Annual & sustainability report
2023

imec

embracing a better life

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Message from the CEO

Dear imec community,

We're living in exciting times. The world is witnessing a digital revolution that is transforming every aspect of our lives, from the way we communicate, work, learn, and play, to the way we produce, consume, and protect our planet. At imec, we're proud to be at the heart of this revolution, developing the key technologies that enable it. Our research in nanoelectronics and digital technologies has been pushing the boundaries of innovation and creating value for our partners and society for more than 40 years.

History unfolds daily, only revealing the true impact of events as time passes. 2023 stands distinct, though. The year undeniably marked the start of a new era for artificial intelligence (AI), although it isn't a new concept. The idea of attributing artificial consciousness to non-living matter has been discussed for centuries. Still, it was only in the 1950s that AI's scientific journey really kicked off. However, AI's development depended on the availability of powerful and efficient computing devices, which were scarce and costly at the time. It wasn't until the intervention of chip tech pioneers like Gordon Moore that AI received the necessary boost to advance.

Today, this pioneering spirit lives on in the research conducted by imec, where the groundwork is laid for the creation of ever more tiny, powerful, yet cost - and energy-efficient microchips and computer systems.

With the introduction of generative AI, artificial intelligence has suddenly become accessible and at everyone's fingertips. This unlocks extraordinary opportunities for creativity, innovation, and problem-solving. Generative AI can help us design new products, services, and experiences, as well as generate novel solutions to meet the great challenges of our time.

To illustrate how deeply AI is embedded in our lives, just look at the automotive industry, where artificial intelligence has become an essential component, enabling cars with advanced safety features such as lane departure warning, pedestrian detection, and collision avoidance. In fact, to meet the stringent standards of the automotive industry, cars equipped with AI have become must-haves. This is where imec research programs such as SensAI, which focuses on developing advanced sensor fusion systems, are raising the bar.

AI-driven advancements are transforming healthcare too, accelerating complex diagnoses, revolutionizing personalized therapy development, optimizing new drug efficacy testing, and laying the groundwork for future proteomics research. Proteomics holds the key to personalized medicine by unraveling intricate protein structures, functions, and interactions, promising a deeper understanding of organismal structure and function compared to current genomics practices.

And AI's impact extends also to preventive healthcare. Recently, a Belgian hospital collaborated with imec researchers to develop algorithms predicting acute kidney failure's transition into a chronic condition. Early intervention based on such predictions promises to alleviate considerable suffering.

In essence, AI's rapid integration into virtually every aspect of our lives has been nothing short of phenomenal. The year 2023 served as a pivotal moment in this evolution, marked by generative AI's breakthrough.

In 2023, we had an incredible year in terms of innovation, collaboration, and impact, achieving groundbreaking scientific results. We have also strengthened our partnerships with academia, industry, and government, in Belgium and around the world. And we have continued to contribute to the United Nations' Sustainable Development Goals (SDGs) through our research and social initiatives.

At the same time, we have been facing various challenges and opportunities in the global context. Geopolitical tensions, recovery from the pandemic, the climate crisis, and the digital transformation have all helped shape the science and technology landscape.

In the aftermath of the COVID-19 pandemic, and amid ongoing geopolitical unrest, regional Chips Acts have emerged. In particular, initiatives in Europe, the United States, and Japan have attracted significant interest and financial support. With initiatives such as these bound to accelerate the innovation cycle, it is expected that we are once again on the verge of a period of rapid technological breakthroughs. So, I firmly believe that 2024 is going to be 'the year of truth'.

We are committed to staying at the forefront of semiconductor-based innovation for years to come — with collaboration (both within and across the various Chips Act initiatives) as our primary tool. Only through collective efforts can we lay the groundwork for solutions that will address ongoing challenges, from climate change and mobility issues to the mounting pressure on our healthcare systems.

We have a clear and ambitious vision for 2024. We want to consolidate our position as a world-leading research and innovation hub in nanoelectronics and digital technologies. We want to enhance our positive impact on society and the environment through our solutions for health, mobility, energy, and education. We want to foster a culture of excellence, diversity, and collaboration within our organization and with our partners. And we want to inspire the next generation of researchers, innovators, and entrepreneurs.

I'm confident that with our talented and diverse team, our state-of-the-art infrastructure, and our strong network of partners, we will be able to achieve these goals and more. Together, we can make a positive difference in the world and shape the future of technology.

Thank you for your trust and support!
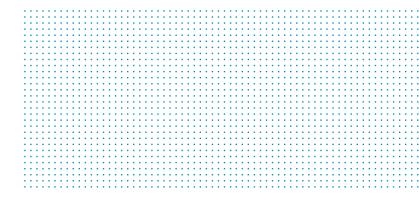
Luc Van den hove
President and CEO of imec

1. Highlights

International recognition for imec

Imec is internationally recognized by industry and policymakers as a critical contributor to the global semiconductor ecosystem. In July 2023, the Flanders government signed a letter of intent committing to invest in the further expansion of imec's cleanroom. The investment of up to €750 million reflects the ambition in the European Chips Act to support pilot lines as part of the Chips for Europe initiative.

European Commission President Ursula von der Leyen endorsed the EU Chips Act ambitions with a visit to imec. Also in attendance were Belgian Prime Minister Alexander De Croo, Flanders Prime Minister Jan Jambon and Minister of Innovation Jo Brouns, and Peter Wennink, ASML's CEO. In November 2023, European Commissioner Thierry Breton announced that the EU Chips Act funds for the various pilot lines, including a sub-2 nm system-on-chip pilot line, were approved and that calls for proposals were open. If our proposal is approved, we can further strengthen our leading position in nanoelectronics R&D with the support of Flanders and Europe, a position that was strengthened this year when we further deepened our long-standing strategic partnership with ASML, committing to installing ASML's full set of advanced lithography and metrology equipment in our Leuven cleanroom.

We are convinced that the chips acts in the various regions should reinforce and complement each other, generating critical mass to accelerate innovation in the microchip industry. Consequently, in 2023, we made a firm commitment to cross-border collaboration in Europe, the United States and Japan. A joint R&D lab was opened on the Purdue University campus in the US state of Indiana in December 2023 where a team of imec and Purdue researchers is developing new materials for the next generation of computing chips, work that will also serve to develop a more sustainable chip technology. The intention to collaborate with the University of Michigan was also announced, on whose campus, in the very heart of the US automotive industry, the focus is on developing semiconductor materials and chip architectures to primarily benefit the automotive industry. Rapidus, the recently established Japanese chip manufacturer, also joined our core program.
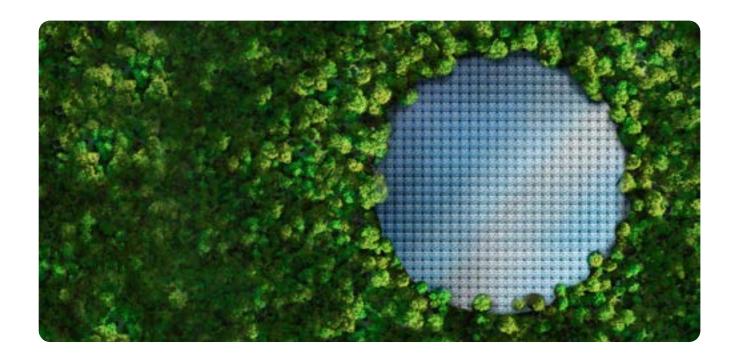
Smaller than 2nm

The increasing use of artificial intelligence (AI) is expected to double the need for computing power every six months. But this is only possible if hardware development keeps pace. To make microchips even more powerful and high-performing than those of today, imec is working on several fronts. One is the program on sustainable microchip technologies and systems to which companies across the value chain have signed up. These include fabless and systems companies such as Amazon, Apple, Google, Meta, and Microsoft, as well as chip manufacturers GlobalFoundries, Rapidus, Samsung, and TSMC. Materials and equipment suppliers Air Liquide, Applied Materials, ASM, ASML, Edwards, Kurita, Lam Research, SCREEN, and Tokyo Electron are also involved. We also achieved significant results with several types of innovative memory technologies and developed innovative conductor films with very low resistivity and made progress on finding ways to efficiently dissipate heat.
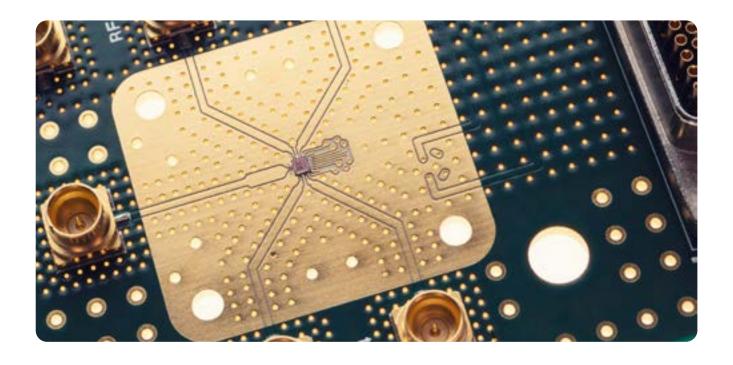
Imec.netzero goes public

This year our Sustainable Semiconductor Technologies and Systems (SSTS) program launched a public version of the imec.netzero platform. SSTS encourages partners from across the microchip industry to co-develop strategies to reduce the environmental impact of the IC manufacturing process. Imec.netzero is a web application measuring the impact of chip production and identifies areas where there is a major impact.

Quantum computing

One of the more groundbreaking R&D issues over the next few years will undoubtedly be the development of mature quantum systems with better qubits, less variability, and higher reliability, and more manageable and easier to connect to. At imec, we use the precision and accuracy of chip manufacturing processes to bring qubits from the lab to production. In 2023, we demonstrated a cryo-CMOS multiplexer operating at record low temperatures and providing highly reliable control after successful interconnection with superconducting qubits, a breakthrough published in the Nature Electronics journal.
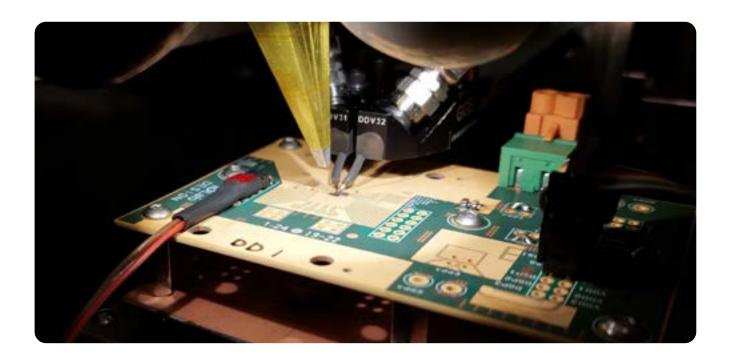
Advancing connectivity

We presented a 200 Gbps optical receiver that not only performs very well in terms of speed, but is also scalable. This speed and scalability are essential to continue handling the explosion in data rates in cable communications.

In the imec.icon MM-WAVES project, we developed an optimal network topology and layout for mmWave fixed wireless access (FWA). As a result, our industry partners Pharrowtech, Telenet, and Unitron succeeded in rolling out an FWA during a field test. They also demonstrated that mmWave FWA technology can reach a speed of 1 Gbps, comparable to that of cable technology.
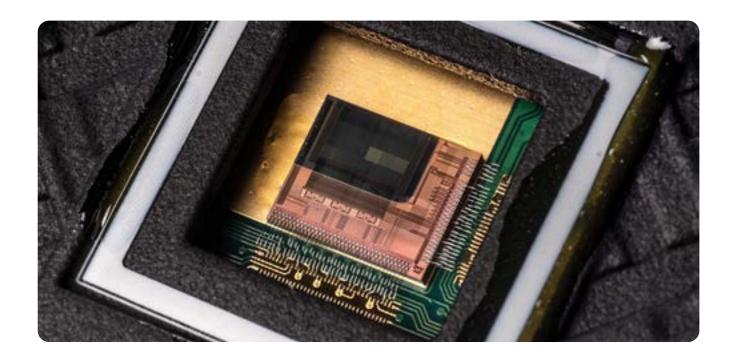
We also demonstrated an essential building block for 140 GHz radar, which is very accurate when detecting over short distances. This kind of technology is of interest for communication and detection in cars (in-cabin and out-of-cabin) and in industry (on-cobot sensing).

Sensing and actuating

This year, imec became the first in the world to succeed in integrating a pinned photodiode structure into thin-film image sensors. With this game-changing achievement, we unlocked the superior absorption qualities of thin-film imagers in infrared imaging.

We also presented a fundamentally new way to render colors at submicron pixel size, which is a big step towards significantly improving the signal-to-noise ratio, color quality, and resolution of high-end cameras.

Sustainable innovation

Data and AI

To pave the way towards creating data spaces in Belgium, we launched the Belgian Data Space Alliance in 2023, along with Agoria, KU Leuven, Digital Flanders, Paradigm Brussels, Agence de Numérique, SolidLab, and the Flemish Data Utility Company. The Flemish Smart Data Space consortium also launched a first pilot project on its data spaces portal.

As part of the GreenMov, and together with our partners, we have been promoting green mobility by sharing and reusing data.

In 2023, we also launched a prototype for a web app combining real-time rail data with data from Blue-bike, a widely used bike rental service in Flanders. The app predicts the availability of Blue-bikes upon arrival at a train station.

Along with VITO, Cegeka, and the city of Bruges, we launched a Bruges digital twin, which today helps the city with its policy choices on mobility and air quality.

Towards sustainable mobility

As part of the Mobilidata program, we work with policymakers and companies to develop innovative technological solutions for more sustainable mobility. In 2023, more than 100 intelligent traffic lights were installed around Flanders. In addition, 13 new traffic alerts and warnings have been integrated into navigation apps linked to the Mobilidata platform, such as motorists driving on the wrong side of the road or active dynamic 30 km/h zones. Mobilidata has become a pioneer in Europe, with international road authorities watching closely.

Another important digital transformation project in Flanders is the Physical Internet Living Labs (PILL) project, which uses digital technology to develop a so-called physical internet that makes transport logistics more efficient and sustainable. In 2023, together with our partners VIL (the innovation platform for the logistics sector in Flanders) and Vrije Universiteit Brussel (VUB), we conducted a first live test with ten logistics companies. We also developed a data standard for multimodal logistics networks to facilitate future adoption of the PILL platform.

Better healthcare at lower cost

In 2023, we joined forces with the University Hospital Leuven (UZ Leuven) to achieve a compact set-up for our hyperspectral camera with a surgical microscope. The first intra-operative pilot tests at the hospital generated accurate clinical data, indicating a promising path forward to in vivo detection of low-grade gliomas (groups of slow-growing brain tumors).

Working with the Royal College of Obstetricians and Gynaecologists and the United Kingdom National Health Service (NHS), we developed an app that allows better risk assessment and adapted care during pregnancy. The app will be used in a pilot study in 54 countries in central and southern Africa.

ITEC, an imec research group at KU Leuven, together with AZ Groeninge (Kortrijk), developed and tested an algorithm which can predict which patients are at high risk of chronic kidney failure in the months ahead.

As part of the ATHENA consortium (Augmenting Therapeutic Effectiveness through Novel Analytics), together with Janssen Pharmaceuticals (since September 2023, Johnson & Johnson Innovative Medicine), we optimized the Patient Trajectory Analysis (PTRA) high-performance computing software, so that it can combine health data from different sources. With the optimized software, our partners were able to develop medically substantiated development pathways for bladder cancer.

In the MONUMENT project (MOre NUrturing and More Empowerment Nested in Technology), we worked with European partners on technological solutions to help caregivers of people who have dementia. We developed a prototype combining remote monitoring and an alarm system, allowing people with (early) dementia to stay in their own home longer.

At Holst Center in Eindhoven, the Netherlands, as part of the Intranet of Neurons project, imec is developing implants with extremely low power consumption, which extends implant life.
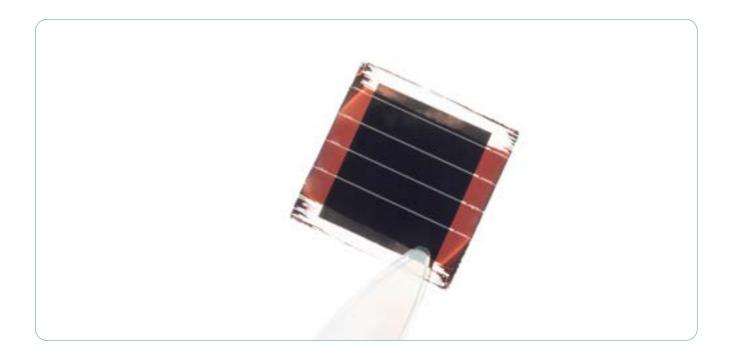
Decarbonization

As part of EnergyVille, we have been collaborating with partners KU Leuven, VITO, and UHasselt to advance sustainable energy technologies and smart energy systems. We have added an industry-compatible ammonium salt treatment to improve our perovskite solar cell process, resulting in lower efficiency losses and greater stability for this type of solar cell.

For the imec.icon SNRoof project (Solar multi-junction cells iNtegrated in 3D curved ROOFs of electric vehicles), we worked with other companies to integrate highly efficient solar cells into curved solar panels for car roofs, resulting in a 6 % efficiency gain. The project also identified opportunities for further efficiency improvements and provided insights on how to seamlessly integrate solar panels in a range of surfaces and configurations.

Working with Bekaert, we developed high-efficiency solar cells, starting from germanium foil as thin as 10 μm — a breakthrough for aerospace applications.

Imec venturing

2023 was another successful year for our deep tech venturing activities. The venturing team launched four new spin-offs:

- Axithra, a medtech start-up developing disruptive deep tech solutions for measuring concentrations of medication in blood, benefiting from imec.xpand investment;

- Enfoil, a spin-off developing flexible solar panels;

- IoSA (Internet of Small Animals), designing solutions to monitor animal behavior; and

- Specifix, a UAntwerp and imec spin-off developing an AI-based tool to support orthopedic surgical procedures.

The European Innovation Council Accelerator (EIC Accelerator), the EU's vehicle for financing deep tech start-ups and scale-ups, selected three existing imec ventures, Swave Photonics, Axelera.ai and Azalea Vision as being among 2023's most promising deep tech ventures. Swave Photonics and Axelera.ai were selected for the EIC Accelerator and each received €2.5 million in grants and potential equity investments of up to €15 million each. Axelera was selected for EIC Transition support and received a grant of €2.5 million.

Three imec spin-offs achieved significant capital increases last year. At the close of the A-round, Axelera.ai had raised an additional investment of €9 million. Spectricity raised €5 million in a series B-round, and Swave Photonics raised an additional €3 million at the close of its seed round.

With the success of imec's associated venture capital fund imec.xpand, deep tech venture funding is being significantly expanded. In 2023, imec.xpand raised €275 million in funding commitments for its second fund imec.xpand.II. This brings the fund's total investment capacity above €400 million, making it one of the most impactful early-stage deep tech venture capital funds in Europe.

Our imec.istart program was ranked number one start-up accelerator linked to a university by UBI Global — a big boost for our imec.istart team.

2. Imec: driving sustainable growth

2.1. Shaping the future

Imec is the world's largest independent research and innovation center for nanoelectronics and digital technology. Our vision and mission are a perfect reflection of what drives us:

"As a world-leading research and development center for nanoelectronics and digital technology, we strive for the impossible and aim for disruptive innovation. We maximize our positive social impact by providing sustainable solutions to improve quality of life. At imec, we shape the future.

As a trusted partner for business, start-ups, and academia, we bring together brilliant minds from around the world to be part of a creative and stimulating environment. By tapping into our world-class infrastructure, as well as our local and global ecosystem of diverse partners across a wide range of industries, we accelerate progress towards a more connected and sustainable future."

All the disruptive innovations we develop stem from our deep desire to make a positive impact and contribute to a better life in a sustainable society, from the thoroughly functional miniaturization of chip technology and disruptive sensor concepts for personalization in the pharmaceutical industry, to a diverse portfolio of other activities in the digital sphere.

That's why we work on more than just microchip technology research and development. The combination of imec's first-rate talent, world-class infrastructure, and a local and global ecosystem in a full range of sectors is leading to new technologies and innovations in healthcare, mobility, cities, Industry 5.0, energy, education, entertainment, agrifood, data and telecom.

But radically innovative solutions don't emerge overnight, nor do they come from a single expertise or technology. They are the result of a long process of international cooperation, of combining different fields of expertise, pooling capital, and achieving scientific and technical breakthroughs. Thanks to this ecosystem, every smartphone today contains microchip technology developed by imec.

Imec's vision and mission also drive their business strategy. Today, this embodies four key principles:
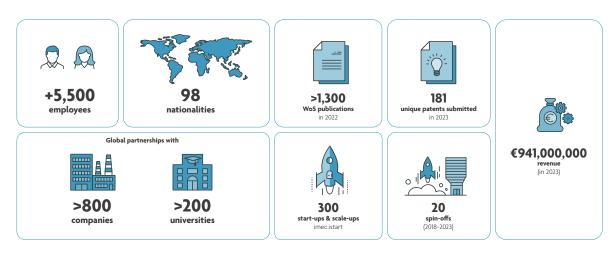
- Imec will, over the next ten years, continue to drive forward the functional miniaturization of semiconductors;

- Imec will address society's big challenges, using all its expertise in digital and advanced semiconductor technology to develop disruptive applications;

- Imec will be an ambitious and disruptive driving force behind unique electronic and digital system innovation, working towards a sustainable society;

- Imec will combine its position as global technology leader with local civic engagement in high-impact projects, wherever it has a local presence.

2.2. About imec

Imec is an independent research center, founded in 1984 by a group of about 70 scientists. It is headquartered in Leuven (Belgium) with research sites across Belgium, the Netherlands and the United States. The research center is also represented on three continents.
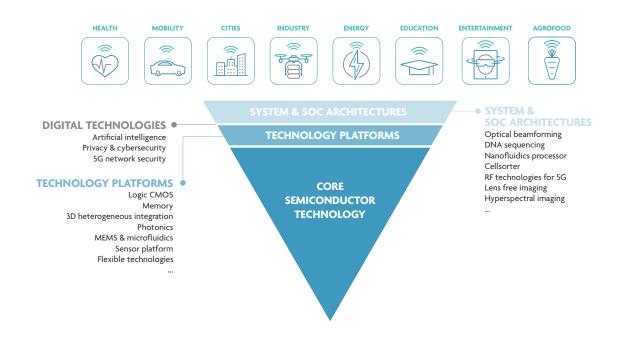
Imec is a registered trademark for the activities of imec International (IMEC International, a public utility founded under Belgian law), imec Belgium (IMEC vzw), imec the Netherlands (Stichting IMEC Nederland), imec China (IMEC Microelectronics Shanghai Co. Ltd.), imec India (IMEC India Private Limited), imec San Francisco (IMEC Inc.), imec Florida (IMEC USA Nanoelectronics Design Center Inc.) and Imec.IC-link USA.

Imec key figures in 2023:

+5,500 employees	**98** nationalities
>1,300 WoS publications in 2022	**181** unique patents submitted in 2023
Global partnerships with **>800** companies	**>200** universities
300 start-ups & scale-ups imec.istart	**20** spin-offs (2018-2023)
€941,000,000 revenue (in 2023)	

Imec leverages its expertise in microchip technology and system architecture to develop a range of innovation platforms which, combined with digital technologies including AI, enable disruptive solutions in healthcare, mobility, cities, industry, energy, education, entertainment, agrifood, data, and telecom.

Imec's innovation platform:

HEALTH   MOBILITY   CITIES   INDUSTRY   ENERGY   EDUCATION   ENTERTAINMENT   AGROFOOD

SYSTEM & SOC ARCHITECTURES

TECHNOLOGY PLATFORMS

CORE SEMICONDUCTOR TECHNOLOGY

DIGITAL TECHNOLOGIES
Artificial intelligence
Privacy & cybersecurity
5G network security

TECHNOLOGY PLATFORMS
Logic CMOS
Memory
3D heterogeneous integration
Photonics
MEMS & microfluidics
Sensor platform
Flexible technologies
...

SYSTEM & SOC ARCHITECTURES
Optical beamforming
DNA sequencing
Nanofluidics processor
Cellsorter
RF technologies for 5G
Lens free imaging
Hyperspectral imaging
...

2.3. Business models

Imec today leads as a world-renowned research center for chip technology, and we want to maintain that position. So, from the very beginning, we have been building an advanced business model that evolves with the economic and technological situation, and innovations we co-develop.

Imec's business model consists of:

* Collaboration on research and development

* Innovative services and solutions

* Tailor-made support for technology start-ups

Collaboration on research and development

Collaboration is vital to what imec does. In the early 1990s, collaboration with large companies — often global players — began as an open innovation model, a business model in which the partners shared research costs and results with each other. Over the years, further bilateral collaborations followed. Today, imec is the R&D hub for the world of nanoelectronics, with hundreds of collaborations across the entire value chain. All the major global players in the semiconductor ecosystem, whether from industry, research centers, or academia, come to imec to collaborate on researching and developing the technologies of the future.

Resulting from these broad collaborations and the growing knowledge base, imec also achieves breakthroughs on a global level, applying its expertise in nanotechnology to other areas, particularly healthcare and life sciences. These breakthroughs are also now possible in areas such as renewable energy, low-power communication, agri-food, and mobility.

Imec's automotive chiplet program launched in 2023 is a good example. It brings together companies from the microchip ecosystem with key players from the automotive industry to work on standardizing computer chips for the cars of the future.

Offering innovative services and solutions

In addition to its R&D offerings, imec leverages its expertise and extensive international industry network to support the innovation process at smaller organizations with limited internal R&D resources as much as larger companies, taking initial ideas to fully functioning products. After all, developing an application-specific integrated circuit (ASIC), or a chip, is complex, especially for a start-up or SME.

For this kind of development, imec.IC-link, imec's service department, has a full-service offering for start-ups and SMEs, including design, wafer production, chip assembly and testing, as well as ASIC qualification and optimization. Through the European Union project EUROPRACTICE, this service has been offered to academia for several decades. The aim is to expand the integrated circuit ecosystem with the most relevant innovative processes.

