as a result of the transfer of the Surface Solutions business unit to Merck Surface Solutions GmbH. The other business sectors were expected to see a similar level of sales to fiscal 2021. Net income was also expected to be the same as in the previous year.

Net sales in the Life Science business sector increased slightly compared with the previous year (+3.5%). This was primarily due to higher costs oncharged to subsidiaries in the Life Science business sector, especially in connection with IT services. On the other hand, product sales declined mainly as a result of the global business development of the Process Solutions business unit (-12.3%); further information can be found under “Course of Business and Economic Position”. Increased net sales in the Life Science Services (+0.5%) and Science and Lab Solutions (+10.3%) business units were not sufficient to completely offset the downturn in product sales. The year-on-year decrease affected the North America, Asia-Pacific and Europe regions, whereas sales growth was recorded in the regions of Latin America and the Middle East and Africa.

Net sales in the Healthcare business sector were down substantially on the previous year (-16.2%). This was due to lower costs oncharged to subsidiaries in the Healthcare business sector, especially in connection with IT services.

Net sales in the Electronics business sector declined substantially year-on-year (-22.3%). Despite the growth in OLED sales (+20.9%), net sales in the Display Solutions business unit fell by -37.6% on the back of weaker demand in end markets. The Surface Solutions business unit also recorded a double-digit downturn in sales (-44.5%). A large mid-eight-figure amount of the downturn in the Surface Solutions business unit was attributable to the transfer of the operations at the Gernsheim site to a separate company, Merck Surface Solutions GmbH, effective October 1, 2021. From a regional perspective, sales declined in Asia-Pacific and Europe in particular.

Net income was below the forecast level due to lower net sales, higher financial and tax expenses, and higher other operating expenses in particular. An increase in investment income and a reduction in the cost of materials were not sufficient to offset this.

Forecast for 2023

In light of the termination of the business leasing contracts with Merck Life Science KGaA and Merck Electronics KGaA and the continuation of the respective business operations in separate companies, these business sectors are expected to see a downturn in net sales as a result of the transfer of product-related sales. The other business sector is expected to see a similar level of sales to 2022.

As in the previous year, the financing costs of the Sigma-Aldrich acquisition and the Versum Materials acquisition will continue to adversely affect net income. Conversely, investment income will increase as a result of the transfer of the operating businesses to Merck Life Science KGaA and Merck Electronics KGaA in particular. Net income is forecast to be slightly higher than in 2022.

Merck Financial Services GmbH, Darmstadt, will provide the company with sufficient financial resources and thus ensure liquidity.

No risks that could jeopardize the continued existence of the company have been identified.