Tailor-made support for technology start-ups
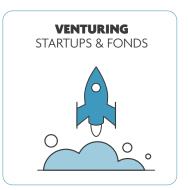
The imec deep tech venturing program creates and supports imec spin-offs that use imec-developed disruptive technologies to ensure their products are competitive in the target market. Specializing in constructing ventures, the imec venturing team helps imec researchers shape their business. The most promising ideas are selected for the Venture Timebox incubation process, during which the venturing team draws up the business plan, makes an investment presentation, and engages the right team of founders. Then, together with the venturing team, the founders raise the necessary seed capital. The venturing team also collaborates with strategic external ventures. These are early-stage ventures (seed, pre-seed, or series A) with a strong founding team anchored in a significant end market where imec technology can solve a clear problem. The idea is that imec's contribution will give the venture a major competitive advantage.

With a capitalization of more than €400 million, imec.xpand, imec's independently managed venture capital fund, is one of Europe's leading private funds for early-stage deep tech investments. It finances deep-tech start-ups for which imec technology, expertise, network, and infrastructure make the difference.

In addition to our deep tech venturing program, and its related venture capital fund imec.xpand, there is also the imec.istart program, a unique business accelerator program for digital companies. Through specialized coaching, facilities, and general support, imec.istart helps technology entrepreneurs grow their businesses. Through one of the two early-stage funds (one for Belgian activities and one in the Netherlands), the start-ups also receive an initial capital injection to facilitate their acceleration (from €100,000 up to a maximum of €250,000 per start-up). We have supported more than 300 technology start-ups and spin-offs in this way in recent years. Thanks to imec.istart, imec was named the number one start-up facilitator in the world by UBI Global in 2023. UBI Global determines these rankings through a biennial global survey of incubators and accelerators. In the meantime, imec.istart is also expanding to Italy.

R&D COLLABORATION	DEVELOPMENT	VENTURING STARTUPS & FONDS

Imec's business models meet industry requirements and ensure a smooth transition from imec's R&D to impactful products and services.

2.4. Press releases
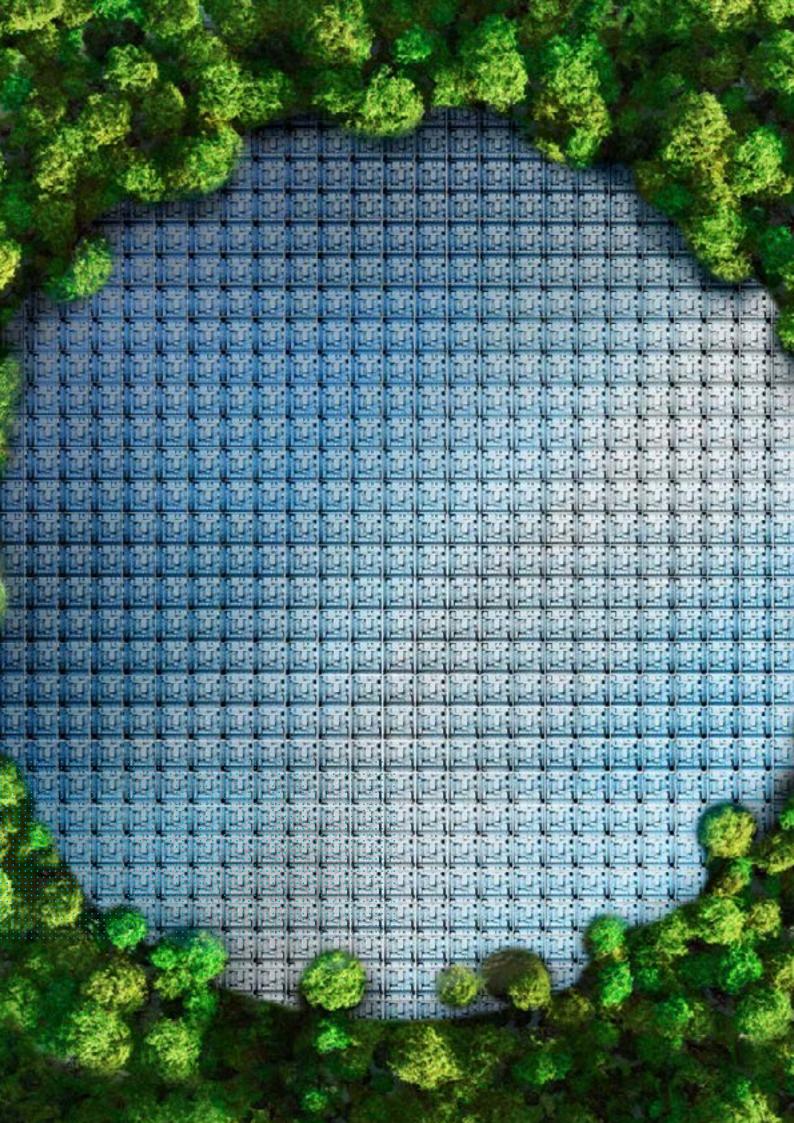
An overview of our press releases in Dutch and English from the past year:

Persberichten   Press releases

3. Imec's sustainability strategy

3.1. Imec's values driving our sustainability strategy

Imec is committed to sustainable developments for current and future generations. This means we have to think ahead about the impact of the microchip industry on people, the environment, and society. As an R&D hub, we can and want to inspire and involve the entire value chain in the development of sustainable, innovative technologies and solutions.

Imec didn't choose its tagline 'Embracing a better life' lightly. It reflects our long-term vision to create a sustainable world through technology and innovation. It also aligns with our values of connectedness, excellence, integrity and passion.

INTEGRITY   **CONNECTEDNESS**   **PASSION**   **EXCELLENCE**

We translate these values in our day-to-day operations and in dialogue with our partners. You will also find them in our sustainability policy. We involve all our internal and external stakeholders in identifying the risks of a technology for people and the environment. We also focus on the positive impact our core activities have on the entire imec ecosystem.

This approach requires an adapted policy structure, and we have taken many steps in this respect in 2023:

- Imec has included the theme of sustainability in the "corporate balanced scorecard" in recent years, translating imec's strategic goals into measurable parameters.

- We appointed a sustainability director responsible for further developing the imec sustainability policy and objectives in the short, medium and long term. Further extending existing support for sustainability in our own organization is, of course, also a priority.

- We confirmed the existing policy structure, where sustainability is repeatedly put on the agenda at the highest level of management.

- We further expanded the sustainability team, allowing us to respond effectively to the increasing demand for reporting and certification.
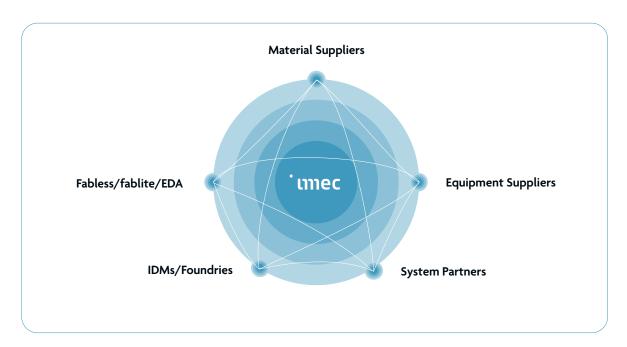
3.2. Imec stakeholders across the value chain

Recognizing needs in society at an early stage and seeking deep technological solutions for industry have been a priority since imec was founded. That's why stakeholder dialogue is an essential building block of the imec collaboration model. In doing so, we are looking to take maximum account of the needs and expectations of our stakeholders.

In this collaborative ecosystem, we bring together the entire nanoelectronics value chain, from system companies and chip manufacturers like TSMC, Samsung, and Intel, to materials and equipment suppliers and design houses. Competitors work side-by-side in imec cleanrooms, home to the world's most advanced collection of microchip fabrication tools. Our strong ties with academia also nurture our innovative competences.
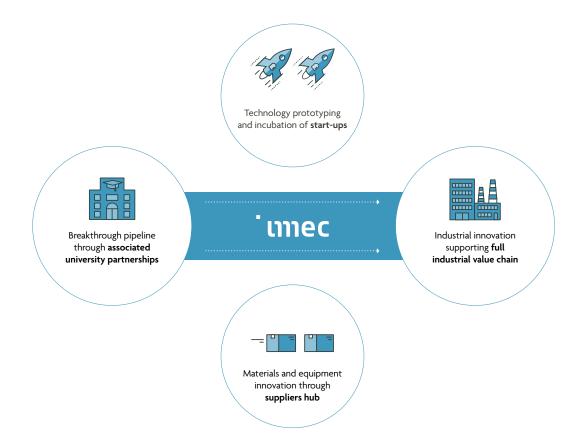
Imec connects all the key players in the microchip value chain. By bringing together top players for breakthrough R&D activities, imec is changing the innovation model from open innovation in the value chain to open innovation at every stage of the value chain. In such a model, partners work together not just layer by layer, but across the different layers.

Network innovation model

The imec ecosystem, however, extends far beyond its industrial partners. We collaborate with more than 200 universities around the world. These academic partnerships feed the imec pipeline in the long term and are the basis of our technological research. In the R&D pilot line, we transform academic concepts into industrial innovation. This is possible because of the large numbers of leading equipment and materials suppliers in our network. And together, we develop new concepts and technology platforms. Through these platforms, we also support start-ups, which often do not have access to top-level technology. Moreover, when promising developments have a sufficiently scalable potential, our experts can be a bridge to venture partners.

Imec is looking to leverage its core activities - research and innovation - to provide answers to the many societal challenges emerging worldwide. The urgency of these challenges, and increasing demands from employees, prospective employees, and partners clearly demonstrate that striving for a sustainable society is the only right approach.
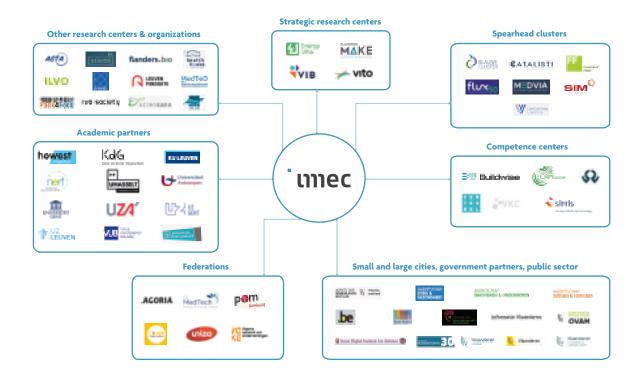
Along with more than 5,500 colleagues all over the world, we are working for the future ensuring good health, safe traffic, sustainable energy, and so much more. Taking good care of this excellent group of employees is therefore a top priority. After all, we need to nurture the diverse range of teams and their deep expertise and drive.

In both international and Flanders contexts, imec is committed to numerous initiatives. Sharing knowledge and expertise is crucial in this, giving us a clear view of the local societal challenges and the sustainable objectives set by organizations in the microchip sector.

Initiatives in which imec is involved:

- SEMI SAC – the Sustainability Advisory Council of SEMI, an international consortium of semiconductor companies

- SEMI SCC – SEMI's Semiconductor Climate Consortium, of which imec is a founding member

- IEEE IRDS – the Institute of Electrical and Electronics Engineers' International Roadmap for Devices and Systems

- ESIA – the European Semiconductor Industry Association

- SIA – the Semiconductor Industry Association, which represents the microchip industry in the US

- GSA – the Global Semiconductor Alliance

The Flanders ecosystem

In Flanders, the company's birthplace, we can also build on a rock-solid and broad-based ecosystem.

With our large group of stakeholders, we are well placed to clarify the needs and challenges of the ecosystem. We listen and together formulate answers to today's questions. With their help, we also define priorities in our sustainability strategy. In this way, our stakeholders help determine our policy, ambitions, and actions over the short and long term.

3.3.   Risks and impacts across our value chain

For some time, we have been monitoring the impact of new EU and other directives closely, such as the Corporate Sustainability Reporting Directive (CSRD). We also want to stay well informed about evolutions in the Corporate Sustainability Due Diligence Directive (CSDDD) and more stringent regulations on the use of raw materials through, among others, the Critical Raw Materials Act. In response to global climate and regulatory changes, as well as geopolitical and economic movement, imec decided in 2022 to adjust its priorities. The increasing numbers of questions from stakeholders and the potential impact of our research on sustainability themes played an important role in this decision.

Following this decision, a thorough risk and impact analysis was carried out throughout the value chain. This included imec's role in making chip production more sustainable, as well as the risks the organization is facing along the supply chain due, for example, to the use of scarce minerals or harmful chemicals and gases. These are examples of risks and impacts that imec identifies upstream of the value chain. Our research and technology also have a positive impact on future users or applications downstream of the imec ecosystem.

We also took a close look at our own organization of course, and how we can prevent or reduce negative impacts and continue to focus on our strengths.

The environmental, social, and governance (ESG) aspects were included in our analysis. We weighed new sustainability risks and integrated them into the existing enterprise risk management inventory, while current risks were reviewed. Positive impact was analyzed in the same way: how can imec generate the greatest positive impact and minimize negative impact?

The analysis led to a list of issues for the internal and external imec stakeholders. External stakeholders were interviewed about these by representatives of the various categories of stakeholders. Internal stakeholders were questioned through an internal survey.

The outcome gave a clear picture of imec's sustainability priorities. Representatives of the departments involved then established shorter-term objectives and long-term ambitions for each of these priorities. The exercise was completed in the first quarter of 2023.

Certain actions were implemented immediately after the results of the survey. We will start working on other, more long-term ambitions, such as the development of a climate plan in line with the Paris Agreement and the EU climate targets, in 2024.

	UPSTREAM	IMEC	DOWNSTREAM

Making sustainable impact

Developing technologies to accelerate the decarbonization of industry, the built environment, and the power and transport sectors

Research to improve the ecological efficiency of chip production

Developing solutions that use energy more efficiently

Leveraging our digital and nanotechnology competences to enable smart applications that contribute to a thriving society (health, cities, logistics, mobility, agrifood)

Venturing

Creating and supporting start-ups with a positive impact on society

With our people

Promoting a healthy work-life balance

Stimulating diversity & inclusion

Investing in engaged and talented employees

Supporting a solid health and safety culture

Respecting the environment

Increasing responsible and circular use of energy and materials in our own operations, mobility, and infrastructure

Efficiently using and reusing water and effluents

Minimizing and repurposing waste streams

Through good governance

Using an ethical charter and SDGs as a compass for our research projects

Maximizing data security and customer privacy

Engaging in responsible procurement and conducting supply chain due diligence

Employing high standards of good governance on anti-corruption and fraud

3.4. Our priorities for an integrated sustainability policy

The imec sustainability priorities form the basis for an integrated sustainability policy fully aligned with the imec organization and strategy. The result is an ambitious action plan, which also defines areas such as objectives, responsibilities, and KPIs.

As a participant in the Voka Charter for Sustainable Entrepreneurship, imec has also been prioritizing its objectives for many years, inspired by the United Nations sustainability goals (UN SDGs), with which the 2023 impact analysis links. In the Charter, we also select priorities where we can play a reinforcing role. The financial and impact-based materiality will be finalized in 2024.

Sustainability priority	Priority domain	Material topic	Value chain impact	Main SDG contributions
Making sustainable impact (see section 4.1)	Developing technologies to accelerate the decarbonization of industry, the built environment, and the power and transport sectors	Climate change and energy		
	Research to improve the ecological efficiency of chip production	Pollution - water use - resource use and circular economy		
	Developing solutions that use energy more efficiently	Climate change and energy		
	Leveraging our digital and nanotechnology competences to enable smart applications that contribute to a thriving society (health, cities, logistics, mobility, agrifood)	Climate change and energy, water use, biodiversity and ecosystems, health and welbeing		
Venturing (see section 4.2)	Creating and supporting start-ups with a positive impact on society	Employment, diversity and inclusion		
		ESG governance for ventures and start-ups		
With our people (see section 5.1)	Promoting a healthy work-life balance	Employee health and wellbeing		
	Stimulating diversity & inclusion	Diversity and inclusion		
	Investing in engaged and talented employees	Diversity and inclusion		
	Supporting a solid health and safety culture	Employee safety		

Sustainability priority	Priority domain	Material topic	Value chain impact	Main SDG contributions
Respecting the environment (see section 5.2)	Increasing responsible and circular use of energy and materials in our own operations, mobility, and infrastructure	Climate change / Energy / Pollution / Responsible material and resource use for both hazardous and non hazardous materials		SDG 8, 12, 13, 14, 15
		Mobility		SDG 7, 13
	Efficiently using and reusing water and effluents	Water management		SDG 6, 14
	Minimizing and repurposing waste streams	Waste		SDG 12
Through good governance (see section 5.3)	Using an ethical charter and SDGs as a compass for our research projects	Ethics		SDG 16
	Maximizing data security and customer privacy	Data security and privacy		SDG 11, 17
	Engaging in responsible procurement and conducting supply chain due diligence	Responsible procurement		SDG 3, 6, 8
	Employing high standards of good governance on anti-corruption and fraud	Governance		SDG 8, 16, 17

Support base and a structure to move from policy to action

Imec is seeking to play a leading role in making the microchip ecosystem more sustainable. Taking on this role requires a robust sustainability policy. The sustainability director ensures that the highest levels of management are aware of the most important ESG themes, and also ensures the further development of an ESG management structure.

During the preparation of the sustainability strategy in 2023, various teams worked out their ambitions and objectives. Together with the sustainability director, one member of each team is appointed "owner" responsible for monitoring the sustainability strategy. The new sustainability director further shaped the strategy and how it would be managed, while discussions will continue in working groups in 2024. Through training and education, we also continue to build broad support for sustainability among our employees.

Some accomplishments in 2023:

- The Innovation Challenge team launched an ESG innovation call and gave several pioneering ideas a chance to develop further.

- The Venturing and imec.istart teams set up a working group immediately after setting out their ambitions, establishing an internal process for ESG screening and mentoring start-ups and new ventures.

- Our marketing, communications and outreach team seeks to inspire others with a sustainable perspective, developing a guide to producing sustainable publicity material and organizing sustainable events.

- At the annual employee party, imec presented a sustainable.minds award to imec employees who have had a significant positive impact. This year, the award went to the FAB team. Along with the Environment, Health and Safety (EHS) and SSTS teams, it made significant progress on how to reduce our process emissions.

- Imec's mobility policy has been expanded and updated to benefit the entire imec community. Eye-catchers are bicycle leasing and the introduction of the mobility budget.

- As part of a renovation project in our ecosystem, the Facilities and Infrastructure team repurposed office and building materials. This meant that, Ponton43 school in Leuven could furnish their classrooms with our discarded office furniture.

Our commitments and sustainability certifications

Our commitment to generating a positive impact is also reflected in a transparent approach and communication about sustainability. Because we believe it is important to share our knowledge about sustainability, we regularly give keynotes on how we integrate sustainability into our research and take part in panel discussions on the theme.

To structurally embed sustainability and confirm our commitment to our partners, we went through a number of audit and certification processes and renewed our Responsible Business Alliance certification. Through our participation in the VOKA Charter for Sustainable Entrepreneurship, we also continue to actively build on our commitments to the United Nations sustainability objectives. As a United Nations SDG pioneer, the imec team is seeking to achieve SDG Champion status, defining 10 SDG actions with a special focus on imec's core activities.

In 2024, imec will start a new process to obtain an Ecovadis certification. We have also included a number of commitments towards a climate-neutral Leuven.

After a 3-year process within the Voka Charter for Sustainable Entrepreneurship, imec received the officially recognized UN SDG Pioneer certificate in 2022.

4. Making sustainable impact

As an international research center, collaborating with hundreds of partners, imec considers its mission is to develop technologies that contribute to a more sustainable future by focusing on the positive impact of future chip technologies and preventing the negative effects and risks of these technologies. Our focus is on disruptive innovation.

We continue this pursuit of a sustainable future in our own research and in our collaborations with and guidance for spin-offs and start-ups.

4.1. Through research and development

In the chip industry, interest in sustainability has never been stronger. This is unsurprising, knowing that semiconductor production represented 175 million tons of the global 50 billion tons of greenhouse gas emissions in 2021, and that these emissions will increase by about 50 % over the next decade. This is partly due to growth in the sector, and partly due to the introduction of more complex processes, which themselves also lead to a larger carbon footprint. To reduce that footprint, our industry will have to shift up a gear. But the scaling up activities of the microchip industry also consume a lot of energy and cause greater CO_2 emissions, as does the training of complex AI models such as the ever-expanding Chat GPT. The combination of this increasing digitization with a green transition is often referred to as the 'twin transition'. In an ideal twin transition towards a sustainable society, digitization and greening are mutually reinforcing. But digitization also leads to increased energy consumption and greater use of scarce materials. The digital transformation therefore also has a negative environmental impact. As a society, we need to manage it responsibly.

Our R&D objectives

The biggest lever in the twin transition is the accelerated electrification of society. Imec is committed, both as a producer and user. On the production side, we are working on technologies to accelerate the **decarbonization of the power sector**. On the user side, we develop solutions to do the same for a number of key energy consumers, such as **industry, the built environment, and the transport sector**.

Resulting from imec's unique position in the semiconductor ecosystem and its knowledge of semiconductor manufacturing, we can calculate the CO_2 emissions for each new technology in terms of digitalization. We can also estimate the impact of these emissions on climate. As such, sustainability is a parameter in **making our chip development as ecological as possible**. In that context, we also continue to further shrink chip technology and improve 3D chip stacking technologies. We make chips that are more powerful and at the same time consume less energy. This is crucial in a world where data use, and therefore also energy consumption, are growing exponentially.

Making sustainable impact

We also build **solutions to use energy as efficiently as possible** and use our expertise to **develop disruptive applications** contributing to a sustainable society.

In short, the challenges of the transformation to a digital, circular society are big and numerous. But the expertise and the opportunities to succeed are there.

"Sustainability starts with you. Every contribution counts, even if it seems insignificant, like taking the stairs instead of the elevator, cycling to work, or sorting your waste correctly. We need to switch from the current linear economic model to a circular one. The success of such a transition will have to be collective. Through its activities, imec is creating a network of partners to achieve that collective transition."

Rudi Cartuyvels, imec executive vice president and chief operations officer

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Imec's ambition to make a substantial contribution to a sustainable society through research and technology is reflected in four policy areas. Behind each policy area is an ambitious action plan:

Objectives of the imec R&D pillar	Ambitions
Developing technologies to accelerate the decarbonization of the power sector, industry, the built environment, and the transport sector	Reducing the cost of green hydrogen through electrolysis based on imec nanomaterials
	Reducing CO_2 emissions in industrial processes through imec nanomaterials
	Contributing to the electrification of the transport sector through solid-state battery technology
	Helping to ensure that photovoltaics (PV) become a dominant (and green) energy source
Carrying out research on enhancing the ecological efficiency of chip production	Measuring the environmental impact of future technology production for all imec research programs
	Integrating environmental impact studies into all current research programs
	Sharing knowledge with partners and the public about the environmental impact of semiconductor technology production within imec
	Integrating material circularity principles and chip life cycle analysis into program management, with the aim of increasing recycling and reuse

Developing solutions that use energy more efficiently	Setting the stage for increased energy efficiency in semiconductor products and systems
	Developing new hardware and software to improve energy efficiency in AI
Leveraging our digital and nanotechnology competences, developing smart applications that contribute to a sustainable society (health, cities, logistics, mobility, agrifood)	Developing disruptive applications that contribute to a more sustainable society
	Developing applications that help deliver on the climate objectives of the European Green Deal
	Developing applications for more fine-grained monitoring of sustainability parameters

4.1.1. Developing technologies to accelerate the decarbonization of industry, the built environment, and the power and transport sectors

If we want to limit global warming and meet the Flemish, European and international goals of climate neutrality by 2050, global CO_2 emissions must be drastically reduced. This can be achieved through a greater focus on renewable energy, reducing our energy consumption, and developing solutions to store renewable energy. We will also have to find smart ways to capture and reuse greenhouse gases.

Reducing CO_2 emissions, reusing CO_2, and generating and storing renewable energy require new technologies on a large scale. That's why imec uses its nanotechnology expertise to achieve radical innovation in green energy. We focus on four objectives:

- using imec nanomaterials and structures to lower the cost of green hydrogen via electrolysis;

- reducing CO_2 emissions in industrial processes using imec nanomaterials and structures;

- contributing to the electrification of mobility through solid-state battery technology research and development; and

- focusing on photovoltaics as the dominant green energy source.

An important side note: in addition to the technological challenges, there are a number of societal challenges associated with reducing carbon emissions. This is because the enormous growth of the green energy sector risks leading to raw material scarcity and human rights violations. The raw materials concerned include indium, silver, bismuth, and even the production of poly-Si feedstock used in generating photovoltaic (PV) energy, and platinum and iridium used in electrolysis.

Mining, and using cobalt and lithium in battery manufacture, also present many challenges in terms of availability and working conditions. Imec has an important role to play here. Indeed, the technological choices we make in our research have major consequences when upscaling in collaboration with industry. That's why the choice of the right materials and less use of scarce materials in our research is crucial.

Using imec's nanomaterials to reduce the cost of green hydrogen through electrolysis.

Currently, the chemical and steel industries mainly use 'grey' hydrogen, produced by steam reforming. In this process, natural gas and high-temperature steam are combined, producing CO_2 as well as hydrogen. As part of EnergyVille, in collaboration with KU Leuven, researchers in 2022 demonstrated that imec's nanomesh material improves the current density of nanomesh electrodes by a factor of 100 compared to current standard materials. Our material is therefore more than suitable for electrochemical applications, such as electrolysers producing green hydrogen.
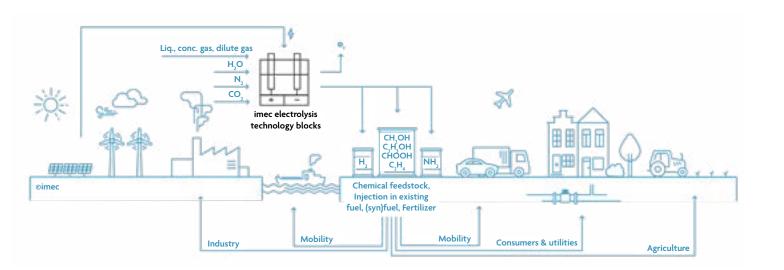
In order to focus heavily on green hydrogen production, imec, VITO (both partners in EnergyVille), and industrial pioneers Bekaert, Colruyt Group, DEME and John Cockerill jointly founded Hyve in 2021. Hyve aims for cost-efficient and sustainable hydrogen production on a gigawatt scale. This 'green' hydrogen is produced by electrolysis of water and using renewable energy. Investments were made in this through Flemish Resilience in 2023, and systems installed in the EnergyVille labs to further scale up imec's nanomesh production.

Reducing CO_2 emissions in industrial processes through imec nanomaterials

Due to, among other factors, solar panels and cars that run on green electricity, CO_2 emissions can be reduced quickly in the transport and construction sector. But in other industrial sectors such as agriculture and the steel and cement industries, this kind of rapid decrease is less realistic. To meet the Paris Climate Agreement goals, these sectors need a solution that actively removes CO_2 from the air. The gas is then reused (circularity) to produce organic molecules needed in the chemical industry.

Imec is working on this as part of Energyville through the 'Power-to-Molecules' project, referring to technologies that can convert CO_2 captured from the air (or as a waste stream from an industrial process) into renewable fuels and chemical building blocks. These can then be used as basic components for the chemical industry, the energy sector and agriculture. This fuel, also known as e-fuel, is an important step towards making aviation more sustainable.

Contributing to the electrification of the transport sector through solid-state battery technology

Through its research and development on solid-state battery technology, imec contributes to the **electrification of mobility**. Regarding storage, the focus is on innovative solutions for mass electrification of mobility via solid-state lithium-metal batteries. These batteries have superior energy density, improved safety, and a manufacturing approach compatible with current industry practices. The technology imec has developed in this area over the past ten years was successfully transferred to the imec spin-off SOLiTHOR in 2022, with the aim of further development and commercialization. In the past year, SOLiTHOR's technology has made solid progress. Because its technology enables high energy density and guarantees a high level of safety, SOLiTHOR focuses primarily on the aviation industry.

Focusing on photovoltaics as a dominant green energy source

The availability of cheap electricity through **photovoltaic** generation is a crucial factor in a successful energy transition, and is why imec research has focused for decades on improving its efficiency, lifespan, and sustainability, while reducing costs. This is partly achieved through research into innovative cell and module technology. High efficiency is made possible through cost-effective tandem and triple-junction cells for terrestrial applications. Work is ongoing to make the technology compatible with the TeraWatt era by reducing the use of scarce metals and through PV product circularity, with imec partnering in an international consortium to evaluate PV panel reuse.

In July 2023, one of the PV-related studies led to the creation of Enfoil, an imec and UHasselt spin-off developing flexible solar panels. The panels are just a few millimeters thick, extremely robust, and can be perfectly integrated into all kinds of surfaces. Unlike standard silicon solar panels, these thin-film solar cells are available in every possible shape and size. This means that Enfoil can undertake to install or integrate the solar cells on surfaces such as trucks, buildings or tents where, previously, those who wanted to integrate solar panels on this kind of surface were on their own.

Discussions with the industry to bring Enfoil's thin-film solar cells to the market are ongoing and, for the moment, the focus is on the logistics sector. We are seeking to integrate the solar films on truck roofs and sidewalls, so that they can feed the truck sensors and track-and-trace systems, saving battery power or, where there's a lot of sunlight, even charging the battery.

In a future where using renewable energy sources is normal, transportation and the required voltage conversion associated with this will increase dramatically. Due to its higher conversion efficiency and therefore lower efficiency losses, gallium nitride (GaN), which has many advantages as a power conductor, can play an important role in transporting renewable energy. In addition, its higher switching frequency means that the converters for the chemical conversion to renewable energy can be smaller and therefore require less material to produce them.

EnergyVille makes energy transition a reality

For most sustainable energy projects, imec is a partner in EnergyVille, a collaboration which also includes KU Leuven, UHasselt, and VITO. It assists governments, businesses and citizens with broad expertise and groundbreaking technologies in the transition to a sustainable energy system.

This energy system should operate as much as possible on renewable energy sources such as solar and wind, and should match supply and demand locally and in a decentralized manner. It should also rely mainly on electricity as an energy vector, with smart links to other carriers such as heat and hydrogen.

As a result of blazing fast technological developments, this system is rapidly becoming a reality. It is EnergyVille's task to further develop and link the technological elements from a multidisciplinary and integrated vision.
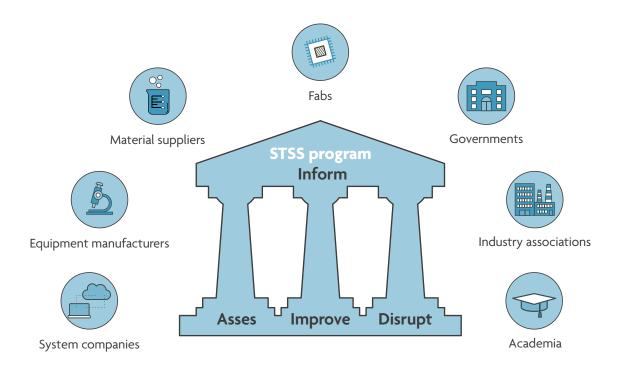
Within EnergyVille, imec mainly works on solar energy, energy storage, and power electronics both at the Leuven site and at the EnergyVille site in Genk. In Leuven, the focus is on proof-of-concept of highly innovative materials and components using imec's extensive nanotechnology knowledge and interface control. In Genk, imec participates in the upscaling of various technologies so that the energy transition can be achieved faster.

"2023 confirms the need for an energy transition in the energy, industrial, and transport sectors. Only in this way will our societies be more resilient to geopolitical shocks. But in the current European context, this is not self-evident. Compromises, for example in mining, will certainly be needed."

Prof. Dr. Jef Poortmans, imec fellow and energy program director and EnergyVille R&D coordinator

4.1.2. Research to improve the ecological efficiency of chip production

Digital solutions can be used to tackle environmental and climate issues. That's why semiconductor technology is an essential ingredient for a more sustainable future. But what about our industry's own environmental impact? Imec estimates that IC production will account for 3 % of total greenhouse gas emissions by 2040. This is partly due to the industry's growth, but also because the process behind each new technology node is becoming more complex and energy-intensive. As well as the additional increase in CO_2 emissions, an 8 % combined annual growth in production volumes is expected between 2020 and 2030. So it's clear that the semiconductor industry needs to step up a gear to reduce its carbon footprint.

Fabs

Material suppliers

Governments

Equipment manufacturers

Industry associations

System companies

Academia

STSS program
Inform

Asses **Improve** **Disrupt**

Let us not forget that the microchip industry has other ecological consequences than its contribution to climate change. It also causes high water consumption, depletion of abiotic raw materials, and generates e-waste.

To address all of this, imec created the three-pronged Sustainable Semiconductor Technologies and Systems (SSTS) program, translated into four ambitions applying to the entire ecosystem:

- Documenting the environmental impact of future technology production for imec research programs on logic, memory, packaging, and radio frequency (RF) technologies.

- Integrating environmental impact research into all current research programs.

- Exploring the principles of material circularity and chip life cycle assessment to increase recycling and reuse opportunities.

- Sharing knowledge about the environmental impact of imec's production of semiconductor technology with our partners and the general public in a secure way, while respecting the sensitivity of the data.

The SSTS program: assess, improve, disrupt, inform

Most semiconductor companies endorse the same 'net-zero' ambition by 2050, and many are already making significant efforts to monitor and reduce their greenhouse gas emissions. But no company can achieve this ambition alone. It requires a joint effort from the entire ecosystem.

As a central hub in the semiconductor ecosystem, imec established its Sustainable Semiconductor Technologies and Systems program in 2021. The program's approach can be characterized as three pillars under one roof.

Assess

The first priority in understanding the impact of integrated circuit (IC) manufacturing of more advanced technologies is to close a glaring knowledge and data gap and properly assess all the data. This is achieved on the basis of a bottom-up analysis of the individual process steps.

Imec uses data from its own 300mm fab, supplemented with information from its ecosystem of material and equipment suppliers. In so doing, imec is constantly working on consolidating databases for process equipment, recipes, infrastructure, and libraries of process flows. The imec.netzero software platform combines all the data to achieve a quantified, bottom-up understanding of IC production's environmental impact.

Improve

Because imec.netzero identifies the most high-impact issues, partners in the SSTS program can handle them by adapting existing and future process flows. At the beginning of 2023, 17 'improve' projects are ongoing and 15 projects are defined, with the ongoing projects including three on fluorinated gases (F-gases), per- and polyfluoroalkyl substances (PFAS), and their replacements. One of the 'improve' projects is the three-pronged strategy for lower emissions during etching: stack optimization, process optimization, and new molecules.

All projects are evaluated through small-scale projects at imec fabs or partner facilities.

Disrupt

To improve semiconductor production sustainability in the long term, it will not be enough to adapt current processes. That's why we're also looking at revolutionary new technologies that result in:

- smaller materials footprints,
- reduced impact of the use phase, and
- improved material circularity.

Inform

This fourth element acts as a roof over the three pillars, because imec feels it has a duty to share knowledge gained in the SSTS program with the general public. That's why we launched a publicly accessible version of our imec.netzero virtual fab in November 2023.

In 2023, we also sounded the sustainability bell at more than a dozen international conferences, including IEDM, ISSCC, SPIE Advanced Lithography, and Semicon. We also organized three successful roundtable sessions where program partners openly shared their sustainability vision, and we made sure that SSTS program activities results received a lot of media attention.

The SSTS program ecosystem

The SSTS program's ecosystem consists of an impressive list of partners: fabless and systems companies including Amazon, Apple, Google, Meta, and Microsoft; IDM companies and microchip manufacturers including GlobalFoundries, Rapidus, Samsung, and TSMC; equipment and materials suppliers including Applied Materials, Air Liquide, ASM, ASML, Lam Research, SCREEN, and Tokyo Electron, and facility and infrastructure companies including Edwards and KURITA.

Three of these partners joined in 2023, with new partners joining in 2024. The interest of these leading semiconductor companies in SSTS underscores the support for a sustainable focus throughout the industry's supply chain. The collaboration with these companies also provides the necessary funding for forward-thinking R&D projects helping achieve the chip industry's technological and sustainability goals.

A public version of imec.netzero supports the industry in reducing its environmental impact

In November 2023, imec launched a public version of imec.netzero, a 'virtual production fab', developed in 2022. It provides a quantified picture of the environmental impact of the production of large volumes of integrated circuits (ICs) for various technologies, including future technologies not yet in production. For example, it measures energy and water consumption, the impact of material choices such as rare minerals, and greenhouse gas emissions. With this web app, imec gives users a lot of options to parameterize the virtual fab models and adjust them to boundary conditions. The results can be examined with a high level of granularity. In this way, imec aims to help identify and classify high-impact environmental challenges in the industry.

In 2023, imec.netzero was enriched with data on logic, memory, and 3D packaging technologies. Bills of material and their impact were also fully characterized and made available in imec. netzero and RF technologies have been added to the web app. Compound semiconductors perform strongly at high frequencies, but with a potentially high emission cost. Therefore, power-performance-area-cost-environmental (PPACE) analysis can help with wafer selection and subsequent integration. Finally, an IC packaging model was added.

The launch of the publicly accessible version aims to support the industry in reducing its environmental impact beyond the semiconductor supply chain. The public version shares high-level information and thus gives the wider public the opportunity to gain more insight into the environmental impact of IC production. It uses the same fab models and process databases as the private version of imec.netzero, but offers more limited options.

The web app provides unique insights into data that are otherwise inaccessible to the public. For example, visual presentations of climate change (CO_2 emissions), electricity consumption, and total water consumption can be generated for multiple logic technologies (from N28 onwards). This can also be achieved by manufacturing in different geographical locations.

"As with most other industries, Scope 3 emissions account for more than 80 % of our company's carbon footprint. That's why we need to pay more attention to these types of emissions in our efforts to achieve zero CO_2 emissions. But a Scope 3 emission for one company can be a Scope 1 emission for another, so it's crucial to have a dialogue across the value chain. Much more research and funding is also needed, because developing new chemicals and implementing them in the value chain takes a long time."

Sri Samavedam, imec senior vice president

4.1.3. Developing solutions that use energy more efficiently

Imec and the microchip industry's scaling-up activities are leading to greater efficiency, but converting this into a computational and system architecture is an additional challenge, since continuing to scale current solutions linearly is no longer a viable option.

Imec is therefore developing solutions for more energy-efficient semiconductor products and systems, and to improve AI's energy efficiency.

More energy-efficient microchips and systems

Today, at least 75 % of the carbon footprint of technological devices such as mobile phones, laptops, and TVs is determined in the manufacturing phase, a major reason to focus on energy efficiency and process emissions in semiconductor products and systems when researching the environmental footprint of semiconductor technology.

That's why imec is working on a separate energy efficiency roadmap running parallel to the general technology program roadmaps. Using a given functionality on the imec logic technology roadmaps, the teams quantify the potential for energy improvement. For this research, imec is only a link in the total value chain but, as a neutral player, it takes a leading role. We are, in fact, not looking only at quantifying emissions from our own process, we are building an ecosystem to make data sharing on emissions in the value chain easier.

Improving AI's energy efficiency

Continuous performance improvements in computer chips, driven by what's known as Moore's Law, have resulted in a more efficient society. Recent developments, including in the field of AI, are also leading to a range of new possibilities. But continuing to scale AI solutions in the same way as computer chip development is not feasible, principally because of the huge energy consumption caused by AI models.

Until the beginning of 2023, chatbots, for example, were relatively dumb. You asked a question, got an answer, and that was it. Tools such as ChatGPT, so-called 'large language models', are a lot smarter. To build and train one AI model, you need thousands of servers that need to keep running for up to a year. As a result, they cause prodigious carbon emissions. For example, to train GPT-3, ChatGPT's predecessor, CO_2 emissions equivalent to those of a car driving to the moon and back, were needed.

There are currently several AI models. To perform even better, these models need to be made more complex — and therefore larger. Until 2010, a typical AI language model doubled in size every two years — today it is every two months. Moreover, the energy consumption while using AI applications is enormous. For example, if you ask Siri to turn off the lights, your consumption will be higher than if you leave the light on for over an hour.

Continuing to scale up AI models and applications in this way is therefore clearly no longer possible. If we don't do things differently fast, AI will soon hit a brick wall.

Co-design

One of the solutions to control the energy consumption of AI lies in the innovative redesign of AI hardware and software. By perfectly aligning AI hardware and software during the development process, we optimize their energy efficiency. This co-design requires interdisciplinary collaboration at various levels, but the results pay off. Tests show that co-design can lead to AI efficiency improvement by a factor of 1,000.

Decentralizing AI computing power

Another option to reduce AI's energy consumption is through edge AI, using artificial intelligence at the 'edge' of a network, where the data is generated, typically by sensors. In practical terms, this means that the calculations required to apply AI happen in decentralized rather than central data systems. An obvious advantage is that decisions and actions can be taken more quickly, since the information is close to the local sensors. There is no longer any need for communication between the sensors and the cloud, which means less bandwidth is needed, resulting therefore in lower energy consumption.

In healthcare, for example, edge AI can offer solutions for wearables with health sensors, such as those being developed at Holst Center in Eindhoven in the Netherlands, by imec and TNO. The data are collected and processed at the sensor, eliminating the need for a back-and-forth to the cloud. Imec is also working on AI models that can decide for themselves at any time whether it is best to run centrally or decentrally, an ideal solution to keep an AI application running optimally, while keeping energy consumption low. In fact, decentralized processing consumes only somewhere between 1/100th and 1/1000th of the energy used by processing in a central data center.

What does the 2023 imec.digimeter tell us?

The imec.digimeter has been mapping trends in the ownership and use of media and technology in Flanders since 2009. We also use the digimeter to gauge how Flemish people feel about all these technological developments.

The latest results show that, although Flemish people are increasingly familiar with the concept of AI, fewer than half succeed in explaining exactly what AI means. Another striking finding is that income level plays an important role in the interest in artificial intelligence, and almost half of Flemish people are concerned about the impact of AI on their privacy. Finally, there's a feeling prevalent among both young and old that technological innovations follow each other too quickly for the average Fleming. In other words, the digital divide is widening. Time to do something about it!

AI for energy

The energy transition means a heavier load on our electricity grid and costly investments. Due to the variable production pattern of most renewable energy sources, there is a need for electricity storage systems, such as batteries or conversion to green hydrogen, and for the ability to time-shift part of the energy consumption. Renewable energy sources are also often spread across our energy system. As a result, we need to be able to monitor and predict how we use our energy grids in real time much more than before. Finding ways to do that is crucial.

Digital technologies such as the internet of things (IoT) and AI can help. At imec, we focus on developing scalable, practical, and high-performance techniques to optimize and flexibly control the various elements of a system — homes with solar panels and batteries, heat pumps, and charging stations perhaps — as optimally and flexibly as possible. For buildings, this means limiting energy consumption without sacrificing comfort.

Imec also develops solutions for preventive maintenance of renewable energy sources and major consumers of renewable energy — problems are detected and addressed more quickly, resulting in less energy loss.

SensAI

Through the SensAI project, we are gaining more insight into the architecture for autonomous driving, specifically focusing on the capacities of the necessary sensors in relation to the target application. With these sensors, we are progressing towards increasingly better and more efficient perception systems.

Sensor fusion enhances the effectiveness of autonomous systems by integrating data from various sensors, resulting in more accurate and reliable information, thus making the vehicle safer. This is especially valuable in complex conditions such as bad weather or variable lighting conditions, where individual sensors may have limitations. In SensAI, the added value of each sensor is also accurately determined, optimizing signal processing, ensuring safety, and minimizing energy consumption.

Photonic chips

Integrated photonics, or photonic chips, promise not only fast communication, but also lower energy consumption. Photonic chips do not generate heat like traditional chips and therefore do not require cooling. As part of the PhotonDelta growth fund program, imec is developing photonic chips for applications in data telecom, mobility, and food, among others.

Efforts are being made in micro-transfer printing and flip-chip process technology for chiplets, enabling large volumes of 5G components based on indium phosphide to be produced. As a result, large-scale applications with more energy-efficient photonic chips are within reach.

Since the large-scale use of AI, there has been increasing concern about what should happen to the personal data generated by an AI system. The idea that everyone should have control over their own data is gaining ground. That's why imec has been working on Solid for a number of years, in collaboration with Tim Berners-Lee, inventor of the World Wide Web (WWW).

The basic idea behind the project is to separate apps and data from each other. People can store their personal data in a decentralized data vault, allowing them to decide with whom they share their personal data. In this way, personal data are no longer held by a handful of large players, but become reusable raw material for all organizations you trust. For example, you could share your personal medical data and the data from fitness tracking devices with the medical or sports institution of your choice. Such a personal data vault would level the economic playing field again and offer significant opportunities for Flemish companies.

The Solid vault technology is already fundamental to Athumi, a public company that stimulates secure data exchange and data collaboration between consumers, businesses, institutions, and governments.

Making artificial intelligence smarter today requires a huge amount of computing power. As a result, an AI system can almost only be trained by the largest companies or organizations on our planet. The question of how we want to build an AI system is therefore becoming more important. How do we do that ethically, and to what extend do we let commercial interests influence it?

"AI will fail if it doesn't become sustainable. After all, the future smartphone will not be bought for its camera, but for how sustainable it is. Through its research, imec ensures that AI consumes less energy, becomes cheaper, and therefore remains sustainable and accessible to everyone."

Prof. Dr. Steven Latré, imec vice president R&D machine learning and AI

4.1.4. Leveraging our digital and nanotechnology competences to enable smart applications that contribute to a thriving society (health, cities, logistics, mobility, agrifood)

How do you feed 10 billion people in 2050 sustainably? How do you keep people healthy? How do you reduce the impact of humans on the environment? Developments in nanoelectronics and digital technology, such as sensor miniaturization, artificial intelligence, and digital twin applications, are leading to unprecedented opportunities for society. Collaboration and knowledge exchange between companies, schools, universities, research and social institutions, and citizens are crucial in this respect.

Imec aims to leverage its expertise to develop disruptive applications that contribute to a sustainable society, help achieve the European Green Deal's climate objectives, and enable a more fine-grained monitoring of sustainability parameters.

1
Develop applications that have a **disruptive impact** on society, thereby rendering it **more sustainable.**

2
Develop applications that contribute to the **climate goals** set by the **European Green Deal.**

3
Develop applications that facilitate a more fine-tuned **monitoring** of **sustainability parameters.**

A few examples:

Agri&food

- In the **Indoor Autonomous Farming** research program, OnePlanet Research Center, a multidisciplinary collaboration between Wageningen University and Research (WUR), Radboud University, Radboud University Medical Center, and imec, is developing an edge-based control system that regulates the climate in greenhouses based on real-time data collected in the greenhouses. Innovative sensor and camera systems measure physiological processes in crops and record the 3D structures of plants. This data can be used to optimize the greenhouse climate and make the cultivation system highly autonomous.

- In this program, OnePlanet combines expertise in high-tech sensor systems with an in-depth knowledge of data sciences, machine learning, agriculture, and food. In the long term, this enables autonomous, local and sustainable production of fresh and healthy food in densely populated areas, reducing the distance between producer and consumer.

- The **Digital Orchard** research program collects 3D scans of fruit trees in orchards using LiDAR camera technology. Data and images are combined with knowledge about plant models to build a digital orchard (digital twin). The data are also used to develop virtual reality (VR) and augmented reality (AR) applications for training purposes. Unskilled workers, for example, can learn how to prune using a VR application. In the longer term, the digital orchard will make it possible to develop innovative robot systems for specific and complex tasks, such as pruning, picking, thinning, and spraying. Using these autonomous robots in fruit orchards will ease heavy labor and reduce labor shortages in the future. These advancements ensure sustainable, safe, and stable food production.

Environmental sensing

As part of the environmental sensing research program, and on behalf of various provinces in the Netherlands, OnePlanet Research Center collaborates with several research parties to better measure air quality and nitrogen precipitation (nitrogen deposition). Through objective data on nitrogen emissions from the agricultural sector and its deposition in nature reserves, we put farmers more in the driving seat, with a better understanding of the impact of their activities. With these insights, nitrogen-reducing solutions and instruments can be sought. OnePlanet is currently participating in four local pilot projects, a validation study, and one regional and one European project.

Through widening its focus to the photonic measurement of other greenhouse gases such as CO_2, methane, and nitrous oxide, the project is being expanded to other regions and other sectors in 2024. After all, sensors with integrated photonics are applicable in the agricultural sector as well as sectors such as mobility, communications, and the food industry.

Making sustainable impact

Health

OnePlanet is also doing a lot of work in healthcare. In addition, imec is strongly committed to bioconvergence because, when the worlds of chips and biology converge, a new world of applications emerges.

A few examples of imec's contribution to creating a healthier world:

- In **Ingestibles for Gut Health**, OnePlanet is developing an ingestible smart pill containing minuscule sensors connected to a digital platform with advanced chips. In its transit through the body, the pill will continuously send data to the digital platform, providing doctors and scientists with insights into what is happening in the intestines without the need for invasive and time-consuming medical examinations. Which nutrients are absorbed where? For people with Crohn's disease, for example, which parts of the intestine are most affected? What happens in an irritable bowel? A clinical trial with volunteers is currently ongoing.
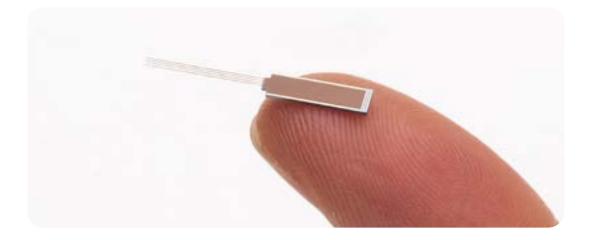
- OnePlanet measures and determines dietary patterns using artificial intelligence. Based on these measurements, it advises companies on their strategic decisions, for example about eating behavior or the effect of packaging.

- Imec is working on ways to make medicines much more affordable. Medicines are now often very expensive and development time is so long because preliminary tests, involving animal testing or animal modelling, often do not correlate with results in humans. With **organ-on-chip**, that's about to change. On a chip plate of only 1 mm², thousands of electrodes send signals to and from a human cells — such as liver or brain cells — placed on it. In addition, at Holst Center in Eindhoven, imec is developing new biochemical sensors that provide insights into these complex biological systems. This allows us to mimic

an organ, such as the brain, while simultaneously reading the signals from the organ. In this way, for example, the characteristics of Parkinson's disease can be deciphered. Additionally, a large number of tests can be carried out simultaneously on the miniaturized device, thus speeding up pharmaceutical research. Tailor-made treatments can also be tested, including the impact of cancer treatment on an individual patient's heart.
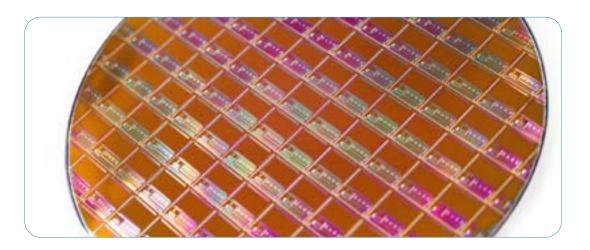
- One of the most successful technological developments of the past decade are **neuropixel probes**. These needle-shaped shafts, a few micrometers in size, contain thousands of recording electrodes and can be inserted up to 15 cm deep into the brain. Its application is of great importance for reading neurons and in research into common diseases. More than 900 laboratories worldwide are currently using the technology in their research.

- Because of the ever-shrinking components on a computer chip, imec is now also active in synthetic biology. Based on biological building blocks such as DNA, we are creating artificial systems. For example, imec has developed a method using computer chip technology to assemble DNA strands on a large scale and in parallel. These strands can, for example, be used in biocomputing for data storage (so-called DNA storage).

- In cell and gene therapy, imec has developed a number of building blocks. At chip level, these building blocks are used to sort individual cells, integrated biosensors, and enzymatic assays, among others. In the long term, the combination of these building blocks will lead to a dramatic reduction in the cost of innovative cell and gene therapies, such as CAR-T cell therapy.

Imec takes a similar approach to proteomics, developing a platform using nanopore technology to provide the necessary functions to enable next-generation sequencing at chip level, for example. Cell and gene therapy also facilitate the diagnoses process. For example, proteins — often a biomarker for disease — can be detected in very low concentrations in a patient sample. Resulting from cell and gene therapy, cancer cells are also better mapped, making tailor-made immunotherapy a realistic prospect.

Mobility

The Automotive Chiplet Program is building the car of the future.

In the 20th century, the automotive industry, in particular, left its mark on society and our economy. But today, horsepower is no longer a measure of a car's power, it's the teraflop. Cars of the future will mainly be powerful computers on wheels. This shift in focus is not just about driving itself, but about causing fewer accidents, autonomous driving, and carbon-free driving, among other things.

For an industry that has been operating in the same way for more than a century, that means quite a significant change. The automotive sector has no answers to these kinds of questions and has little experience with sensors such as LiDAR (LIght Detection And Ranging technology), radar (motion detection technology) and ADAS (advanced driver-assistance systems). The automotive sector also has very strict standards. A car must typically last an average of 20 years. In the microchip industry, however, technology is changing rapidly. Still, the automotive sector looks to the chip industry for solutions.

As a world leader in research on advanced 2.5D and 3D system-on-chip integration, imec took the lead in a chiplet standardization initiative with the automotive industry in 2023 with the Automotive Chiplet Program. Despite stringent standards in the automotive industry, the aim is to improve cooperation with the sector and stimulate innovation in chiplets for automotive applications. In this way, imec is helping the automotive sector make the car of the future a reality.

In 2023, we organized two well-attended workshops on chiplet standardization. The entire automotive ecosystem was represented and participated in discussion on the common challenges of chiplets.

OpenEd introducing students to digital and chip technology

As part of the OpenEducation (OpenEd) program, the OnePlanet Research Center develops learning workplaces for students of different fields of study and levels. The students are introduced to digital and chip technology and learn to collaborate in interdisciplinary teams.

The research center, for example runs a program where students from vocational education collaborate on assignments related to digital technology and artificial intelligence to be better prepared for the professional world after graduation. In 2023, more than 500 students participated enthusiastically in the program, which is continuing in 2024.

Chris Van Hoof, imec vice president R&D and general manager OnePlanet Research Center, spoke at the Love Tomorrow Conference, part of Tomorrowland in Belgium, about the future of our health.

Making sustainable impact

"Even if you're a general practitioner, a farmer, or just a citizen, rather than a data scientist, you should have safe access to data and be able to interpret it correctly. Everyone should have the knowledge to handle data correctly."

Chris Van Hoof – imec vice president R&D and general manager OnePlanet Research Center

OnePlanet – technology for a better future

The OnePlanet Research Center, a multidisciplinary collaboration between Wageningen University & Research (WUR), Radboud University, Radboud University Medical Center, and imec, focuses on fundamental and applied research, groundbreaking innovation, and disruptive product applications in 'precision health, nutrition and behavior' and 'precision agriculture, food and environment'. The latest chip and digital technologies offer unprecedented opportunities to create a society in which everyone can live a healthy life and have access to healthy and sustainable food.

The societal impact commission at OnePlanet Research Center regularly evaluates the current and expected social impacts of the OnePlanet program on our agriculture, our food, the environment, preventive health, and our behavior. It also assesses the innovative capacity of the program, its impact on equal opportunities, our education and the labor market, our economy, and the business climate. Where necessary, the committee asks for adjustments to the program.

4.2 Venturing

Entrepreneurship and innovation are not something you do alone. You do this by working with others and by supporting them to develop their ideas. That's our ambition with the deep tech venturing and imec.istart program.

In our deep tech venturing program, we create spin-offs that use imec-developed deep tech technology. We support these spin-offs in implementing this technology in disruptive products and by setting up contacts with deep tech venture financing. The imec venturing team also supports imec initiatives ready to commercialize their technology as a spin-off and transform into a venture. Through the imec Innovation Challenge, we encourage our own employees to come up with new technologies. Additionally, imec supports existing external start-ups through imec.istart and guides them towards successful development and upscaling.

4.2.1 Creating and supporting start-ups with a positive impact on society

In addition to its own research, innovation, and technological developments, imec uses its expertise and extensive international network to support technology companies both large and small, spin-offs, and ventures, in their innovation process.

With this support, we have three ambitions:

- to attract, grow, and embed talent in an accelerating and inclusive venture ecosystem;

- to create start-ups and spin-offs and guide them in evaluating potential ESG risks and opportunities; and

- to create ventures that aim to have a direct and positive ESG impact on society.

To achieve these ambitions, we integrate sustainability into the day-to-day operations of our venturing and acceleration programs. Our teams build expertise and pass it on to the entrepreneurs they support. They carry out an ESG screening of the company, for example, and assess its ESG risks, as well as the positive and negative impact of the company.

The assessment also looks broadly at the UN Sustainable Development Goals (SDGs). Additionally, we provide tailor-made training to ventures, start-ups, and spin-offs on essential aspects of sustainability, such as the impact of CSRD legislation. This makes their ESG reporting more transparent, making it easier to attract investors and grant aid.

Sustainability embedded in the venturing process

The imec venturing and acceleration efforts were running at full speed in 2023. Sustainability is now clearly integrated into the entire imec innovation and venturing process.

ESG from initial idea to business plan

Right from the initial call for ideas, we assess the ESG impact of the potential venture. Through three simple questions, the imec venturing team gauges the sustainable impact of a new technology. The aim is to raise awareness among potential ventures about the importance of sustainability and guide them towards a positive ESG impact. During the enrichment phase, we provide relevant ESG information and conduct a brief ESG impact analysis. The venturing team identifies key risks and advises venture candidates on trajectories that they can investigate further.

After the enrichment phase, selected ventures receive six to nine months of process guidance and financial support in a 'Timebox'. This includes a sustainability structure to meet investor criteria regarding ESG. The ESG impact is analyzed and scored based on a number of KPIs, such as potential energy consumption, and diversity scores. ESG indicators are included in the business plan at the venture creation phase. Since sustainability has been taken into account right from the initial idea, there is little need for adjustment when the venture is eventually created.

New imec ventures in 2023

In this way, 47 of the 83 'calls for ideas' in 2023 received support from our venturing team during the enrichment phase, while 19 of these received process guidance and financial support in a 'Timebox'. Nine promising initiatives are still active or supported through an internal timebox.

Four ideas eventually led to new spin-offs:

- Axithra is a spin-off of imec and Ghent University developing a new technology to accurately measure medicine concentrations (initially antibiotics) in the blood. This kind of technology paves the way for personalized and optimized care. €10 million in seed capital was raised from an international syndicate of investors led by imec.xpand and Kurma Partners. Noshaq, Wallonie Entreprendre, and Werfen Diagnostics have also invested in the company.

- Enfoil is a UHasselt-imec spin-off designing foldable, extremely robust solar panels only a few millimeters in thickness, which can be integrated onto various surfaces.

- Specifix is a UAntwerp and imec spin-off developing an AI-based tool to support orthopaedic surgical procedures. The AI tool visualizes how the skeletal structure can be reconstructed, starting from individual bone fragments after trauma. This should lead to better outcomes after surgery.

- IoSA is an UAntwerp and imec spin-off developing solutions monitoring animal behavior to support research, nature conservation, and agriculture.

"With the imec venturing team, we are planting a seed in the industry of the future. We ensure that sustainability is woven into the core of deep tech organizations. Sustainable deep tech innovation is gradually becoming a reality. So, we're at the beginning of a wave of 'sustainability by design.' "

Mario Huyghe, imec senior venture development manager

The imec Innovation Challenge: a first seed

Many imec ventures have their origins in the imec Innovation Challenge, a biannual call from imec's strategic development and venturing teams in which all employees and students working at imec can participate. In 2023, there were more than 80 submissions. The aim is to discover new bottom-up innovations with break-through potential. Most of these deep tech ideas are at a very early stage, where help from imec is beneficial in their further development to the point where the technology can go to market.

Innovative ideas ready to tap into a larger market potential are prepared for spin-off through a Timebox guidance process by the venturing team. Ideas with significant potential, but still very far from market and still needing fundamental research and development, are guided by the strategic development team to a higher technology readiness level.

Thinking about ESG impact

Everyone participating in the Innovation Challenge delivers a 'friendly pitch'. This is followed by a three-month enrichment period, during which the market potential is examined. Participants then present what they have learned in a selection pitch. Ideas still far from market require further research and development. The participants also present their technical plans during this phase and, at this point, we select the issues with which we want to continue.

Because early-stage topics are still far from market, it is not easy to estimate the exact ESG impact of the ideas assessed. Nevertheless, at this stage we can present participants with a limited questionnaire on the sustainability of their idea, whose main purpose is to induce further thoughts on the issue.

Imec itself also uses a list of sustainability criteria to either filter out the issues presented or to award an ESG score, just as we do at the very beginning of new doctoral research. We determine which of the SDGs a research project contributes to, so that candidate researchers can take this into account when making choices.

Hyve (a joint venture on hydrogen production), SSTS (a research program on sustainable production of logic and memory chips), quantum computing, and DNA-based data storage, are just a few of the research projects to have emerged from the Innovation Challenge.

Imec.istart the number one digital start-up accelerator

The success of imec.istart became clear in May 2023, when it was chosen by UBI Global as the world's number one accelerator for technology start-ups affiliated with a university. UBI Global is the Interactive Learning Community for Business Incubators and Accelerators. While the focus of imec's venturing activities is on setting up its own spin-offs, imec.istart is focused on supporting many spin-offs and externally developed digital start-ups.

For these start-ups, sustainability is usually still in its infancy. When selecting start-ups, we still mainly get traditional business cases, but there is a gradual shift taking place, partly because of questions from investors and business partners about the positive impact of their solution and the ESG risks, and partly because some start-ups are founded as a solution to an environmental or social issue.

The imec.istart selection procedure

Selection

High level risk and impact evaluation with focus on knowledge & materiality.

Acceleration program

ESG knowledge building and impact measurement.

Alumni

Network and knowledge sharing.

In our selection process, we assess how well founders have understood and articulated their potential ESG risks and positive impact. In the acceleration program, we are increasingly training start-ups on the relevance and increasing importance of ESG in doing business. We raise awareness about ESG-related risks and opportunities, and give them basic tools and a framework for taking action through workshops and the use of templates. We also enable portfolio companies to self-assess and report on the ESG risks and impacts of their materials.

At the end of the process, we advise start-ups on ESG as a core part of their business operations, so that they take responsibility for their ESG performance and learn to identify business opportunities related to it, such as fundraising, and product.

Imec.istart in numbers

In 2023, €1,636,000 was invested in 21 new and 12 already established start-ups. Since imec.istart's inception in 2011, a total of €16.1 million has been invested, with the total number of start-ups in the imec.istart Fund portfolio now 166. Over the course of 2023, the total funding raised by imec.istart portfolio companies cumulatively exceeded €900 million, representing a leverage effect of x40, meaning that that for every €1 that imec.istart invests, the portfolio companies have attracted an average of €40 from other funding sources. Of the nearly 300 start-ups that imec.istart has supported since 2011, 48 have already made an exit, while 83% of them are still active today (including those making an exit).

2023 highlights

- In May, imec was named the number one tech start-up accelerator in the world. For 2024, and over the next few years, we are looking to coach our start-ups to further execute solid ESG strategies, we expect to become active in new countries, and look forward to the ESG performance of the first portfolio companies gaining access to the newly launched imec.istart Future Fund.

- In July, Pariter Partners and imec.istart announced a strategic partnership to support technology transfer and innovation ecosystem in Italy. These are our first steps in Italy.

- At the beginning of July, imec.istart, together with in4care vzw, took over the activities of BlueHealth Innovation Center (BHIC). The innovation center stimulated innovation and entrepreneurship at the intersection of technology and healthcare in Flanders. Imec.istart continues the early start-up coaching aspect of BHIC, while in4care continues to support healthcare organizations (mainly institutions) in their innovation process. The transfer does not affect the independent BlueHealth Innovation Fund (BHIF), which will continue to invest side by side with the imec.istart Fund in young HealthTech start-ups.

- The creation of a new Article 8 imec.istart investment fund (imec.istart Future Fund). Article 8 funds have environmental or social characteristics, but no sustainability objectives.
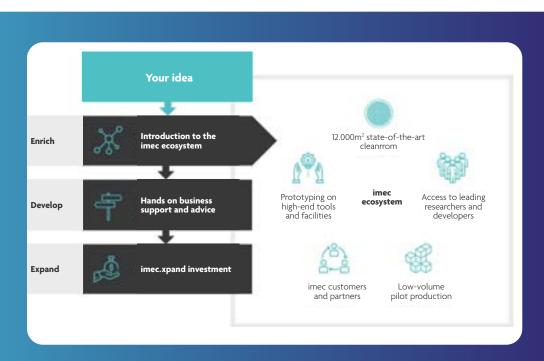
Imec.istart start-up receives the 2023 Trends Global Impact Award

The imec.istart start-up Turbulent won a Trends award on climate and energy and the 2023 Trends Global Impact Award. Turbulent develops resilient and cost-efficient hydropower turbines that power businesses and communities and inject energy into the power grid.

"In the world of tech start-ups, sustainability is still in its infancy. At imec.istart, we are well placed to raise awareness about ESG-related risks and opportunities in our community. And we see that there is indeed a gradual shift underway. We strive to continue increasing the positive social impact of the start-ups we support."

Sven De Cleyn, imec.istart program director

Imec.xpand supporting start-ups with their initial financing

As imec's global footprint grows, we want to have an impact on the ecosystems in which we are present. We assist numerous start-ups in securing their first financing through imec.xpand, an independently managed venture capital fund. The fund supports the long-term growth of start-ups through significant financial investment during the early and later stages of their development, through access to the imec ecosystem and business support and advice.
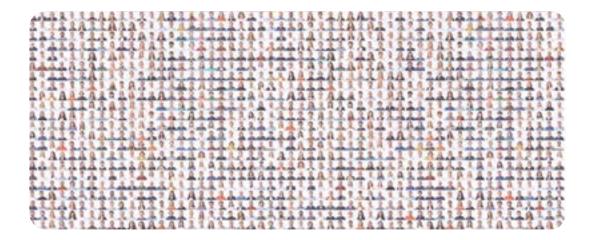
In 2022, the early-stage deep tech investment fund shifted up a gear. In March 2022, the second fund — imec.xpand II — was established. By the end of December 2023, funding commitments amounted to €300 million. The independently managed fund, which has been categorized as an Article 8 fund, closely collaborates with imec and invests in start-ups benefitting significantly from imec's knowledge, expertise, network, and infrastructure.

5. Working sustainably

5.1. With our people

5.1.1. HR policy at imec

The imec group has a total headcount of more than 3,081 contractual employees or 2,867 full-time equivalent (FTE). In addition, there are 2,526 non-contractual employees, including guest researchers and industrial residents participating in collaborative programs, doctoral students, temporary staff and consultants. The age distribution is relatively stable: 19.6 % are 50 or older, 11.5 % are under 30 and the largest group (68.9%) is aged between 30 and 50.

Sustainability also means that imec must pay due attention to its employees.

Exceptional people should be enabled to deliver exceptional results, and this is the starting point of our HR policy, which is based on the following strategic pillars:

- Our employees are resilient. We prioritize their health and well-being and enable every talent — especially critical and vulnerable talent — to grow.

- Our management leads as one team, facilitated by solid support and cross-departmental collaboration.

- The organization is effective and agile, ready for sustainable multinational growth.

Imec defines **4 solid values** driving imec teams in everything they do. They combine an intense focus on results, through passion and excellence, with an equally intense focus on people and culture through connectedness and integrity, encouraging employees to give of their best every day.

The **ethical code of conduct** complements imec's vision, its mission, and its values, serving as a guide for our daily activities, helping to manage ethical dilemmas and determine a course of action in problem situations. The code of conduct covers a wide range of issues, from integrity in research to social responsibility. While it is inherently understood within a European and Belgian context, the code explicitly underlines strict adherence to labor laws and human rights. The code also condemns child labor and modern slavery. Moreover, everyone has a duty to report any suspected violations, and suppliers must also follow the directive. Customers and partners are not yet required to adhere to this, but this is on the agenda for 2024.

In Belgium, **an employment regulation** applies and, in the Netherlands, an **employee handbook**. The employment regulation and employee handbook are attached to every employment contract. Changes are always discussed in the Works Council. Significant parts of the documents are devoted to the different work regimes: for part-time employees, shift workers, and others. They also contain clear instructions on permitted working hours, illness and accident, disciplinary actions, and safety-related issues such as clothing, raw materials, equipment, and tools.

In 2024, the implementation of a major, critical **time and attendance registration program** is on the agenda. This program, important for both employees and managers, includes logging work hours, overtime, vacation, project time, purchasing additional leave, recording work from home, and manager approval.

In Belgium and the Netherlands, the **Works Council** plays an important role establishing employee participation in HR policy. In Belgium, this is supplemented by **the Committee for Prevention and Protection at Work (CPPW)**. Both comprise management and employee representatives, but the Works Council has both financial and social powers while the CPPW focuses on welfare and safety, agreeing an annual action plan to promote employee well-being. The HR and EHS teams seek to be reliable partners with both the Works Council and CPPW. Every imec employee in Belgium is covered by collective labor agreements negotiated in the Works Council.

In 2023, the newly established **Belgian Joint Committee 335 (JC 335)** for services and support to businesses and self-employed people reached a first protocol agreement on issues such as time credit, bicycle allowances, job seeking, and education. As part of this JC, we are currently interpreting what this will mean for imec.

Other updates on social dialogue in Belgium:

- Preparations for the lead-up to the 2024 social elections have begun. Registered voters are voting for new representatives for both the Works Council and the CPPW.

- Joint working groups have evaluated Collective Labor Agreement 104 (CLA 104) on age-related human resources policies and have proposed a new and updated text.

- Imec's flexible bonus policy has been improved to create greater transparency and clarity about how it applies at imec. It will be further discussed before being finalized.

In 2023, we also transposed some **legislative changes** into our HR policy for Belgium:

- In collaboration with consultancy partner PWC, we implemented the new special tax regime for expatriates in 2022. In 2023, we closely monitored critical talent who were considering leaving us because of this new regime and took action where necessary.

- We are applying the new Belgian immigration procedure and providing feedback on any issues encountered.

- As a result of the labor deal legislation, a training plan and a right to training were introduced and we also provided for the right to digital discconnection.

- We are ready to implement the changes in legislation for time off starting from January 1st, 2024.

Lastly, we are preparing to change our employment conditions. Now that the expansion of the production site is operational and the construction of a new cleanroom (FAB) is becoming a reality, we are taking a closer look at structural flexibility – shift work and stand-by duty – combined with ad hoc flexibility. Is our way of working scalable and future-proof? What needs to change to support daytime and night-time operation with tightened cycle time objectives as well as the health and well-being of employees? The defined and validated 'shift work at imec' project will be implemented in 2024, and will change how we organize the beating heart of our work on campus - the cleanrooms.
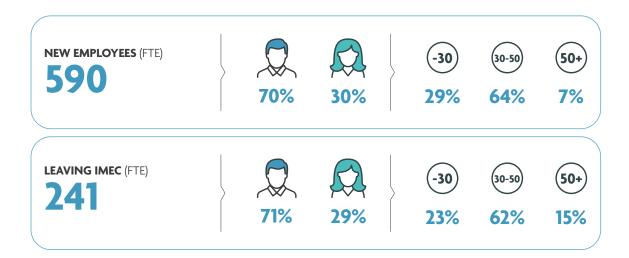
We aim to further harmonize the **imec international human resources policy** by streamlining processes such as performance and talent enablement and the bonus mechanism, although internal guidelines and criteria for these processes could differ, since they depend on local regulation.

What certainly helps is our better understanding of the **relationship between workload** and our **HR operations**.

What headcount or FTE do we need to manage everything from vacancies, cars, bicycles, promotions, cases, to reorganizations, for example? Understanding this gives us a better picture of our future needs as the organization grows, in Belgium and internationally.

By 2024, we seek to be even more efficient and **implement interactive Power BI reports** that are updated daily. An exit dashboard must be part of this too.

Analysis shows that 241 people (FTE) left imec in 2023, representing a total turnover of 8.4%. On the other hand, imec recruited 590 new employees (FTE) in 2023.

NEW EMPLOYEES (FTE)			-30	30-50	50+
590	70%	30%	29%	64%	7%

LEAVING IMEC (FTE)			-30	30-50	50+
241	71%	29%	23%	62%	15%

Workforce changes, new employees, and turnover (FTE) in 2023, all countries, on payroll

The three pillars of the HR strategy are further explored in this report. The first emphasizes our desire for our employees to be resilient and able to grow. We encourage this by ensuring a healthy work-life balance, promoting diversity and inclusion, and investing in engaged and talented employees. Pillars two and three address the role of management and the organization.

5.1.2. Promoting a healthy work-life balance

Imec seeks to be a committed and inspiring workplace, which is challenging in an international context and amid rapid growth. Imec also wants to increase individual resilience and cultivate a sustainable, stable workplace. This requires particular attention to workload, outdated procedures and tools, and any unclear agreements or communications. We gather feedback from our employees through surveys and, where there is stress, discomfort, or undesirable behavior, we are setting up easier access to assistance through a range of channels, contacts, and communication.

Our **welfare services** needed greater clarity and better management. We therefore developed a holistic strategy in 2023 involving our organization, management, teams, and individuals. The aim is to provide practical tools and create a healthy working environment with a framework for simplified recourse, and with specific activities jointly organized by HR and EHS.

We took actions to give appropriate support to as many people as possible through the right combination of internal, external, online, and personal channels, including a SharePoint and well-being dashboard, new well-being training courses and e-learnings, a Vitality Lunch&Learn for managers, and online and offline psychological support, such as Mindlab courses. The internal confidential counsellors received training and will be further supported in 2024 through peer assistance with our new external medical service.

In 2024, we will consider whether, and by whom, our current external employee assistance provider program should be replaced. We are also exploring ways to better train and raise manager awareness about their role in team member well-being.

In 2023, imec the Netherlands organized a well-being week featuring workshops, lectures, and activities such as massages and walks. This was an important step in raising well-being awareness, and in 2024 we would like to build on this and take it further. Awareness of desirable and undesirable behavior has grown in the Netherlands as a result of the discussions between confidential counsellors and each service.

The Belgian legislator introduced a new well-being measure as part of the labor deal, which we have since implemented: **the right to disconnect**. This has been added to the hybrid working policy, along with some additional measures on awareness and communication, training, team agreements, and imec-wide communication guidelines, for example, how to take holidays or work together across time zones without compromising the right to disconnect.

With all the new colleagues joining imec, extra office space is also needed, which will come with imec 6. In close collaboration with FAIN, we are creating the beating heart of this building and of our entire **Leuven campus, the 'marketplace'**. We are taking our daily and event catering to the next level in a pleasant environment, a place to collaborate, socialize, relax, have healthy delicious and diverse food and drink and, above all, to find each other. We are also reviewing our catering offering in 2024.
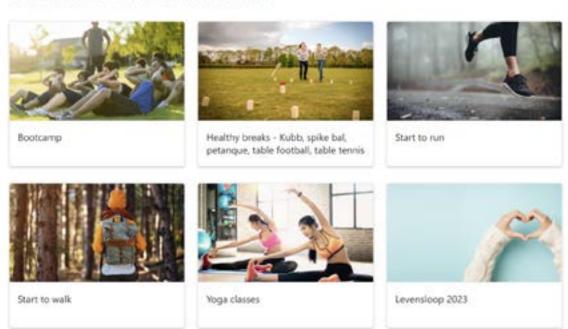
The HR Manager Center was launched in September 2023, after an extensive testing phase addressing queries from imec management on how to implement HR policies, processes, and tools, and what to do in challenging situations. The 215 cases since September prove that there is a need, and the HR Manager Center fulfils it with distinction. How appropriate it is to have launched this new center on the fifth anniversary of our HR Employee Center, since it builds on its strengths and successes. Since October 2018, the HR Employee Center has handled 50,000 cases, requests, and questions from imec employees.

Setting up the HR Manager Center, including two dedicated HR advisors handling manager queries, also means that the **HR business partner team (HR BP team)** maintains its high level support for the ever-growing organization. Because transactional matters are delegated, strategic support for managers can broaden and increase. This strengthens and anchors the strategic HR BP role within imec.

The existing **age-conscious personnel policy was evaluated and discussed** by a task force. Suggestions and additions were put together to keep employees over the age of 45 fully engaged. As part of the project 'Shift-working at imec' to move towards more sustainable working in shifts, a number of 'staying healthy on shifts' training courses will be organized in 2024.

Imec also organizes sporting initiatives such as the recurring **Move More** program promoting mental and physical health. From yoga to 'start-to-run', from bootcamps to Levensloop, the program is diverse and is drawn up in collaboration with employees.
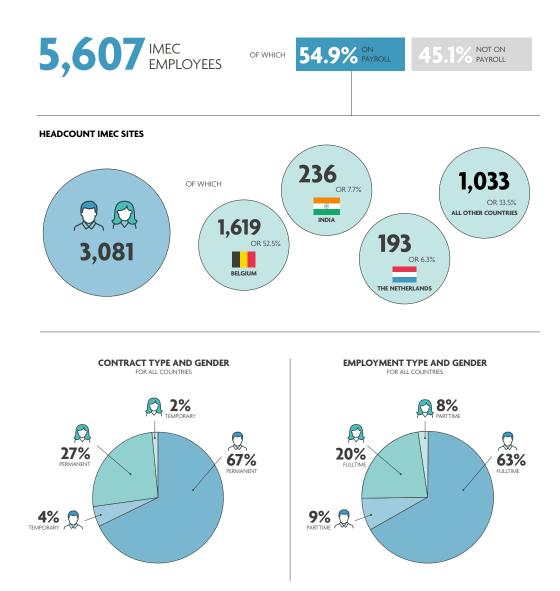
Check out the Move More initiatives here!

Bootcamp

Healthy breaks - Kubb, spike bal, petanque, table football, table tennis

Start to run

Start to walk

Yoga classes

Levensloop 2023

5.1.3. Stimulating diversity and inclusion

Diversity, equity, and inclusion (DEI) are becoming increasingly important in every organization, including imec. Our organization has no fewer than 98 nationalities while our workforce of 28% women reflects the still unequal representation of women in STEM research worldwide.
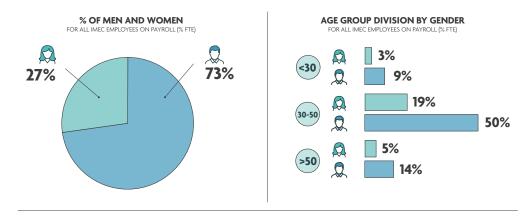
Over the past ten years, imec staff have steadily become more international. This is noticeable at all levels, including the highest, with imec continuing to attract researchers from every part of the world. The three main countries of origin are Belgium, the Netherlands, and India.

5,607 IMEC EMPLOYEES

OF WHICH **54.9%** ON PAYROLL **45.1%** NOT ON PAYROLL

HEADCOUNT IMEC SITES

3,081

OF WHICH

1,619
OR 52.5%
BELGIUM

236
OR 7.7%
INDIA

193
OR 6.3%
THE NETHERLANDS

1,033
OR 33.5%
ALL OTHER COUNTRIES

CONTRACT TYPE AND GENDER
FOR ALL COUNTRIES

2% TEMPORARY

27% PERMANENT

67% PERMANENT

4% TEMPORARY

EMPLOYMENT TYPE AND GENDER
FOR ALL COUNTRIES

8% PARTTIME

20% FULLTIME

63% FULLTIME

9% PARTTIME

Country of origin, for all imec employees (payroll and non payroll) - headcount

The representation of women at senior management level has seen a slight increase in recent years, rising to around 15%. Looking to the future, better female representation in leadership positions is part of our diversity and inclusion strategy.

Our DEI policy is supported by two sponsors at imec, who manage the DEI project team and set priorities. As active speakers on diversity and inclusion, they have been representing not only our HR vision, but the entire organization, for example, during the panel discussion **'There is no he, she, or x in equality' at the open.minds employee event** at the end of 2023.

% OF MEN AND WOMEN
FOR ALL IMEC EMPLOYEES ON PAYROLL (% FTE)

27% 73%

AGE GROUP DIVISION BY GENDER
FOR ALL IMEC EMPLOYEES ON PAYROLL (% FTE)

<30   3%   9%

30-50   19%   50%

>50   5%   14%

BY AGE
FOR ALL IMEC EMPLOYEES ON THE PAYROLL (% FTE)

BOARD OF DIRECTORS
(% FTE)

30-50   >50

18%   82%

MANAGEMENT TEAMS
(% FTE)

30-50   >50

33%   67%

Imec's vision, mission, and values are based on respect and diversity. The company launched an **inclusive workplace policy** in January 2021, outlining imec's vision of diversity and inclusion.

Imec actively embraces every aspect of diversity, because diversity is a source of creativity and disruptive innovation. Imec is committed to ensuring that people can perform their duties in an environment free from discrimination based on gender, ethnicity, age, religion, gender identity, sexual orientation, or disability, and without harassment or behavior that may be offensive or humiliating. Imec promotes and accepts equal opportunities for everyone.

The workplace policy also contains a step-by-step plan, including measures against undesirable behavior. In 2023, there were seven reports of discrimination in which the step-by-step plan was followed. Internally, employees can rely on their manager, the official confidential counsellors, and their HR Business Partner. Externally, they can call on the company doctor, prevention advisers for psychosocial matters, and the Employee Assistance Program. Channels and procedures are described and documented very specifically for Belgium, the Netherlands, and the US.

In recent years, the focus has been specifically on **gender diversity and inclusion**, including:

- a gender equality plan;

- a corporate KPI for the growth of the percentage of women in leadership positions – 25% by 2025 and 30% by 2030 – achieving our interim target of 22% women in leadership positions from T7 onwards by the end of 2023;

- adding inclusion to the connected.minds surveys;

- the opportunity for international employees to work from abroad for six weeks, linking the hybrid to the inclusive workplace policy;

- the systematic use of a gender decoder in job advertisements.

Panel discussion "There is no he, she or x in equality", at open.minds 2023

Following a **gender equality roadshow** in 2023 we raised awareness of our gender equality plan among imec management and the Board of Directors. To conclude, we presented the theme to all employees at the quarterly update meeting. After the roadshow, several management teams (Wageningen, LST, SAT, SCPD and STS, CMOST, FAB) took part in the 'Hack your bias' training, which has been part of our open offering for around three years.

In 2023, we implemented **new tools** to help us achieve the following objectives in the coming years:

- Making our employer brand more attractive to women through a new video about gender equality at imec. A completely revamped candidate page will be built around this in 2024.

- Monitoring candidate gender and age in our selection process. This will allow us to determine whether women and men progress equally through our selection process and to make adjustments where necessary.

- Offering a higher referral bonus to imec colleagues who refer women for higher management and R&D positions. Women in senior management or R&D – just like designers, for example – are scarce talent and have unique skills that we want to tap into even more.

- Talent reviews focusing on female employees, with an accompanying template for growth conversations between managers and employees, the 'Career Conversation for an Inclusive Workplace'.

- In 2024, better facilities for women will gradually be implemented on the Leuven campus: from extra sanitary waste containers and more and better equipped breastfeeding/lactation rooms, to dispensers for hygiene products.

Video on gender equality at imec

More generally, our page on **inclusive communication** has been further expanded. Imec employees will find inspiration about accessible and gender-inclusive communication, and now also about culturally inclusive communication and inclusive meetings. Since the end of 2023, rainbow lanyards for imec badges and rainbow pins have also been made available in the imec shop. Those who wish can visually highlight their commitment to the theme.

The **'Safe Space'** event, organized by several departments at the Antwerp 'Beacon' campus in 2023, won the united.minds award. Together with management, HR, confidential counsellors, our external prevention partner Mensura and Theater InSpinazie, the teams interactively explored how to make our workplace a place where mutual respect and integrity are normal.

In 2023, we also went more **public** with DEI. External presentations were given at the 'Breaking the Silos' event, Vlerick HR Day, and in the TESTARE project, where we collaborate with the University of Cyprus and Fraunhofer, among others. Imec also participated in a panel on gender equality in STEM sectors at a jobs fair in early November.

In 2024, we will explore **new themes** including neurodiversity, through training and exchanges with other organizations. This approach allows us to make better-informed decisions when incorporating subjects into the DEI strategy, which we want to completely renew in 2024.

5.1.4. Investing in engaged and talented employees
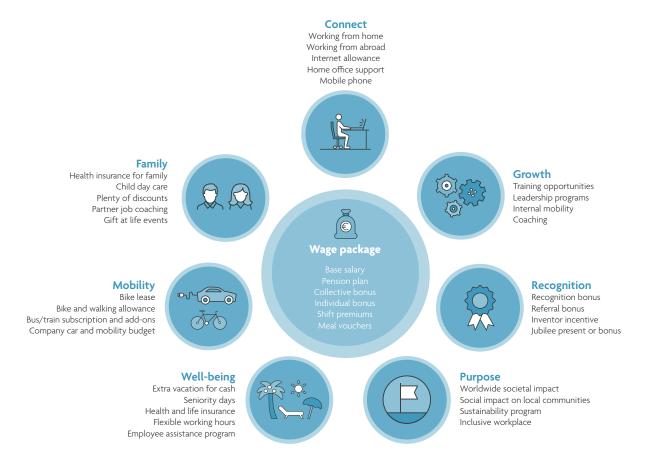
The 'war for talent', with an unprecedented number of registered vacancies in 2022, only slowed down slightly in 2023. Still with 578 closed payroll vacancies and 608 new payroll starters processed and welcomed, some of whom were recruited in 2022, 2023 was a busy time. In the past year, we surpassed the threshold of 3,000 payroll employees.

A **High Volume Recruitment strategy** for talent acquisition was activated, consisting of five pillars (see visual).

High quality influx

Future-proof recruitment

High volume recruitment

Engaging and efficient hiring process

Internal mobility

Total rewards

- **High-quality influx:** This means targeted employer branding, sourcing, and networking to expand the current and future talent pipeline. Examples from 2023 include two international talent fairs (with follow-up on return on investment), new imec employer branding videos, an e-learning course to activate the hiring managers' LinkedIn account for recruitment purposes, and an improved candidate website.

- **Engaging and efficient hiring process:** We strive to provide an excellent candidate experience and a fast selection process, educating recruitment managers to prioritize selections and to provide feedback. They also learn to make each interview a two-way conversation and engage and retain candidates. Specifically in 2023, 'collaborative recruitment' for design engineers across different departments was designed and translated into practical agreements for rollout. Pooling positions and deploying teams of recruitment managers is the way to recruit in the future. To improve the candidate experience and the quality of assessment and development centers, we selected a new vendor. We also drafted guidelines for consistent use of their services and for follow-up through a development process.

- **Total rewards:** Imec, as a non-profit organization, pays its employees a fair and market-competitive salary, but does not want to be, and cannot position itself as, a top-paying employer. Since remuneration consists of much more than just money, a renewed reward strategy has been communicated. The remuneration components together form an attractive package for employees, with something for everyone as its basis. As an example, imec provides comprehensive group insurance, which extends and deepens the European and Belgian social protection that employees enjoy in the event of loss of income, illness, unemployment, accident, disability, parenthood, or retirement.

- **Internal mobility:** Retention is the new recruiting – supporting internal candidates and offering clear opportunities for advancement. The internal career site guides internal candidates and helps them to refer external contacts. No fewer than 22% of our new hires were already imec employees or PhDs, and 1,439 applicants were referred to imec by someone who already works for us.

- **Future-proof recruitment:** In aiming for sustainable talent acquisition, with a new mindset for recruitment, each element of 'Find - Borrow - Make' is equally important. Under the 'Make' heading, for example, imec school, running for the third time in 2023, is a dual learning program combining theoretical education with on-the-job learning, supervised by a wide range of in-house imec trainers. After graduating, the imec school students are prepared for a position as a first-line support assistant or process assistant in the cleanroom. Under the 'Make' umbrella, imec also participated in the Erasmus+ funded METIS4skills project, which mapped the European semiconductor skills gap and aims to help close it through necessary training. Furthermore, an imec working group was established to explore external initiatives for imec to take in 2024 to alleviate the shortage of semiconductor-skilled talent, whether or not subsidized by the respective Chips Acts.

Connect
Working from home
Working from abroad
Internet allowance
Home office support
Mobile phone

Family
Health insurance for family
Child day care
Plenty of discounts
Partner job coaching
Gift at life events

Growth
Training opportunities
Leadership programs
Internal mobility
Coaching

Wage package
Base salary
Pension plan
Collective bonus
Individual bonus
Shift premiums
Meal vouchers

Mobility
Bike lease
Bike and walking allowance
Bus/train subscription and add-ons
Company car and mobility budget

Recognition
Recognition bonus
Referral bonus
Inventor incentive
Jubilee present or bonus

Well-being
Extra vacation for cash
Seniority days
Health and life insurance
Flexible working hours
Employee assistance program

Purpose
Worldwide societal impact
Social impact on local communities
Sustainability program
Inclusive workplace

A selection from the standard employee benefits package

In 2023, we significantly **improved onboarding, offboarding, and cross-boarding** processes and tools for candidates. These improvements were defined, built in SAP SF, and tested in 2022 before being implemented in the spring of 2023. The processes streamline collaboration between ICT, HR, and ICO teams in new recruitments. They give candidates, recruiters, managers, and management assistants a clear overview and ensure a smoother onboarding and exit process, whether for new employees or internal mobility. The candidates can clearly follow the process and see what steps still lie ahead. Once started, candidates receive tailored information about everything they need through a Sharepoint page.

In a rapidly changing environment, imec needs to be efficient and flexible at the same time, maximizing its results and remaining relevant. The best way to do this is to listen to employee feedback and act on it quickly. We accomplish this through the **connected.minds surveys** gauging the overall work experience, including every aspect of involvement, engagement, vitality, and leadership. This method combines general surveys for the entire imec organization with specific and frequent team surveys. The results are easily and clearly visualized in a dashboard.

- In 2022, the second imec-wide survey was conducted, after which three company actions were defined: **Create Clarity** was addressed first, because greater clarity has a positive impact on the other two actions, **Boost Vitality** and **Cross-team Collaboration**. In 2023, a management team developed actions for improvement in policy, roles, responsibilities, better discipline in decision-making, and generalizing best practices. The next step is implementation. We supported the process and development in the working group.

- No imec-wide survey was rolled out in 2023. We did, however, **actively encourage team pulse surveys** to follow up on action plans. These are shorter questionnaires sent out at team level. The response rate for the pulses was 71%, slightly below our goal of 75%. 25% of the teams have organized this kind of interim survey so far. We will be actively monitoring which teams need extra support and, where necessary, HR Business Partners will help set up sustainable actions.

Learning matters. Imec.academy has worked hard to get this message across in 2023. Our ability to learn is strategically important to imec, our partners, the EU, and the world. Skills gaps and strategies to address them are included in every Chips Act. But what critical technical capabilities are we talking about? Top-down, we conducted capacity interviews with senior management to get a clear picture of this. Bottom-up, we gauged the learning needs of the entire imec community.

We received 563 responses to our survey. We learned why, what, and how people at imec learn, prefer to learn or share knowledge, whether by training, mentoring or coaching. This helps us to design potential learning interventions, build the required skills, and shape the role of imec.academy.

Belgian labor legislation also introduced a **'right to training'**. In line with imec tradition, ours is set at 60 hours instead of the legally required 40 hours. Moreover, we are implementing this internationally, not just in Belgium. The accompanying **training plan** includes our imec.academy training offer, better communicated and tailored to specific strategic themes or target groups. Themes include cross-team collaboration, vitality, and diversity and inclusion, while target groups include new employees, PhD students, and people managers.

The plan is extended with new learning initiatives: a talent inspiration guide and an online learning platform (Coursera, in pilot). It also introduces a new initiative: the **'Learning Week'**. An opening event sets the tone, followed by training bytes, learning bytes (best practices), and a walk-in demo room. No fewer than 900 registrations prove that this initiative was very successful in encouraging people to learn.

'The Climate Fresk' training kicked off a pilot project on sustainability in 2023. The results were positive and the initiative will be offered structurally through the imec.academy in 2024.

Learning efforts have almost doubled from an average of 22.63 hours in 2022 to an average of 39.4 in 2023, demonstrating that learning really matters to our employees.

Through the driving force of good **managers**, the First Time People Manager track was further rolled out and extended with additional learning modules, with 80 recently recruited or promoted managers joining the two-year program. Basic leadership skills training is offered in groups, while HR processes are taught at the employees' own pace, through e-learning supplemented by practical case coaching sessions. With an average of 47 hours of development or training, the 40-hour corporate KPI for this target group is easily exceeded.
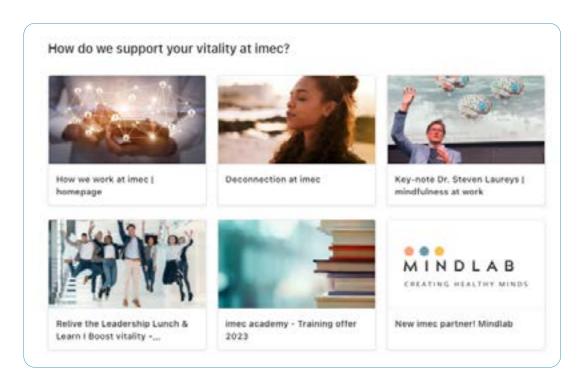
Four **Lunch & Learn sessions** were organized for all managers, to strengthen the area of corporate action, encompassing 'Vitality', 'Create Clarity', 'Cross-team Collaboration' and 'Conversations' respectively.

In addition to this extra training for managers, a renewed training program for **project management** was developed and rolled out. A total of 468 project leaders took part, with an average learning time of 10 hours per person.

In 2021, a number of impactful innovations were introduced, not least **performance & talent enablement** for imec Talent, with talent reviews, feedback and growth interviews, salary reviews, and a recognition bonus as novelties. In 2023, we combined a self-assessment with focus groups of managers and employees to identify areas for improvement. Better alignment between objectives and BSC/KPI, increased inspiration for talent (and better documentation), and greater recognition for teams, are just a few of the areas for improvement. We are rolling out actions around this and building a PowerBi report to give managers a better picture of the entire process.

As part of the process, employees can request feedback on the achievement of their goals through imec Talent, although we lacked a qualitative **360° feedback tool**. In collaboration with the HR BPs, we designed and tested such a tool in imec Talent. The focus is on expected and effective behavior for which goals can be set, gaps between self-evaluations and evaluations by others can be identified, and distributions of answers/scores can be visualized.
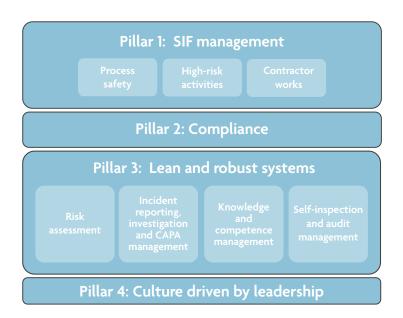
We find the **current job framework** outdated, complex, and inconsistent in use. Currently, the new subdivisions are being created based on a few clear principles. It should make potential career steps more visible, help remove obstacles and, above all, ensure fair compensation. Skills will not be a part of it, nor is it a means to 'offer' career paths. After a pilot and formal approval, the framework will be rolled out in 2024.

How do we support your vitality at imec?

How we work at imec | homepage

Deconnection at imec

Key-note Dr. Steven Laureys | mindfulness at work

Relive the Leadership Lunch & Learn | Boost vitality -...

imec academy - Training offer 2023

MINDLAB
CREATING HEALTHY MINDS

New imec partner! Mindlab

5.1.5. Supporting a solid health and safety culture

Environment, Health and Safety (EHS) are crucial themes for imec, its employees, its customers, and the wider community. To prevent serious accidents and incidents, it is essential that we closely monitor and control the most significant EHS risks.

Imec's EHS policy was comprehensively revised in 2022. In the new policy, the focus is on preventing major accidents, categorized as serious injury and fatality (SIF) accidents, and compliance with the legislation. To be successful in this area, we need to build a robust and efficient EHS management system and a culture based on leadership, commitment and trust. In 2023, we worked on the 4 pillars of the EHS policy — 1: SIF Management, 2: Compliance, 3: EHS management system, and 4: EHS culture.

Pillar 1: SIF management

| Process safety | High-risk activities | Contractor works |

Pillar 2: Compliance

Pillar 3: Lean and robust systems

| Risk assessment | Incident reporting, investigation and CAPA management | Knowledge and competence management | Self-inspection and audit management |

Pillar 4: Culture driven by leadership

Pillar 1: SIF management

Imec's SIF management is based on managing three risk areas.

In implementing our **process safety policy**, we identify and evaluate the technical safety risks of our installations and facilities. In 2023, the methodology to achieve this was revised, and the new approach was applied for the first time. In 2024, further technical installations will be screened for their process safety risks.

In 2023, additional fire prevention measures were implemented in the imec tower underground car park due to the increased fire risk resulting from further electrification of the vehicle fleet.

For activities with an increased safety risk (**high risk activities**), it is crucial to have clear safety agreements, and ensuring they are understood and followed. That is why in 2023 we drew up simple safety instructions for the main EHS risks in the imec laboratories. These instructions and an accompanying knowledge test were linked to the laboratory access management system through the Access Management Improvement Plan (AMIP). This ensures that everyone with access to the labs is aware of the EHS risks and the applicable safety agreements. AMIP will be rolled out to all laboratories at imec Leuven in 2024.

Imec considers health and safety to be just as important for contractors as for its own employees. In the context of **contractor safety**, we initiated a thorough review of the existing safe work permit and contractor site access system in 2023. These reviews will conclude in 2024.

Pillar 2: Compliance

As a low-threshold Seveso company — handling, producing, using, or storing hazardous substances — imec is obliged to comply with all relevant EHS laws and regulations. The company must also anticipate new legislation and any changes to current laws in a timely manner including, for example, new legislation using fluorinated gases. Through close cooperation with the sector organizations SEMI and ESIA, we stay informed about these changes.

Imec must also be able to demonstrate that it understands and manages its main business risks. The imec Enterprise Risk Team facilitates this exercise through risk review meetings. The main business risks are included in the business risk register, which is regularly updated and monitored.

With important expansion projects planned in the coming years, a lot of time will also be spent preparing the required environmental permits, submitting them on time, and monitoring them.

Pillar 3: EHS Management System

To be successful in managing SIF risks and ensuring legal compliance, imec must put in place an efficient and robust EHS management system, based on the basic principles of the ISO 45001 standard, Article 9 of the Seveso Cooperation Agreement, the Royal Decree on the dynamic risk management system for Belgium, and the Working Conditions Act for the Netherlands.

In 2023, we took a significant step with the introduction of an **incident reporting system** through which employees can report dangerous situations and incidents. When reporting an incident the employee must indicate the potential risk involved. Because the system is user-friendly, it can capture large numbers of risks. Assessment of the risk potential makes it possible to distinguish between potentially serious (SIF) and minor (non-SIF) incidents. The incident reporting system was introduced in a pilot phase at the Leuven site in 2023 and will be rolled out across every imec site in 2024.

Major EHS incidents must be fully investigated and appropriate action taken. In 2023, preparations began to digitize the current incident investigation method (8D). The **digital incident investigation module**, scheduled to be rolled out in 2024, will be linked to the new incident reporting system.

Since imec is a research institution, a wide range of chemical products are kept on site, with each chemical pre-screened for its EHS aspects. The **Chemical Life Cycle Management** (CLM) project aims to further optimize and digitize this process. In 2023, we enlisted the support of an external partner for this, with rollout planned for 2024.

Although imec already has an audit and self-inspection program in place, this was supplemented in 2023 by an **EHS-barrier strength review process**. The audits focus on high-risk EHS processes and installations aiming to assess whether safety barriers intended to keep risks under control are present and functioning correctly. In 2023, we conducted three barrier strength reviews and, in 2024, we will conduct further reviews.

For large projects, it is important that EHS aspects are identified in a timely manner, so that they can be taken into account at the design stage. In 2023, a comprehensive **EHS project checklist** was developed to systematically map and monitor EHS risks in major projects from design to completion. The checklist will be used systematically in 2024 to screen every major new investment project.

Focusing on further professionalizing medical services, imec switched to a **new external medical service** in 2023. In the first year of the collaboration with this new external partner, efforts primarily focused on managing standard processes. In subsequent years, imec is seeking to get the external partner to further optimize standard processes and become a tailored and risk-focused medical surveillance program.

In Belgium, the EHS policy is supported by a growing **EHS service** with 13 employees. In time, this team will continue to evolve and set the standard for imec's global EHS operations.

Pillar 4: EHS culture

A safety culture driven by leadership and commitment forms the basis of imec's EHS policy. To embed this policy deeply in the organization, various campaigns were rolled out in 2023 to positively influence safety behavior, developed and prepared by imec's multidepartmental Safety Steering Committee.

The first campaign asked employees to reflect on risks in their work and in their workplace. In a subsequent campaign, the concept of SIF risk was explained and the new incident reporting system launched. A similar approach will be applied in 2024, with a campaign dedicated to the new digital incident investigation module. This will be followed by multiple campaigns focusing on critical safety behavior and peer accountability.

All employees also complete a mandatory EHS training plan, of which some elements must be repeated every three years. In addition, each new employee is assigned a mentor who informs them about the key basic EHS aspects from the first day of work.

A solid safety culture is supported and driven by management. Consequently, our management was, and will continue to be, closely involved in safety campaign rollouts across all the imec sites.

2023 EHS results

Imec continuously manages the safety and health risks of its employees. An accident rate of 0.48 per million hours worked for contractual employees was reported in 2023. Accidents resulting in temporary incapacity for work are mainly attributed to incidents caused by working with chemicals or by falls and tripping. The new incident reporting system also allows us to conduct more detailed accident analysis.

In 2023, more than 1,050 inquiries were handled and closed by the EHS Employee Center. Satisfaction with the center, in terms of speed and quality, averaged nearly 8.5 out of 10.

"We cannot prevent every risk and every accident, but we must do everything we can to manage the risk of serious incidents. This is a key focus of imec's EHS policy. It is also encouraging to see other departments adopting this principle. They don't try to do everything, but focus on aspects that truly have an impact."

Roel Scheys – imec EHS director

5.2. Respecting the environment

Sustainability is a key driver at imec – for our research projects, and our operational departments. We recognize that our own operations have a significant carbon footprint. It is therefore our aim to reduce our carbon footprint and water consumption, and embrace circularity.

Imec has a three-pronged strategy to achieve this, characterized as reduce, replace, and compensate, with specific goals for the most important themes. In 2023, imec took further steps on these three strategic pillars. With new insights, greater expertise, and results-oriented actions in the short and medium term, the transformation is taking shape.

REDUCE CARBON FOOTPRINT

- Define carbon footprint (scope 1-2-3)
- Reduce energy consumption
- Reduce process emissions
- Make mobility greener

RESPONSIBLE WATER MANAGEMENT

- Reduce water dependency
- Maximize water recycling

REDUCE AND RECYCLE WASTE STREAMS

- Waste management
- Circularity
- Material and resource management

Thanks to the help of various services – including our FAB operations, Infrastructure and Corporate Services, and Human Resources (including the Environment, Safety and Health department), we can reflect on numerous impactful achievements in 2023.

- We entered into an energy policy agreement signifying a formal commitment with the Flanders government. In 2023, our gas consumption declined by 19%, while electricity consumption increased by 3%.

- Over the past year, we have set up pilot installations to test the possibility of reusing water in our installations.

- Construction and renovation respecting the principles of circularity is the new normal at imec. Reusable building materials have been given a second life through the imec smart workplace program.

- We have focused on communication and awareness-raising on waste management and have also put in place a more efficient stock management regime.

The Leuven Climate Contract

Incentivized by Leuven 2030, a City of Leuven initiative, imec has made an ambitious commitment to climate issues. Along with other local partners, imec signed Leuven's 'Climate City Contract', with the aim of pushing the city towards an 80 % CO_2 reduction by 2030, with 2019 being the reference year. Leuven is the first Belgian city to sign such a contract with the European Commission. Imec will contribute to this in various ways, including through its approach to process emissions and circularity in construction projects, participation in an Urban Lab, and research into efficient local energy exchange using a local heat network.
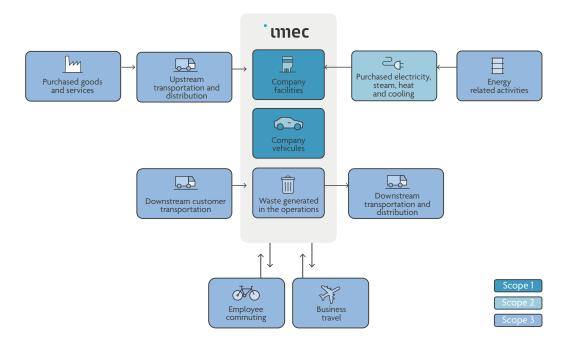
First Leuven climate contract

5.2.1. Measuring our carbon footprint
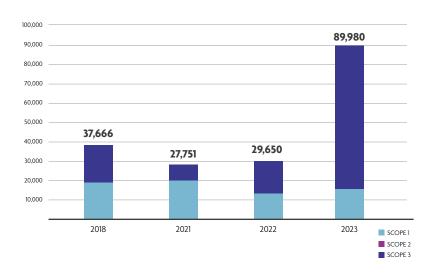
To measure is to know. Following this maxim, imec has been calculating its carbon footprint for Scope 1 and 2 emissions since 2015 (reference year 2014). This has included both direct and indirect emissions from our purchased energy. In 2019 (reference year 2018), Scope 3 emissions were added, initially in a limited way. For the 2023 reporting year, we significantly expand our reporting of Scope 3 to include a more thorough analysis of categories such as purchased goods and services, and transport and distribution. Scope 1 covers direct CO_2 emissions, Scope 2 indirect CO_2 emissions from energy generation, and Scope 3 other indirect CO_2 emissions.

Major sources of carbon emissions, such as wafers, chemicals, gases, exposure masks, ICT equipment, and various services were identified more clearly and completely. We also added a comprehensive overview of emissions from imec.IC-Link. A significant proportion of these emissions results from trade in processed wafers, which represents a large carbon footprint. To accurately determine their impact, the imec.netzero platform was used. Only emissions from the Leuven and EnergyVille sites have been included so far, but moves are being made to include some emission categories from imec the Netherlands in the reports.
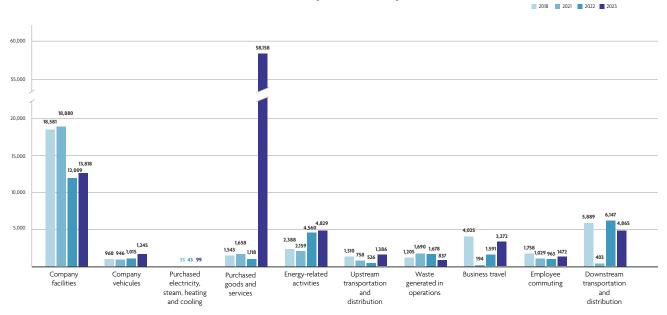
Overview of topics included in Scope 1, 2 and 3 carbon footprints for imec

EVOLUTION CO$_2$ EMISSION (TON CO$_2$-eq)

	2018	2021	2022	2023
Total	37,666	27,751	29,650	89,980

Legend: SCOPE 1, SCOPE 2, SCOPE 3

EVOLUTION CO$_2$ EMISSION (TON CO$_2$-eq)

Legend: 2018, 2021, 2022, 2023

Company facilities: 18,581 / 18,880 / 12,009 / 13,818
Company vehicules: 968 / 946 / 1,015 / 1,245
Purchased electricity, steam, heating and cooling: 35 / 43 / 99
Purchased goods and services: 1,543 / 1,658 / 1,118 / 58,158
Energy-related activities: 2,388 / 2,159 / 4,560 / 4,829
Upstream transportation and distribution: 1,310 / 758 / 526 / 1,386
Waste generated in operations: 1,205 / 1,690 / 1,678 / 837
Business travel: 4,025 / 194 / 1,591 / 3,272
Employee commuting: 1,758 / 1,029 / 963 / 1472
Downstream transportation and distribution: 5,889 / 403 / 6,147 / 4,865

In total, the imec carbon footprint associated with Scope 1, 2 and 3 emissions increased between 2022 and 2023 from about 30 kt (kilotons) of CO$_2$-eq (CO$_2$ equivalent) to around 90 kt CO$_2$-eq, an increase of around 300%. Scope 3 emissions now account for just over 80% of the total carbon footprint, mostly relating to purchased goods and services.

In other categories, the most significant trends include a major increase in business travel. Although the trend was downward in 2022, emissions from pilot lines and labs in the 'Company Facilities' category rose again in 2023. In this category, natural gas consumption decreases by 19% and refrigerant emissions by 58%. Process gas emissions, however, increase by 37%. We also see an increase in company vehicles and commuting emissions. Emissions from energy consumption remain more or less constant, since fossil fuel-based emissions are declining and offset by an increase in emissions related to electricity consumption.

In the transport and distribution segment, we also see a sharp increase to above 2 kt CO$_2$-eq, primarily due to more thorough and comprehensive reporting. Regarding waste, we are seeing a decrease in our carbon footprint.

Working sustainably

Total waste volumes increased slightly but, due to the more up-to-date emission factors and because different waste streams are reported in different ways, total emissions in this category were lower than in the previous year.

The carbon footprint figures were commissioned by imec Leuven in collaboration with Futureproofed and calculated using the Greenhouse Gas Protocol (GHG Protocol). For Scope 1, 2, and 3 emissions, this was partly achieved using figures provided by imec.

As part of our new sustainability policy, the objectives around our own carbon footprint have also been revised. We are working towards maximum emissions of 9 kt of CO_2 equivalent for Scopes 1 and 2 by 2030, and carbon neutrality for these categories by 2050. Numerous actions are also underway around Scope 3, including in the areas of mobility, responsible use of materials, and circularity. In 2024, after thorough analysis, we will further clarify the action plan. We are also initiating a climate plan, which will begin with an even more granular analysis of all the emission data. We will also begin active discussions with relevant partners in the value chain with the aim of mutually reducing Scope 3 emissions.

5.2.2. Increasing responsible and circular use of energy and materials in our own operations, mobility, and infrastructure

Reducing energy consumption

Every year, imec invests in initiatives that reduce energy consumption. That is why imec formally signed up to the energy policy agreement with the Flanders government for its Leuven site in 2023. In so doing, imec is committed to developing an energy plan, which includes strategies for greening energy sources, optimizing energy management, and improving energy efficiency.

A selection of our actions and achievements:

- We maximize the use of solar energy at our site in Leuven and have a 100% green energy contract for Leuven and Genk.

- We have replaced the use of natural gas to achieve climate-neutral heat-cold generation. For heating, we have new heat pump installations and heat recovery. These efforts aim to halve our emissions from heating gases by 2025 compared to our base year of 2015.

How do we do that?

We installed our first heat pumps in FAB1 and FAB2 in 2019 and 2021 respectively, while the heat pump for FAB3 will be operational in 2024. These efforts have led to a 19% reduction in gas consumption in 2023 compared to 2022. For imec 6, the new office building, we are also opting for responsible energy and heat management to be connected to the planned heating and cooling network, and are employing the latest building insulation techniques.

As part of the energy master plan, work continued in 2023 on a study coming within the Leuven Climate Contract, to build a heating and cooling network at the Leuven site. The project was approved, and we will proceed with design and implementation in 2024. We want to go a step further and see if we can expand our network to other local partners, such as KU Leuven.

	Unit	2021 Consumption	2021 Ton CO$_2$-eq	2022 Consumption	2022 Ton CO$_2$-eq	2023 Consumption	2023 Ton CO$_2$-eq
Sources							
Renewable resources	kWh	117,828,409		119,912,182		122,582,999	
	GJp	1,060,456		1,079,210		1,103,247	
Non-renewable resources			6,683		5,009		4,433
Consumption							
i. Consumption for heating – gas	kWh	31,618,000	6,482	25,221,211	4,666	20,850,318	4,274
	GJp	113,825		90,796		75,061	
ii. Consumption for heating – gas	Kg	146	193	237	342	99	144
iii. Fuel oil	l	2,650	8	200	0,56	5,382	15
	kWh	28,199		2,128		57,269	
	GJp	102		7,66		206	
Total energy consumption	GJp	1,174,382	6,683	1,170,014	5,009	1,178,514	4,433
Standards, methodologies, assumptions and/ or calculation tools used	Imec internal calculations based on data provided by suppliers						

Row label (vertical): TOTAL ENERGY CONSUMPTION (own and leased facilities)

Reducing greenhouse-gas process emissions

Process emissions contributing to global warming arise from the use of greenhouse gases in our FABs, occupying a substantial place on our CO$_2$ dashboard. The main greenhouse gas contributors for imec are NF$_3$ and SF$_6$ and, to a lesser extent, CF$_4$ and C$_4$F$_8$. Imec is working in a phased approach to bring down the resulting CO$_2$-eq impact. We typically start with a feasibility study, followed by implementing an improved method. The team's high-level goal is to halve the CO$_2$-eq contribution from 10.3 kt in 2018 to 5.15 kt by 2030.

To achieve our target, we fully map the approximately 150 process chambers every year and measure and analyze consumption and emissions. This gives us a clear view of the chambers and installations causing the highest emissions. Based on this analysis, imec determines whether and where to install new gas treatment units.

Process emissions for 2023 amounted to 9.61 kt CO$_2$-eq, up from 7 kt in 2022. This increase is due to the combination of higher greenhouse gas consumption as a result of higher production volumes, a gas pipeline leak, and new process chambers being included for the first time in the 2023 count.

For the conversion to CO$_2$-eq values, imec follows IPCC 2019, which has been in use since reporting year 2020. The conversion factors are based on gas handler destruction and removal efficiency (DRE) certification and the IPCC 2019 theoretical values. Measurements also confirm the conversion factors for both the efficiency factor (EF) of the process and the gas treatment DRE.
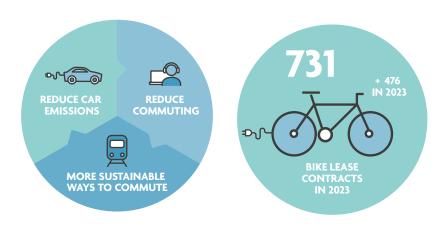
In 2024, the first gas handlers will be installed, and we will also purchase a next batch. A gas handler, depending on the type of gas, has a DRE of around 95-99%, and will normally lead to a sharp decrease in our process gas

emissions. We will continue to activate gas meters in the various chambers in 2024, to give a much more accurate estimation of our gas consumption and emissions. Because a range of process conditions are assessed in an R&D environment like imec's, average consumption may not be a useful approximation.

Greening the impact of mobility

As a research center contributing to knowledge and innovation on mobility issues, we are also implementing new approaches to mobility in our own organization, developing a strategy to completely shift the mindset based on three pillars: avoid, shift, and change.

AVOID: Reduce commuting

Hybrid working has become the new normal in recent years, and that's why imec is looking to make it easier with tools and incentives. Before the COVID-19 pandemic, more than 10% of employees worked from home one or more days per week on average, whereas now it is many more. The "Hybrid Work Policy" includes guidelines and tips on team agreements and team management, healthy remote working habits, and technical support for remote working.

SHIFT: More sustainable ways to commute, less car use

Leaving the car at home and opting for a sustainable alternative, such as public transport or cycling, contributes to reducing our carbon emissions. Imec fully refunds public transport subscriptions, and employees can use bike-sharing systems near train stations for free. They can also leave their bicycle or car in a train station car park free of charge.

The current bicycle leasing policy is a further incentive. Imec's contribution to bicycle leasing has been significantly increased, and employees also receive an allowance for every time they ride a bike to and from work. Last year, we increased that allowance and added a walking allowance. Employees can also use a handy mobility app to register their cycling or walking trips.

More than 731 people now use a leased bike. That's 476 additional contracts in 2023.

CHANGE: Reducing car emissions when commuting

Of course, the biggest impact of employee commutes comes from using cars. Through imec's car policy, including a new calculation for total cost of ownership (TCO), imec has been dedicated to greening its fleet in recent years. We also invested in charging infrastructure for electric cars and advise employees who opt for a car through the mobility budget to choose an electric car. The results are telling: at the end of 2023, imec had 646 cars in its fleet, of which about 65% were green vehicles (hybrid, plug-in hybrid and electric) compared to only 17% in 2020.

The evolution of imec's fleet greening is as follows:

- Average fleet CO_2 emissions – end of 2021: 96g/km, end of 2023: 60g/km

- Percentage of green cars in the total fleet – end of 2021: 33%, end of 2023: 66%

CARS IN USE								
	2020		**2021**		**2022**		**2023**	
Diesel	250	55%	205	43%	158	28.5%	96	20%
Petrol	127	28%	116	24%	150	27%	126	15%
Gas	1	<1%	1	<1%	1	<1%	0	
(Plug-in) hybrid	70	15%	134	28%	197	35.5%	288	45%
Electric	5	1%	22	5%	49	9%	136	21%
TOTAL	453		478		555		646	
Average CO_2 (g)	111		96		87		60	

Imec wins 'Move towards less CO_2' award

In 2023, the 'Move towards less CO_2 award' from the Flanders bus and tram transport company De Lijn went to the imec mobility team. At the beginning of 2023, the team launched a new adapted mobility plan for employees, addressing each individual's needs while maintaining a balance between accessibility, safety, and sustainability.

There is something for everyone. For example, there is a bike leasing program and bike allowance with an increased contribution from imec, unlimited access to Blue-bike's bike-sharing network and full reimbursement of public transport subscriptions, including parking.

In addition, there is the mobility budget for employees entitled to a company car, which can be combined with leasing a smaller, greener car. For employees working shifts, we introduced a car mileage allowance, deliberately set at half the bike compensation, ensuring that the most sustainable choice is always the most advantageous. In short, the plan offers a lot of possibilities and is an improvement for everyone, which is why we won the award!

Before the coronavirus pandemic, travel was quite frequent at imec, since we are an international company. To reduce the impact of business travel, the travel policy has been thoroughly revised. The new policy provides binding guidelines for travel within the EU and clear advice for international travel. For employees in the Belgian offices, flying is discouraged for destinations that can be reached from Brussels in around five hours by train (with a few exceptions). Employees are advised to choose an alternative transport option for these destinations, such as train, bus, or carpooling.

Evaluating the necessity of a trip is based on a number of criteria: Does the itinerary involve more than one meeting or business activity? Are these external meetings with partners outside imec? Are these activities that cannot take place virtually, through teleconferencing or videoconferencing? Has the required minimum number of employees participating in the activity been verified? For situations where flying is the only option, a CO_2 compensation system has been introduced.

Travel to and from imec locations, both by imec employees and visitors, increased again in 2023 , with a negative impact on emissions.

tCO_2-eq	2021	2022	2023
Business travel	194	1,591	3,478
Downstream transport and distribution	403	6,147	5,535
Total tCO_2-eq	597	7,738	9,013

5.2.3. Efficiently using and reusing water and effluents

As more and more regions in Europe and across the rest of the world are facing water stress due to global warming, responsible water management has become a hot topic.

At imec, there is a lot of water consumption in the cleanrooms. The microchip production process uses a lot of water, including at the cleaning stage. This is because today's chips consist of high density components printed in increasingly smaller dimensions, measured in nanometers. All products should have high purity, even the water used in manufacturing. City water is therefore mainly used for the production of high-purity water (HPW).

In 2018, imec invested €300,000 in wastewater recycling. Initially, a pilot plant was built to find the best solution for reuse, eventually leading to the commissioning of a new filter installation.

To reduce city water consumption, the focus in recent years has been on reducing HPW consumption in the cleanroom. This was achieved mainly by reducing idle flows — water circulation in non-active devices — and by fulfilling other, less critical water needs as much as possible through recovered wastewater from R&D production processes. We have now come to the point where that strategy has reached its limits. To further systematically reduce the need for city water, we need to purify wastewater to a level where it can also be used as feedwater for HPW production.

Significant progress has already been made in recent years regarding city water consumption, water recovery, and wastewater reuse. We therefore remain committed to our goal of reducing water consumption from 800,000 m³/year historically, to 600,000 m³/year by 2025. In 2024, we also plan to determine our long-term water consumption goal, taking into account both the effects of water-saving projects and imec's planned expansions.

m³/year		2020	2021	2022	2023
Total water consumption	Total consumption of external water (city water)	743,622	746,842	761,893	768,296
Water discharge	Total discharge into surface water	605,103	616,587	616,612	620,503
	Total water discharge (sewage)	18,767	14,461	24,419	28,300
	Total water discharge (external treatment, including liquid waste)	1,159	1,533	1,490	1,327
	Total water discharge	625,029	632,581	642,521	650,130
Vaporization	Vaporization	118,593	114,261	119,372	118,166

In 2023, 214,016 m³ of wastewater was reused in Leuven, which corresponds to 586 m³ per day. In 2018, imec consumed approximately 800,000 m³ of city water, in 2023 this was 768,296 m³.

Imec has been looking for solutions to further reduce city water consumption. Consequently, three sub-objectives were defined in 2023, each leading to the start of a practical project that will continue during 2024:

Waste removal: by reusing water, less wastewater is discharged, but the concentrations of the substances left in this wastewater increase. These include ammoniacal substances frequently used in semiconductor production. The pilot project is looking at how to remove these substances so that concentrations remain within the applicable discharge standards and for water reuse to remain an option.

Closed loop local abatement devices: further concentration of the permeate water before discharge reduces water consumption in local abatement systems. Initial estimates suggest a possible reduction of 90%. Based on the projected consumption data in the future master plan, the total reduction in water consumption would be 400,000 m³ per year. In pilot tests, we will assess the feasibility of achieving this 90% reduction, taking into account the specifications of the local abatement devices.

Water recovery plant (WRP) pilot: by converting the current test installation for water reuse into a full-scale plant, we are taking an important step forward. The tests show that the reuse installation is stable. The water is initially used for technical installations such as cooling towers, water scrubbers, and air scrubbing. In the next phase, we are also looking at reusing the wastewater as replenishment water for the HPW installations.

5.2.4. Minimizing and repurposing waste streams

Good management of waste streams starts with the circular management of all incoming material flows. Imec uses this principle as a guideline when purchasing, managing, and processing incoming materials for research activities, construction, and renovation, as well as catering supplies and office materials.

Circularity at the forefront of our construction projects

Circularity is central to imec's smart workplace project. In 2023, we carried out three initiatives of which we are particularly proud:

1. Donating depreciated office furniture to schools in Leuven, including Ponton43, a school offering special secondary education giving crucial support in the classroom. The school was able to furnish its classrooms with our old furniture.

2. Delivering repurposed office and construction materials to the Leuven materials bank where they are given a new life as building and insulation materials.

3. Applying circularity principles for new projects, through imec's smart workplace project, in the selection of materials, such as PET felt for acoustic walls and fully recyclable raised floors, thus giving priority to repurposing and future-proof, sustainable, design choices.

The most impactful location for materials and waste is our Leuven site where we have a materials and stock management policy and an extensive waste management system. At other locations, where imec is mainly a tenant, employees follow guidelines set by the site owners.

Imec has three pilot production facilities on the Leuven campus — FAB1, FAB2, and FAB3 — generating both liquid and solid waste streams. In 2023, we launched an adapted waste procedure, in line with VLAREMA guidelines, available on the imec intranet, with clear guidance on waste management and sorting. Employees can also use imec's digital office center for queries about the correct way to manage waste.

In the past, most liquid waste streams from the three FABs were collected and processed externally. In recent years, we have invested in on-site purification facilities for FAB2 and FAB3, and have succeeded in significantly reducing the quantity of externally processed liquid waste. In the past year, we also investigated whether we could process and discharge additional liquid waste streams at our site through biological water treatment. We tested this on a laboratory scale, extracting effluents from the water purification process and purifying them through biological treatment, including with our own domestic wastewater. This method will allow us to use effluents in the future to purify used process water. This research will continue in 2024.

For our solid waste, we make a distinction between chemical (industrial) waste and household waste. The more research activities we conduct, the more waste we generate. That is why we strive for responsible use of these flows and take care with their storage. In the past year, for example, we have taken extra measures regarding separate waste streams for sulphuric acid, expanded polystyrene (ESP also known as Styrofoam), and hard plastics. Furthermore, our catering team put measures in place to reduce food waste, including by developing a new procedure for meeting-room catering.

In 2024, the team will continue to work on:

- Improving awareness of sorting practices in the offices and cafeteria;

- Avoiding packaging according to Lansink's ladder principles of waste hierarchy, and entering into dialogue with suppliers;

- Improving warehouse stock management;

- Selective collection of waste streams, for example foils from wafer boxes;

- Sustainable, healthy, and circularity-respecting range of beverages for employees at the Leuven site.

		2020 (tons)	2021 (tons)	2022 (tons)	2023 (tons)
Weight generated waste (except liquid waste)	Hazardous waste	254.9	226.8	213.4	221.3
	Non-hazardous waste	434.6	451.6	397	533.1
	Total weight generated waste	689.5	678.4	610.4	754.4
Weight	Hazardous waste – prepared for reuse	0	0	0	0
	Hazardous waste – recycled*	0	0	0	0
	Hazardous waste – other forms of recovery	144.9	135.3	114.7	114.4
Sorted waste (except liquid waste)	Non-hazardous waste – prepared for reuse	0	0	0	0
	Non-hazardous waste – recycled*	0	0	0	0
	Non-hazardous waste – other forms of recovery	246.3	270.2	202.4	326.4
	Total weight sorted waste	391.2	405.5	317.2	440.8

	Incinerated hazardous waste (with energy recovery)	0	0	0	0
	Incinerated hazardous waste (without energy recovery)	7.5	7.1	7.1	5.4
	Hazardous landfill waste	52.9	40.3	46.4	55.3
	Hazardous waste disposed of by other means	49.5	44.1	45.4	46.2
	Total Weight of disposed hazardous waste	109.9	91.5	98.9	106.9
Weight landfill and incinerated waste	Incinerated non-hazardous waste (with energy recovery)	187.9	181.4	194.5	206.7
	Incinerated non-hazardous waste (without energy recovery)	0	0	0	0
	Non-hazardous landfill waste	0	0	0	0
	Non-hazardous waste disposed of by other means	0	0	0	0
	Total weight of disposed non-hazardous waste	187.9	181.4	194.5	206.7
	Total weight of disposed waste	297.9	272.9	293.5	313.6

(*) Data for recycled waste is included in the total of sorted waste – other forms of recovery.

LIQUID WASTE

- Waste solvents
- Waste oil
- Waste acids and caustics
- EKC 265 solvent
- Photo lacquers
- Lab waste
- Residues of CMP slurry
- Sludge electrocoagulation
- Expired chemicals
- Grease from grease trap
- Sulfuric acid solution
- Nitrate-containing waste water
- Lime milk solution
- Plastic cans with residues of chemicals
- Cleaning and rinsing water
- TMAH (developer)

HAZARDOUS SOLID WASTE

- Batteries
- Electrical scrap
- Glass beads
- Quartz glass
- Empty tarnished glass packaging
- Empty tarnished metal packaging
- Empty tarnished plastic packaging
- Hazardous medical waste
- Silicon wafers
- Fluorescent and TL lamps
- Contaminated material
- Filter cake waste water treatment

NON-HAZARDOUS SOLID WASTE

- Glass kitchen
- Wood
- Organic kitchen waste
- Residual waste
- Paper and cardboard
- PMD waste
- Toners ink cartridges
- Metals

Overview of imec's waste groups

All waste from the main waste-generating sites (Leuven and Genk) in 2020, 2021, 2022, and 2023, excluding effluents. Calculations are based on formal data, collected and reported according to Belgian regulations.

Treatment details (recycling or other methods) according to waste group:

GROUPS OF HAZARDOUS WASTE FOR RECYCLING OR OTHER WASTE TREATMENT (EXCLUDING LIQUID WASTE)

	2020	2021	2022	2023
Glass recycling	3.2%	4.7%	5.0%	4.9%
Conversion of sulphuric acid into ammonium sulphate	11.4%	13.3%	12.2%	11.5%
Waste oil and photo lacquers (reuse as fuel)	54.0%	50.5%	44.1%	41.0%
Wafer waste (silicon recovery)	3.1%	2.7%	4.3%	4.5%
Used plastic (recovery of plastic)	8.4%	10.5%	12.2%	10.2%
Sludge from electrocoagulation (reuse in the cement industry)	7.9%	5.8%	6.4%	7.9%
Electronic waste	2.4%	2.3%	3.5%	5.6%
Batteries	0.2%	0.1%	0.4%	0.3%
Other	9.3%	10.1%	11.8%	14.0%

NON-HAZARDOUS WASTE AND RECYCLING OR OTHER FORMS OF WASTE TREATMENT (EXCLUDING LIQUID WASTE)

	2020	2021	2022	2023
Metals	30.2%	36.7%	19.4%	19.1%
Glass and plastics	1.5%	1.8%	2.3%	2.2%
Paper and cardboard	27.4%	20.3%	32.2%	23.0%
Building waste	4.9%	4.8%	0.9%	1.4%
Wood	33.5%	34.0%	42.3%	46.0%
Expanded polystyrene (EPS)	0.3%	0.4%	0.6%	0.3%
Kitchen waste	2.0%	1.9%	2.3%	2.0%
Hard plastics	/	/	/	6.1%

5.3. Through good governance

As part of a global strategy to achieve its mission and realize its vision, imec is working to develop the imec group, managed by imec International, the public utility foundation, which serves as a corporate center for the group's various entities. These entities are founded on imec's corporate guidelines for business development, finance, human resources, and operations while, of course, respecting each entity's own autonomy and governance.

The Good Governance Charter shapes imec's corporate governance policy, outlining imec's principles of good governance and how to monitor them, serving to strengthen the imec group's long-term development and growth. The Charter is a roadmap to a balanced, clear, and transparent division of authority and responsibility, while also outlining the processes of accountability and responsibility. Audit, nomination, and remuneration committees were set up from within imec International's Board of Directors, meeting regularly to determine the items to be included on the Board's agenda. Consultations between the various councils and committees avoid potential conflicts of interest.

Management and Board composition

Members of the governing bodies and management are appointed based on their capability of successfully leading and growing the imec group. Imec International directors are appointed by the imec vzw board with a view to transparency and anchoring the decision in Flanders.

The current composition of the Executive Board, the senior leadership team, the scientific advisory board, and the senior fellows can be found at www.imec-int.com/en/organization.

Key data about imec International's board of Directors as of December 31, 2023:

- All members of the boards of directors at imec International and imec vzw are non-executive directors.

- The ratio of male to female directors on the imec International Board of Directors is 71% – 29% (10 men – 4 women).

- The ratio of male to female directors on the Executive Board is 73% – 27% (8 men – 3 women).

- 64% of imec International directors are independent directors (9 of 14).

- The directors and chairs of the board of directors receive attendance allowances of €1,000 and €2,000 respectively, per meeting. The total directors' remuneration for imec International, including committees and subsidiaries in the scope of consolidation, amounted to €118,500.

Objectives and remuneration schemes

Each year, imec's business strategy is translated into a balanced scorecard and a set of key performance indicators (KPIs).

The balanced scorecard translates imec's strategic goals into practical measurable parameters, with sustainability as one of its pillars since 2022.

KPIs are divided into corporate KPIs (concerned with imec's objectives at company level), covenant KPIs (concerned with imec's performance as a research institution and its impact on the Flemish economy and prosperity), and collective bonus KPIs (concerned with non-recurring result-related benefit), and their coverage includes various sustainability-related objectives. In 2023, for example, there were KPIs related to safety standards, reducing water use, reducing CO_2 footprint, and diversity. Implementing a sustainability checklist as a criterion in investment dossiers was also set out as an objective, and was achieved. The KPIs are adjusted annually as necessary.

A performance bonus is paid to employees who are entitled to variable remuneration and depends on the company's financial results, as well as the corporate KPIs and individual objectives achieved. In addition, imec offers a collective non-recurring bonus dependent on financial results, subject to clearly defined, transparent, measurable, and verifiable objectives. Achievement of these objectives must not be an inevitable outcome at the time the bonus plan is introduced.

Balanced Score Card

Key Performance Indicators

5.3.1. Using an ethical charter and SDGs as a compass for our research projects

Code of Ethics

Our Code of Ethics aligns with our vision, mission, and values, and consists of standards of conduct that reflect imec's ethical principles and help determine the day-to-day activities of imec employees. It is a guideline that helps us take the right decisions in difficult situations, and ensures that we deal with ethical dilemmas in the right way. The Code also refers to the reporting channels for research projects facing ethical challenges, such as issues related to bioethics, data management and privacy, the importance of scientific integrity, and the whistleblowing mechanism.

Imec's Ethics Committee is an independent advisory body reporting to the Board of Directors, composed of imec employees and external experts. The committee examines and advises on ethical issues addressed within the organization and has the following tasks: (i) to assist management and researchers in identifying and addressing ethical issues in the context of research projects, and (ii) to monitor the ethical principles of the organization and to ensure that they are applied. The Committee applies the principle of subsidiarity: if a team has particular expertise (for example, around data privacy), the case will be referred. In 2023, the Ethics Committee provided advice on two specific cases. One was a research project seeking advice on the application of a particular technology in substance abuse prevention and the ethical concerns around it. A second case underlined the importance of ethics in the context of rapidly advancing AI and looked at how policy can be strengthened. Because of the geopolitical situation, imec's policy on collaboration with sensitive countries was also reviewed.

Attention was paid to ethical awareness and ethical dialogue in various training programs in 2023, giving new employees the opportunity to reflect on the impact of these values as part of onboarding. This is also a focus in training courses for future managers (**"first-time people management training"** and **"value-based (self)-leadership"**). Employees have access to imec's Code of Ethics via the intranet, while it is also explained to new employees in a presentation.

Bioethics

Bioethics is a particular discipline under the broader heading of ethics, since it concerns both ethical and safety risks. To address these concerns fully, an expert with a medical degree has been appointed within the EHS group to support internal policy.

Imec treats clinical trial and experimental subjects in accordance with the highest ethical and safety standards. To achieve this, we have an internal policy covering any research involving human subjects and human body material, which helps us in preparing the necessary documents, such as the applications and informed consent of test subjects. To protect the privacy of the subjects involved, imec also complies with data protection regulations (GDPR) and biobanking standards when working with human body material (i.e., cell lines and voluntary samples).

Research involving human subjects or human body material will only begin after explicit approval by an independently recognized medical ethics committee such as, for example, the UZ Leuven medical ethics committee, and is always in accordance with the applicable laws and regulations. A medically trained doctor is always involved in these studies.

For experiments involving animals, we follow the principles of the 3 Rs (replacement, reduction, and refinement), as outlined in our internal policies in this area. Research projects involving animals may only begin after explicit approval from a recognized external ethics committee. In the case of imec vzw, this is the KU Leuven ethical committee for animal experiments.

Experiments with animals are carried out in collaboration with Neuro-Electronics Research Flanders (NERF) and aim to study brain functioning. We use the most advanced bioengineering tools: optogenetics, two-photon microscopy, neuropixel images, functional ultrasound, and advanced behavioral analysis, focusing on understanding sensory information processing, vision, motor control, memory, spatial navigation, and novelty detection.

Scientific integrity

A fundamental element of its organizational culture, imec's policy on scientific integrity focuses on stimulating good research practices and preventing research fraud.

Research fraud is defined as the invention, falsification or plagiarism of a proposal, execution, assessment, or reporting of research results. Acting with scientific integrity also means avoiding dubious research practices, meaning those that do not meet generally accepted standard, such as ghost-writing, questionable authorship, poor data management, incorrect citation of peers, and duplicate publications. Imec follows the European Code of Conduct for Research Integrity (www.allea.org) as a reference framework and endorses the policies and procedures of the Flemish Commission for Scientific Integrity (www.vcwi.be), part of the Royal Flemish Academies of Belgium for Science and the Arts.

Imec's Committee for Scientific Integrity is responsible for the company's integrity policy, which is coordinated by the research integrity officer, and addresses possible violations, including plagiarism and data falsification or fabrication.

Whistleblowers

All imec employees are asked to report Code of Ethics violations and any other unethical behavior, either internally, or through one of a range of reporting channels outlined in our whistleblowing policy, depending on the subject, its sensitivity, and who is reporting the issue.

Each imec group entity has its own reporting channels, with several available for support. There are also guidelines on addressing or resolving issues such as harassment, sexual harassment, violence, discrimination, and other inappropriate or prohibited behaviors. For scientific integrity issues, employees can contact imec's Committee for Scientific Integrity or, in certain cases, the Ethics Committee.

Any employee suspecting a breach and unable to report it through the normal reporting channels, or who does not feel comfortable doing so, can use the whistleblowing channel.

Those reporting in good faith are protected and must not fear retaliation. Reports are handled with great care, guaranteeing independence, prevention of conflicts of interest, confidentiality, data protection and privacy, secrecy, and careful follow-up.

Imec's whistleblowing policy is aligned with Directive (EU) 2019/1937 of 23 October 2019 and the Belgian transposition law of November 28, 2022. In 2023, the whistleblowing channel received two reports. They were both examined and dealt with.

Relationships with partners

In addition to the internal Code of Ethics, imec also has a Code of Conduct for Partners, to include suppliers, research institutions, and customers.

This Code of Conduct outlines the values, mission, vision, and general ethical principles expected of imec's partners, who must comply with local laws and regulations in the countries in which they operate. Regardless of physical location, all business relationships with imec are conducted in accordance with the Code of Conduct for Partners, while imec encourages its partners to go beyond minimum legal requirements and pursue internationally recognized standards and ethical practices.

CODE OF CONDUCT
FOR IMEC'S PARTNERS

Enterprise risk management as an integral part of our business management

Just as other companies, imec is exposed to internal and external risks that can have serious consequences for its stakeholders and its operations. These risks can also affect the environment and the financial situation of the company, making managing these risks crucial.

In 2018, an enterprise risk officer was appointed, reporting directly to the chair of the audit committee. The postholder's remit is to improve the control environment supporting business executives in tighter measures to manage business risk, further refine risk management, and provide senior management and the audit committee with an independent view of the risk landscape.

In 2019, a new approach to enterprise risk management (ERM) was rolled out. A risk register was drawn up together with senior management, and all risks were assessed according to impact, probability, and risk coverage. We identified eight key risk themes:

- innovation and growth

- finance

- organization

- governance, risk, and compliance

- delivery

- information security

- health, safety, and environment

- continuity

For each theme, the main risk factors were identified, and the control environment assessed. To support the risk management activities, a comprehensive risk and control framework was established for complex risks such as information security. In 2022, risk management around environment, social, and governance (ESG) matters was integrated into the existing ERM processes.

As a result of this structured approach, senior management and the audit committee have a clear understanding of the main risks for imec and how imec manages these risks. By repeating this assessment annually and closely monitoring the key risks, senior management keeps a close eye on the situation. The control environment is also continuously improved.

5.3.2. Maximizing data security and customer privacy

As stated in our mission statement, we want to be a 'reliable partner for start-ups and the academic world'. Our security and privacy teams ensure that our partners can rely on us when it comes to data security and privacy. This means that they guarantee the availability, confidentiality, and integrity of data and personal information to our partners.

R&D information, and information in general, are crucial imec assets. They are exceptionally valuable and must be well protected against an ever-increasing number of risks. Imec takes into account risks such as information leaks or the incorrect application of legislation, as well as espionage. Continuously monitoring and managing these risks is of great importance to the various imec stakeholders.

In 2023, the information security team developed a new strategy. In so doing, imec takes into account the increasing expectations of its stakeholders regarding security and the EU's NIS2 Directive, which has since become applicable to R&D organizations. Strategic developments in our collaboration model also led to new components in our own information security policy, such as obtaining additional certifications in information security.

As part of this process, imec has developed a new information security policy based on an in-depth risk analysis, focusing on the following themes:

- principles for risk analysis, governance, and management, roles and responsibilities, actions, and information security resources;

- standards for systems;

- document management standards and processes;

- principles and codes of conduct for internal employees, and subsequent training and awareness campaigns; and

- partner and vendor policies.

Imec uses a structured and documented information security management framework (ISMF) to draw up and implement this new information security policy, based on industry best practices, including ISO 27001 and ISO 27002 standards, and the NIST SP 800-53 framework. In 2024, the team is preparing for ISO 27001 certification. In 2023, we also worked hard to update our cybersecurity policy, based on the Trusted Information Security Assessment Exchange (TISAX), a mechanism for information security in the European automotive industry.

Training and awareness are crucial in addition to governance, risk management, and policy. Until 2023, there was a mandatory training course on information security every three years for all employees. Starting in 2024, this training will be provided annually, with the goal of certifying every employee. Currently, 85% of employees hold such a certificate, while 15% do not, because of the time interval between the expiry of a certificate and the scheduling of a new training session, or due to employee temporary absence. There are also regular awareness-raising activities, including on recognizing and reporting phishing attempts.

Other training sessions concern correct document management, embedding agreements in business processes, and identity and access management. All our internal company documents must be labelled according to their confidentiality level. Since the introduction of the system in 2022, all imec documents have been given such a label.

To conclude, there is also a great deal of activity in the microchip industry. In 2023, the SEMI Cybersecurity Consortium was founded, a working group developing sector-based solutions to better protect the microchip industry against cyber threats. As an active player, imec is looking to help define policy principles. The imec information security officer is an active member of the working group, alongside representatives from organizations including Applied Materials, ASML, IBM, Intel, Lam Research, the US National Institute of Standards and Technology (NIST), PEER Group, TEL, and TSMC.

In 2024, with the aim of modernizing security protocols and enabling more information exchange via SEMI, the consortium will work on the following three action points:

- developing a robust cybersecurity framework;

- developing a sector-specific framework to assess cybersecurity throughout the entire supply chain; and

- integrating best practices from industries such as the automotive and medical sectors.

"Cyber threats are constantly evolving at a rapid pace. By collaborating on data security and exchanging knowledge with our partners in the imec ecosystem and in the microchip industry, we greatly increase our chances of effectively fending off these threats."

Tom Palmaers, imec information security officer

In addition to data security, privacy protection is also an important pillar. The imec data protection officer (DPO) has developed a policy with the privacy office covering potential risks, emphasizing awareness and knowledge building, and providing the support processes for this.

Regarding privacy, the privacy office takes into account significant external trends that could have an impact on imec and its employees. The rise of AI and AI applications was one of the trends in 2023. The combination of AI with privacy will be a point of attention for the next few years. To effectively monitor this trend, imec began to set up an AI framework as part of the imec ecosystem in 2023. A second trend is the convergence of current geopolitical movements with the speed of technological evolutions. To guarantee everyone's privacy, a thorough understanding of these movements, and a robust policy are needed.

Internal developments such as the expansion of the automotive industry and healthcare programs also require a tailored approach from the privacy office. As with all other projects and programs, the team implements the appropriate processes and measures from the start to guarantee the rights and freedoms of those involved.

To conclude, imec processes a lot of personal data that must be handled with care in order to safeguard the rights and freedoms of the individuals involved and to avoid unlawful processing. To this end, we have developed a privacy program monitored by the privacy office, consisting of a number of controls and measures through which we manage the risks associated with the processing of personal data. We always conduct these controls in accordance with applicable regulations such as the GDPR, and carry out these checks for employees as well as for customers and participants in research projects. This ensures the protection of rights and freedoms of everyone in our research programs, in our services to other organizations, and in our internal processes. The privacy policy, the underlying processes, and the controls are monitored, with the results reported to imec management.

Continuously raising awareness of the importance of privacy and the associated behavioral change are priorities in imec's privacy policy. Internally, the privacy office organizes various training sessions and awareness campaigns, including through roadshows.

Roadshows raising awareness about privacy

In the roadshows, participants learn about privacy in general and receive tips and advice on privacy at imec. "What does privacy mean in our daily lives? How does that translate to your day-to-day work at imec?" Topics such as social media, ChatGPT, privacy in research, and privacy in the context of HR, are discussed in these sessions. In 2023, 18 such sessions were organized for a total of 509 participants. In 2024, the program will be extended to include themes on health and AI.

"The strength of our roadshow lies in making clear what privacy actually means. In this way, we increase awareness and knowledge about privacy, and motivate our employees to handle privacy issues correctly."

Klaas Ghesquiere, imec data protection and healthcare compliance manager

The privacy office is also looking to share its knowledge externally. For example, on DPO Day, the imec DPO participated in a panel discussion organized by the Federation of Belgian Enterprises (FEB).

5.3.3. Engaging in responsible procurement and conducting supply chain due diligence

Sustainability is also important to imec's purchasing department. We are aware that the extraction of minerals and the production of chemicals used in our research center may involve human rights violations or environmental risks. The same applies to the equipment and clothing we buy. In recent years, we have put in place procedures to avoid these risks as much as possible. In addition, every imec partner must sign our supplier Code of Conduct.

New suppliers are extensively screened in a four-pillar system assessing them based on quality, approach, cost, and sustainability. We employ a segmented approach, depending on the category of supplier, and they are required to complete a risk-based questionnaire that includes inquiries into their ESG sustainability performance. Do they have an environmental management system in place? Do they have a policy regarding respecting human rights in the supply chain? Are they transparent about their sub-suppliers? For capex spending, sustainability is always a requirement.

The results of the questionnaire are taken into account in the process of choosing a final supplier. A cross-functional team of experts verifies sustainability labels, while suppliers' sustainability claims are screened. When a contract is signed, the suppliers are re-evaluated annually or every three years, depending on their category.

In addition, the purchasing department seeks to make at least 40% of purchases locally. In 2023, imec exceeded that goal, with a large proportion of our purchases made in a 250 km radius of the Leuven site, in an approach intended to contribute to the sustainable economic growth of the communities in which we are located.

In 2023, the procurement team also paid attention to the due diligence aspect, or supply chain care, of the procurement process. Value chain mapping was used to increase transparency in the supply chain for a number of key products. This proved to be a challenging exercise. In 2024, we will continue this effort, further assessing potential risks related to the environment, human rights, and good governance per product group and per supplier.

We also want to draw up a due diligence policy in 2024, aligning with the upcoming EU Corporate Sustainability Due Diligence Directive. But, above all, we want an internal framework and guidelines on sustainable procurement for the entire organization.

Most buyers have followed a training session on sustainable procurement in the past year, giving them the opportunity to get inspired and launch ideas. We are working on an innovative culture and a transition towards more sustainable, as well as more consolidated, purchasing.

The purchasing department plays a crucial role on the road to sustainability. As a sustainability ambassador, we like to take internal customers and external stakeholders along in a positive story. In recent years, for example, we have opted with our IT department, for a sustainable IT solution. Our IT hardware's carbon footprint is compensated by a solar energy project in India.

"Obtaining transparency in our supply chains to better manage sustainability risks is proving to be a challenging task. Nevertheless, at imec procurement, we believe that we can contribute to the establishment of sustainable ecosystems. We are therefore fully committed to a responsible procurement and due diligence policy."

Wouter Machiels, imec procurement director

5.3.4. Employing high standards of good governance on anti-corruption and fraud

Imec has a zero-tolerance policy towards all forms of bribery, corruption, extortion, and embezzlement. The ethical code of conduct stipulates that employees may not be, or appear to be, influenced and must avoid conflicts of interest.

Employees are also not allowed to accept incentives that may influence business decisions and are strictly prohibited from offering unlawful financial or non-financial incentives to partners or stakeholders.

Imec has a separate policy on conflicts of interest, which is implemented through various preventive measures. The risk of misuse or errors is minimized through segregating duties, strict access control, and the four-eyes principle for sensitive processes and transactions.

The ethical code of conduct also stipulates that employees may not make improper payments in cash, or by offering valuable gifts, to government officials, political parties, candidates for public office, or any other person. The prohibition extends to facilitating payments intended to speed up or secure the execution of a routine government procedure.

To conclude, the ethical code of conduct stipulates that imec does not engage in any form of money laundering.

5.3.5. Through citizenship

Emphasizing engagement and solidarity, imec's commitment to corporate citizenship is evident through various initiatives and collaborations, reflecting our dedication to making a positive impact both locally and globally. From supporting education and disaster relief to environmental sustainability and circular practices, imec actively contributes to diverse causes. Our focus on engagement underscores the transformative power of collective efforts in addressing societal challenges and fostering positive change.

- In collaboration with the non-profit organization Hope for Girls, imec has implemented the 'Empowering Girls through Education' project, aimed at supporting young girls in Kenya. The Visa Academy in Kuria, western Kenya, serves as both a school and refuge for girls escaping the perils of female genital mutilation (FGM) and child marriage. Imec has played a pivotal role by establishing a computer class at the academy and providing essential training for teachers to integrate technology into their classrooms. Furthermore, several teams of imec employees are individually sponsoring the education of one girl each, enabling them to break the cycle of poverty and forge a brighter future.

- Numerous imec employees actively participated in Levensloop Leuven, an event organized by the Foundation against Cancer. Engaging in a variety of activities such as walking, running, jumping, and hiking, they dedicated 24 hours on the Levensloop parcours to demonstrate their solidarity with those tirelessly combating cancer around the clock. Leading up to the Levensloop weekend, imec employees undertook fundraising efforts to contribute to the fight against cancer. The year kicked off with a real winter happening and several dessert buffets were organized on the imec site. Imec matched the funds raised by employees, resulting in an impressive €7,380 transferred to the Foundation against Cancer.

- On the Feast of St. Nicholas, adhering to our annual tradition, we opted to redirect funds towards charitable projects instead of gifting chocolate or candy to colleagues. Each year, imec chooses to have St. Nicholas visit underprivileged young people rather than our own employees. Imec staff can nominate an organization for this St. Nicholas project if they actively volunteer with the organization. The selected projects or organizations receive €2,500 from the imec St. Nicholas Fund. This year, the chosen beneficiaries were Kirikou, Kinderkankerfonds Leuven, Pleegzorg Vlaams-Brabant, and Georges Foundation. The objective of the St. Nicholas Fund extends beyond supporting underprivileged young people; it also aims to recognize employees who dedicate their time as volunteers for these causes.

- During major natural disasters worldwide, imec colleagues immediately initiate efforts to raise funds for victims in their respective home countries. Imec matches the amounts collected by employees, not only as a demonstration of solidarity with the affected individuals but also to promote a broader sense of solidarity with those facing adversity. In 2023, specific initiatives were launched to support victims of earthquakes in Syria, Turkey, and Morocco.

- In 2022, imec pledged to plant a tree for every visitor attending the open business day in collaboration with Natuurpunt. In February, Natuurpunt, alongside numerous imec employees, successfully planted a substantial 2,000m² of forest in the Schulensbroek nature reserve located in Herk-de-Stad.

- Imec donated 60 decommissioned firefighter helmets to Firefighters 4 Nepal. This initiative aims to enhance the equipment of several fire departments in Nepal, providing firefighters with a safer working environment and improving their ability to protect the local population.

- In 2023, energy production and consumption became a concern for every household. Brightlab encouraged children and young people to gain scientific knowledge, think critically, and look for solutions to the energy problem, in collaboration with educational, scientific, and media partners including imec, Energyville, PXL, Howest, GO!, POV, and VRT. Together, we developed innovative educational materials such as ECO-thuis (8-12 years), Verticale windmolen (12-14 years), EDUbox Energie & ik (14-18 years), and the MOOC Energietransitie (17-18 years). For more information, please visit www.brightlab.be.

6.   Financial report

6.1. Consolidated balance sheet

In 2023, imec International's consolidated balance sheet total continues to exceed €1 billion, an increase of 3.5% over 2022.

Tangible fixed assets

Tangible fixed assets increased by €29.72 million in 2023 to €366.51 million, with annual depreciation expenses of €105.14 million. In 2023, imec invested a total of €134.77 million in tangible fixed assets. Sales and decommissioning amounted to €4.09 million, with a corresponding depreciation of €4.01 million. The main acquisitions relate to scientific infrastructure and equipment.

The numerous long-term collaborations with key equipment manufacturers in the chip business on the world stage are vitally important from a strategic point of view.

The imec – ASML Patterning Center continues to play a leading role and is essential for establishing broader collaboration with other suppliers of equipment and materials, such as photoresists and chemicals.

Since ASML is one of imec's most strategic partners, we are working together on the next generation of EUV devices. There is also a great deal of collaboration on the High NA Lab in Veldhoven, which will enable imec to be closely involved in the latest developments. The development of the High NA Lab and the collaboration between imec and ASML are becoming more concrete, with even better defined processes, along with collaboration with participating partners. The lab will officially open in 2024.

Contracts have also been signed with several other strategic device suppliers. Depending on delivery time and application, the purchased devices will end up in the current cleanroom or its extension, which was put into operation in November 2023. Imec is constantly exploring the market in order to always have access to the most advanced devices, which are also used in the standard production process.

Here are some insights into our collaborations:

The strategic partnership continued with device supplier LAM, whose tools are used worldwide for almost all leading edge devices. The contract value of the 2023 agreement with LAM was around €11 million, which was used to purchase the LAM Sense.i, including the AKARA room and a LAM Metryx. The LAM Sense.i represents the next generation platform, developed by LAM. The AKARA room will enable CFET Fin and Gate.

The Lam Metryx is a mass metrology device used to measure the total mass of 300mm wafers. Through differential measurements, it can accurately determine the amount of material deposited on a wafer or etched from a wafer (to about 30 micrograms).

Imec and LAM will also continue to work together on the new patterning approach, with LAM selecting imec for further development and refinement.

There is continuous consultation with device supplier AMAT about opportunities regarding the purchase of AMAT devices or upgrades already in use at imec, ensuring that imec always has the most advanced tools to develop continuously evolving and more complex processes.

The contract with KLA, which began on January 1, 2021, continued into 2023 for a total value of around €11 million. The collaboration between imec and KLA has been ongoing since 2015 and is an important added value for both parties. The collaboration allows imec access to the KLA inspection and metrology equipment supporting imec's program development. Through this collaboration, KLA has access to imec programs, allowing it to develop exclusive KLA vehicles and obtain advanced samples to further improve its own metrology and inspection equipment.

The intention with suppliers is to focus more on process development together. By developing and testing integrated solutions for new equipment, imec becomes part of the supplier's long-term strategy.

Up to 2023, agreements have been concluded for devices that meet imec's investment conditions. Based on the current business plan, imec will meet the conditions for investment and subsidy from the Flanders government for its new cleanroom.

Financial fixed assets

Financial fixed assets decreased by €5.01 million to €54.71 million, a decrease of 8.4% on 2022.

In 2023, imec vzw made investments in Axithra (€0.8 million), Tent bv (€0.5 million, of which €0.1 million were fully paid), and Pulsify Medical (€0.53 million). With the exception of Tent bv, these are 'in-kind' participations involving the contribution of IP.

At Fidimec, the largest investments in 2023 were the full payment of capital (€3 million) in the first imec.xpand fund, which fulfilled 80% of the total investment commitment (€30 million), as well as investments in venture capital funds (€0.37 million). Additional investment of €3 million in the second imec.xpand fund followed.

2023 was the first year of the divestment period of imec.xpand, which holds a total of €116.7 million. The fund has invested €85 million in 16 start-ups. The last investment took place in 2022. 11 investments relate to imec spin-offs.

The portfolio also recorded significant impairment charges with regard to various participations, totaling €12.4 million. The biggest reduction, amounting to €7.52 million, relates to miDiagnostics. As a result of these impairments, the net valuation of the participations is aligned with the current state of affairs within the portfolio, taking into account the principle of prudence and the specific risks taken into account for each case, such as growth potential, product development, and exit expectations. The latter is particularly important in the valuation of venture capital funds. In 2023, the valuations of several companies came under pressure due to the changed financial climate.

Despite the additional investments, the impairments led to a decrease in financial fixed assets.

Current assets

Current assets increased by €10.90 million to €621.52 million, an increase of 1.8% compared to 2022.

Long-term trade receivables decreased by €4.86 million. The receivables, mainly attributable to one particular customer (€5.25 million), have been transferred to the short term, because of a repayment plan lasting only for the upcoming year.

Other long-term receivables increased by €1.22 million to €33.87 million. The long-term receivables relate to capital subsidies from the European Commission and the Flanders government (€24.66 million). There is also a receivable relating to the covenant with the Flanders government for PhD engagement (€3.29 million), and a receivable for the R&D tax credit of €5.65 million.

Stocks of wafers, gases, and chemicals increased by €4.32 million to €10.40 million. The reason for the increase is the change in rules regarding the value of the slow-rotating stock. The procedure has been tightened, providing a more accurate picture of the stock value.

Receivables in less than a year increased by €5.96 million to €171.75 million. Trade receivables rose slightly by 2.8% to €128.48 million. Other short-term receivables amount to €43.28 million. These include short-term receivables to the Flanders Government and the European Commission relating to subsidies under the Flemish Resilience plan (a decrease of €6.49 million to €10.21 million). In addition, the receivable for the balance of the Flemish grant (increasing by €1.56 million to €14.91 million) is included under this heading.

There is also a receivable relating to taxes, which increased by €6 million to €10.04 million. The increase is mainly due to a receivable resulting from further accumulation of the R&D tax credit. For €0.86 million, there is a withholding tax receivable.

Cash investments and cash equivalents together increased by €3.04 million to €381.61 million. The cash investments comprise readily available funds and term deposits of various short-term maturities. The available cash equivalents are committed to ongoing engagements. For example, there is an ongoing investment plan on which significant expenditure is expected in 2024. There are also payment obligations to the public funding partners.

Accruals and deferred income increased by €2.44 million to €23.67 million. This category mainly includes deferred costs related to maintenance contracts, licenses, and software.

Equity

The consolidated shareholders' equity increased by €33.11 million to €383.27 million. The profit for the financial year (group share) was €35.54 million.

Third party interest increased by €20.30 million. This category includes the minority shareholders' share in imec International's consolidated equity. This increase has its roots in the completed capital increase of €27 million at Finlab, the losses incurred by Fidimec in 2023 (€7.90 million), and the profit generated by Finlab in 2023 (€0.94 million).

Debts

Total debt decreased by €17.95 million to €479.11 million in 2023, marking a decline of 3.60%. Long-term debt increased by €2.32 million, mainly due to the transfer of repayment obligations to short-term debts (€6.16 million). Other long-term liabilities include long-term commitments made under the covenant. There is an increase in these long-term liabilities of 3.84 million euros to €9.94 million in 2023.

Debts for up to 1 year increased by €1.17 million to €249.47 million.

There is an increase in trade payables of €3.32 million, while customer prepayments decrease by €9.33 million. Due to the continuation of underlying projects, various advances received from 2022 were used in 2023.

Social debts increased by €14.72 million to €84.38 million. This increase is the result of an increase in the number of employees due to the growth of imec's activities. A statutory indexation of 11.08% was also implemented in January 2023.

Accruals and deferred income decreased by €16.80 million to €185.22 million. There are several reasons for this decline:

- There was a decrease in deferred income 'in cash' of €10.98 million. The deferred income 'in cash' evolves according to the status of the ongoing projects and associated liabilities.

- The transferred earmarked allowances will increase by €7.10 million to €33.70 million, representing funds still to be spent from earmarked allowances already received.

- Accrued revenues 'in kind' decreased by €15.25 million. The R&D equipment has already been delivered to imec, and the quid pro quos will be provided by imec. At present, the related revenue is recognized in the income statement.

6.2. Consolidated income statement

In its R&D strategy, imec focuses on the development of nanoelectronics and its impact on major societal challenges. Global socio-economic priorities, such as health care and ageing, transport, communication, and renewable energy can only be achieved through innovative technologies. Based on this social vision, imec selects technological challenges which align with its mission and which offer sufficient interdisciplinary leverage. This allows optimal utilization of imec's unique infrastructure, competencies, and technology platforms.

This selection will be further developed based on the market-driven growth potential of the technology, and is evaluated against the local economic added value. The key challenges are translated into research platforms and associated research programs, which are more scale- and performance-driven, and generic in nature. Additionally, they are translated into function-driven and application-specific domains. Increasingly, imec is also trying to build bridges between the two major technological directions. A distinction is made between platform research, which is mainly focused on industrial applications, and exploratory and proactive research that strives for fundamental progress.

The cooperation with Flemish companies and organizations is discussed in the annual report for the Flanders government.

Total operating income, including government grants, increased by 11.3% to €941.34 million. Operating profit amounted to €20.26 million compared to €31.94 million in 2022.

All imec entities have a specific focus on the local industry of the country in which they operate. For imec vzw, this is Flanders in particular.

Turnover and other operating income, excluding grants and subsidies, together amounted to €693.15 million, representing 73.6% of total operating income. There is an increase of 11.9% over 2022 to €619.56 million.

In 2023, the grant withdrawn from the Flanders government amounts to €140.21 million, and the subsidies received in the context of 'funded' projects amount to €57.15 million.

2023 marked the second year of operation of the covenant signed in January 2022 with the Flemish Region. Both the Flemish Region and imec made important commitments. For 2023, the grant allocated to imec amounted to €148.25 million, comprising basic funding (€84.29 million) and further earmarked funds (€63.96 million).

Imec, for its part, accepted both strategic and specific operational objectives, which are partly in line with the predetermined key performance indicators (KPIs).

Amounts (x 1000 euros) TY 2023				
	Committed funds	Use of P&L	Outstanding liabilities End of 2023	Reserves carried forward End of 2023
Non-labeled part endowment	84,292	84,292		
Demand-driven research ICON	15,738	6,841	4,284	24,948
iStart	4,492	4,322	654	904
Edit	5,621	4,771	200	3,907
Strategic basic research with core groups	6,744	4,358	548	2,387
Strategic projects with Flemish PhD knowledge centers	4,497	4,171	9,417	
Budget system demonstration	26,325	31,090	4,304	1,380
Care and health	541	362		179
Total	**148,250**	**140,206**	**19,407**	**33,705**

Grant from the Flemish Region to imec and overview of its use.

Because the predetermined targets for all KPIs from the covenant were achieved, the core funding was fully included in the 2023 income statement.

In the context of accurate reporting of the specific activities, the operational costs and the related investments are allocated to the earmarked government funds. To the extent that the grant has not been fully taken or committed, it is carried over to the next operating year. This applies to almost all labelled grants, for a total reserve of €33.71 million. This transfer increased by €7.10 million compared to last year. The use is less than the allocated grant, especially for ICON.

Imec also has outstanding commitments relating to strategic PhD projects amounting to €9.42 million. For ongoing ICON projects, the amount involved is €4.28 million, and for system demonstration it is €4.30 million (see table for the full figures). On project allocation and contract signing with PhD, these amounts were included

under various short-term liabilities, and under long-term liabilities for the longer-term elements. In this way, imec aims to provide a complete and true picture of its obligations.

Other operating income also includes an amount of €32.05 million in cost reductions obtained, specifically the exemption from advance payment of withholding tax for scientific personnel.

The local authorities in Flanders, the Netherlands, and Florida continue to support imec. Governmental financial support for the activities of imec Netherlands and imec Florida amounts to €14.62 million and €2.86 million respectively.

Total operating expenses increased by €106.91 million to €921.07 million in 2023, representing an increase of 13.1%. Total operating costs increased by €39.54 million to €467.62 million.

Concerning equipment purchases, there is an increase of €4.89 million due to the increased output of lotturns in the cleanroom and a rise in the overall level of activity.

Costs for services and miscellaneous goods increased by €34.65 million to €248.51 million, an increase of 16,2%. The largest increase (€7.24 million) mainly involved utilities, specifically electricity. In addition to a slight increase in consumption, there is a significant increase in electricity prices compared to 2022. Furthermore, there is an increase in computer costs of €4.90 million. Higher 'in kind' costs related to software correspond to the increased 'in kind' revenues. Due to the growing number of staff, more servers and laptops were leased.

Additionally, expenses for external services continue to increase, largely driven by the Flex forces category (up by €5.24 million) and temporary staff. Flex forces remain a significant component of the workforce to meet imec's obligations in the current labor market.

The increase in scholarship expenses aligns with the resources received in recent years from the covenant. Scholarships continue to be essential for imec to attract new scientific talent.

There is also an increase in rental and leasing expenses arising from imec's new mobility plan in 2023, providing for more sustainable transport options, as well as the effect of a growing workforce.

Total personnel costs increased by €56.02 million (16.2%) to €344.95 million. The increase in the number of employees from 2,670 to 2,909 and the statutory indexation of 11.08% in 2023 are the main factors behind this rise.

Depreciation of tangible fixed assets increased by 10.1% compared to 2023. In 2023, a total amount of €134.77 million was invested.

Other operating expenses include impairments, or reversals of impairments, on trade receivables (a decrease of €2.85 million, caused by reversals of previous impairments), property tax (which remained stable) and various taxes (increasing by €1.44 million).

The recurring financial result yields a net profit of €15.33 million compared to a net profit of €3.07 million in 2022. The increase is mainly due to the higher interest rate on cash and cash equivalents. Recurring financial income mainly includes interest income and received capital subsidies. The use of these capital subsidies is recorded in proportion to the booked depreciation. Recurring financial expenses mainly include interest.

The non-recurring financial result amounted to -€9.82 million.

Non-recurring financial income (€1.66 million) mainly involves realized capital gains and reversals of financial impairments.

The non-recurring financial expenses (€11.48 million) are the result of various impairments on participations, principally miDiagnostics (€7.52 million) and Indigo Diabetes (€1.10 million).

Due to its innovative activities and environmentally friendly investments in tangible fixed assets for research and development, the imec group has a tax credit of €4.35 million.

Consolidated profit for 2023 amounts to €28.59 million compared to €36.56 million in 2022. The imec group's share of the 2023 consolidated profit amounts to €35.54 million.

6.3. Imec group R&D entities

6.3.1. Imec vzw

For a detailed description of imec vzw's activities, in particular the various R&D collaborations, innovation services, and support for start-ups, refer to www.imec-int.com.

For additional background regarding the financial statements, please refer to imec VZW's separate financial statements.

6.3.2. Imec the Netherlands

The total revenue of imec the Netherlands imec increased by 19% in 2023 compared to 2022. Whereas in 2022, the growth was fully achieved through growth in subsidy income, the growth in 2023 was achieved through growth in net revenue. For the Eindhoven location, the increase was approximately 22% compared to the previous year while, for the Gelderland location, the increase was 147%.

The subsidy income received by imec the Netherlands, will be used for research and development expenses in the research programs, where these costs are not covered by revenues from contracts with companies or from participation in European and national programs. In 2023, use of subsidy income was €1.4 million lower than in 2022.

2023 was a year when the imec the Netherlands foundation was able to strengthen existing programs as well as initiate new activities. The foundation has been working towards a healthy mix of mature programs with solid industrial involvement and new, riskier projects to strengthen growth opportunities for Dutch technology companies.

Existing programs such as "Wireless and Sensing" and "Medical Wearables" continue to attract strong industrial funding. Despite the major international investments in chip design, we are still able to attract leading industrial players to invest in our UltraWideband and Bluetooth chip research. This program has already generated more than 17 patent families for the foundation and numerous contributions to communication technology standardization.

The "Medical Wearables" program also continues to attract international investment. The chip developments and algorithms are reused and adapted to the particular needs of small and medium-sized enterprises (SMEs). A good example is Onera, a company that has developed a unique sleep technology. Since it became independent, the collaboration with imec the Netherlands has continued, contributing significantly to Onera's growth in the Netherlands.

OnePlanet's "Nutrition & Health" program has succeeded in finding initial industrial traction with companies from the food and beverage industry and the consumer health sector. The start of the first human clinical trial of the "ingestible sensor" in November 2023 was definitely a milestone, marking the culmination of over four years' work by a team of more than 20 researchers.

The "Precision Agriculture" program, with an emphasis on controlled agriculture in greenhouses and orchards, combined LiDAR technology and AI to enable autonomous pruning in the future. The "virtual reality" demo gave broad visibility.

In the "Environmental Sensing" program, we strive for innovation with social impact. Within the OnePlanet partnership and along with knowledge partner TNO, the foundation is working on scalable solutions for fine-grained measurement of nitrogen. In 2023, progress on measuring nitrogen has been substantially accelerated through various projects and studies in Gelderland and other provinces.

In the context of data platforms and AI, the OpenPlanet project was completed at the end of 2023. The platform developed is an accessible, user-friendly, and sustainable digital infrastructure that unlocks various data sources, enabling smart analysis and new user application development by regional SMEs.

These digital services provide business-oriented feedback for green agriculture and personalized positive health application.

New photonics initiatives for mobility, data communication, health, agrifood, and "Organ-on-Chip" have been further explored with the launch of several National Growth Fund initiatives in 2023. For imec Netherlands, this concerns the National Growth Fund programs on photonics, NXTGen Hightech, and 6G.

In addition to building teams and activities around these themes, the growth fund grants provide an impulse to new collaborations with other Dutch research groups, universities, university medical centers, and SMEs. In order to strengthen the impact and anchoring of the new research activities, funding for the first European projects on these themes has now also been awarded.

The FITT program, a collaboration with Eindhoven University of Technology, Fontys University of Applied Sciences, and TNO, focusing on vitality at the workplace, saw no fewer than 14 industrial SME partners taking part in 2023. In addition, the initiative was visited by various delegations, including major local players' human resources departments, student initiatives, policymakers, and embassies.

For the period from 2023 onwards, a solution to fund imec the Netherlands in Eindhoven has been secured.

The foundation has also received a number of grants for participation in National Growth Fund initiatives over the next few years.

Additionally, the Dutch government introduced a new funding scheme from 2023 onwards: "Subsidy for strategically important research centers". In 2022, imec the Netherlands Foundation, as a partner in the Holst Center collaboration, immediately submitted an application. The response from the assessment committee was positive. As of January 1, 2023, the foundation has received a subsidy grant of a total of €10 million over five years under the scheme. This provides a solid solution for the medium-term financing of the foundation's Eindhoven location.

For the OnePlanet Research Center opening in Gelderland in 2019, the foundation was awarded a four-year subsidy with follow-up funding for a further four years dependent on performance. In 2022, prior to the end of the first four-year term, an extensive audit was conducted by external parties, covering finances and agreed performance indicators. The Center passed the audits successfully. On the basis of the first four years' performance and the business plan for the following four years, the provincial councils gave their approval for the follow-up financing. OnePlanet Research Center also expects to receive an allocation in 2024 for participation in a new Dutch Growth Fund initiative.

For the Gelderland location, the foundation also received an allocation in 2023 for participation in the National Growth Fund initiative on photonics.

6.3.3. Imec USA Nanoelectronics Design Center

In 2023, the imec entity in Florida celebrated its 7th anniversary. It was also the second year of the current five-year funding agreement with Osceola County. In 2023, the center experienced growth and technical achievements and strengthened technical and regional partnerships, employing a 16-strong workforce.

The superconducting digital team won the DARPA grant and executed the DARPA Next Generation Microelectronics Manufacturing Phase 0 subsidy ($0.25 million imec share). The initiative was prepared by BRIDG in collaboration with Boeing, Corvo, Cadence, Siemens, and various universities. They also won a two-year grant from the Department of Energy ($3.6 million total imec share, $1.7 million imec USA) to further develop the manufacturing processes for superconductor ICs. The project is being prepared by Jefferson Labs in collaboration with NY CREATES and Cornell University.

The center collaborated extensively with BRIDG, Osceola County, University of Central Florida, University of Florida, and other stakeholders, culminating in the historic win for the National Science Foundation Central Florida Innovation Engine. The award, announced in January 2024, provides Engine partners with $15 million over the first two years ($2.5 million imec share) with a potential of $16 million (imec share) over the planned ten-year performance period.

The award enables both the growth of superconducting digital system activities and the start of a new RFIC system activity focusing on 6G telecommunications technology. The center supported Osceola County in winning 17 million dollars from the state of Florida for a new testing lab building in NeoCity. The building will accommodate an extensive cryogenic test laboratory and a new RFIC test laboratory. It will continue to nurture its local relationship with the Plug and Play Tech Center and assist them in establishing industry partnerships within their new semiconductor industry at NeoCity.

7. Patent policy

7.1 Patent policy

7.1.1 Patent strategy

Imec's patent policy is linked to its research programs and is an integral part of our business strategy. It is a crucial element in imec's policy on intellectual property (IP) and intellectual property rights. Our patent policy aims to ensure an optimal return on investment in research.

With its patent policy, imec supports its dual mission: to carry out research through national and international cooperation and to generate added value for Flanders, together with other Flemish actors. For example, the number of patents with Flemish universities with which imec works closely is an important part of imec's patent portfolio. Through this patent policy, imec also ensures that it can publish critical research results, which is essential for a research institution. Moreover, imec is building up an attractive and relevant portfolio of intellectual property rights.

Our patent portfolio is also a measure of how much innovative research is being carried out. Whether research is innovative is assessed by independent patent authorities. Additionally, the patent portfolio reflects imec's background knowledge, allowing imec to demonstrate and assign value to its expertise and contribution to projects. It is also a source of income, since imec prefers to license the patent portfolio non-exclusively to companies in our research programs.
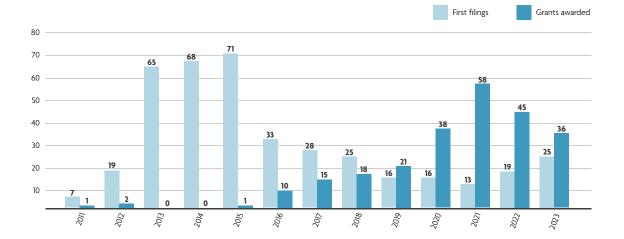
A solid patent portfolio is very important for Flanders, especially when establishing special purpose vehicles (SPVs) or spin-offs. Through a patent portfolio, imec also builds market protection. As the number of spin-offs in which imec is involved increases, the importance of the patent portfolio grows in proportion.

Imec's patent portfolio contains all the patent applications to which imec has rights, whether through ownership and co-ownership or through license and sublicense rights.

7.1.2. Patent group
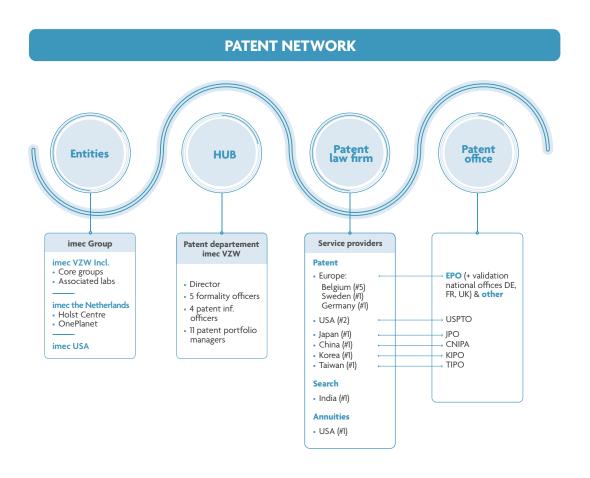
Imec's patent group has 21 employees in five teams: twelve employees are patent managers, five of whom are qualified European patent attorneys. These patent managers are assisted by five people responsible for patent administration and four patent information specialists.

Imec trains patent group employees itself, since most new recruits have little or no experience or knowledge in the field of patents. As part of this training, the patent group has been filing patent applications independently with the European Patent Office (EPO) since 2008. The number of European patent applications has been on the rise again in recent years.

Number of European submissions by imec

The patent group has the necessary expertise and channels to assist imec group entities in patent-related matters. Additionally, it can leverage its global network of IP service providers.

imec group IP network

Within the imec group, imec vzw is responsible for providing patent services. This service also includes training for employees on protecting intellectual property rights, specifically patents and trademarks. For example, all new employees receive a welcome module on intellectual property when starting their employment and are introduced to imec's IP operations.

In the 'imec Group Modus Operandi', imec vzw has drawn up the necessary guidelines to guarantee consistent patent operations within the group of affiliated companies.
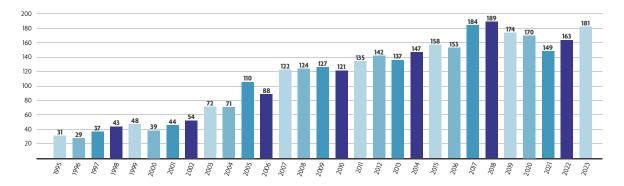
7.1.3   Inventor incentive

In 2023, imec reapplied the imec inventor incentive program. If imec decides to maintain the family of patents, the incentive for inventions will be paid out at the end of the priority year. So, where invention applications lead to patent applications relevant to imec, the inventors are rewarded. The program has also been extended to students in the Digital and User Centric Solutions (DUCS) department core groups.

7.1.4   Accomplishments
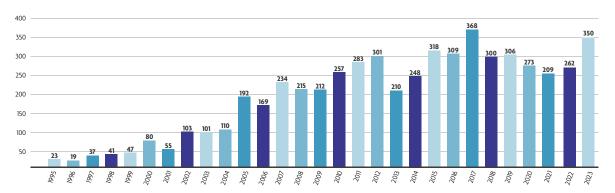
First filings

The number of 'first filings' - patent applications in which an imec invention is registered for the first time - is rising. Since 2023, the 'innovation funnel' initiative, where additional resources from the Flanders government are used to make imec's technology more mature or application-oriented, has been at cruising speed. The number of 'first filings' has increased, but by less than expected. The number of patent applications from regular research activities and from the 'innovation funnel' turned out to be partly interconnected, with both activities relying on the same researchers.

Number of first filings per year

The number of filed inventions shows an upward trend, but varies significantly from year to year. In 2023, actions were taken, including within Semiconductor Technology and System (STS), to stimulate the filing of inventions in strategic areas.

Number of filed inventions per year

Trademarks

In 2023, imec filed two trademarks for spin-offs and for research activities offering services to third parties.

Conflicts

In 2023, there have been six disputes between imec and third parties.

Spin-offs

In 2023, imec's patent group supervised 14 spin-off projects during the venturing process, in the enrichment phase, the venturing Timebox phase, and the venture creation phase.

Patent studies

In 2023, 114 patentability studies, one state-of-the-art study, six landscape studies, and zero Freedom-to-Develop studies were conducted. By mapping the patent landscape in selected technical domains, these studies can help to orientate or benchmark scientific research.

There is also increasing demand for imec's patent attorneys to provide legal advice outside of the process of building up the patent portfolio. In 2023, legal advice was sought for six projects including, for example, on the legal status and impact of third-party patents.

Ideation workshops

In 2023, nine ideation and advanced inventing workshops were organized, aiming to draw up intellectual property development plans on chosen topics. Ideally, an ideation workshop should also lead to initial idea submissions. The topics deal with both strategic research, such as a new research program, and the construction of a patent portfolio for a spin-off. Since they began in 2015, there have been 68 workshops.

7.2 Patent portfolio

7.2.1 Imec vzw patent portfolio

As of December 31, 2023, imec vzw owned or co-owned a patent portfolio of 4,360 maintained patent applications and patents, including those with 'to be abandoned' status or validated in other European countries (excluding European grants, to avoid double counting). International patent applications that have already been filed have not been included. The division into different types of patent applications is more complex than it used to be but, since the new patent database WINPAT has been brought into use, it is also more accurate.

Of the maintained patent applications, 2,951 were granted. These applications were mainly filed with the USPTO (1,046) and the EPO (mainly validated in Germany and to a lesser extent in France and Great Britain: Germany (647), France (434), Great Britain (210), and occasionally in one or more other European countries). Some patent applications have also been filed in Japan (212), China (166), Taiwan (54), and South Korea (45). In addition, as of December 31, 2023, imec vzw maintained license and sublicense rights on 339 patent applications, of which 192 had been granted. As of 31 December 2023, imec vzw has a portfolio of 4,699 patent applications through ownership or license, of which 3,143 have been granted.

In 2023, imec vzw filed 379 patent applications, of which 150 were first filings in a family of patents. 16 patents have also been applied for, for which imec vzw has license and sublicense rights, with two of these being first filings in a patent family. In 2023, the portfolio therefore contains 395 patent applications for which imec vzw has ownership or licensing rights, of which 152 are first filings.

In 2023, 308 patents were granted to imec vzw. Of these, 158 were co-owned with an imec research partner. Flemish universities and colleges were co-owners of 136 patents. Of those 308 patents, 94 were granted by the USPTO (USA), 144 by the EPO, mainly validated in Germany (85), France (27), and Great Britain (11), 8 by the JPO (Japan), 42 by SIPO (China), 9 by KPO (Korea), and 4 by TIPO (Taiwan). 20 patents have been granted to which imec vzw has license and sublicense rights.

In 2023, the European Unitary Patent and Unified Patent Court came into effect. For now, imec rarely makes use of the European Unitary Patent, but is analyzing its investments, returns, and legal implications. Only three European Unitary Patents were filed in 2023.

7.2.2 Imec the Netherlands foundation patent portfolio

As of December 31, 2023, the imec the Netherlands foundation owned or co-owned a patent portfolio of 507 maintained patent applications and patents, including those with 'to be abandoned' status and those validated by other European countries (excluding European grants, to avoid double counting). International patent applications that have already been filed were not included. Since the new patent database WINPAT, the division into different types of patent applications is more complex than before, but also more accurate.

Of the maintained patent applications, 271 have been granted. These applications were mainly filed with the USPTO (98), the EPO (mainly validated in Germany, France, and Great Britain: Germany (67), France (43), Great Britain (32), the Netherlands (3), Italy, Norway, and Switzerland (1 each), and the JPO (25).

As of December 31, 2023, the imec the Netherlands foundation had license and sublicense rights to 29 maintained patent applications, of which 17 had been granted.

In total, as of December 31, 2023, the imec the Netherlands foundation has a portfolio of 536 patent applications through ownership or license, of which 288 have been granted.

In 2023, 66 patents were filed in the name of the imec the Netherlands foundation, of which 31 are first filings. In the same year, zero patents were filed for which the imec the Netherlands foundation has license and sublicense rights.

In 2023, 27 patents were granted to the imec the Netherlands foundation. Of these, 12 were co-owned with an imec research partner, 4 of which were co-owned with Flemish universities and colleges. Of these 27 patents, 14 were granted by the USPTO (USA), 12 by the EPO, mainly validated in Germany (7), France (2), Italy, Norway, and Switzerland, (1 each) and 1 by the JPO (Japan).

No patents have been granted for which the imec the Netherlands foundation has license and sublicense rights.

7.2.3   Imec USA patent portfolio (Nanoelectronics Design Center, Inc.)

As of December 31, 2023, imec USA was (co-)owner of a patent portfolio of 30 maintained patent applications and patents, including those with 'to be abandoned' status or validated by European countries (excluding the European grants, to avoid double counting). International patent applications that have already been filed were not included. Since the new patent database WINPAT, the division into different types of patent applications is more complex than before, but also more accurate.

Of the maintained patent applications, 19 have been granted. These patent applications were filed mainly with the USPTO (7), the EPO (mainly validated in Germany (3)) and occasionally in one or more European countries) and, to a lesser extent, in Japan (3) and China (2).

As of December 31, 2023, imec USA had no license and sublicense rights to maintained patent applications.

In 2023, 4 patents were filed in the name of imec USA, of which there were no first filings. In the same year, no patents were filed for which imec USA has licensing and sublicensing rights.

In 2023, three patents were granted to imec USA, one of which was co-owned with imec vzw. The three patents were granted by the USPTO (USA) (2) and in China (1).

8. Outlook and uncertainties facing the imec group

Due to the negative growth in the microchip industry, ongoing geopolitical tensions, and export restrictions, 2023 was a challenging year. But it was also a year with many opportunities. Despite the challenging environment, we performed exceptionally well in 2023.

Imec's financial results for 2023 show a growth of 95 million euros, with a group-level turnover of 941 million euros. This means that imec has achieved growth of more than 10% for the second successive year.

Furthermore, the substantive results are strong, with continued and confirmed support from key semiconductor players such as Intel, Samsung, TSMC, and ASML, as well as robust growth in other domains such as health, and mobility and logistics. Sustainability remains a key focus across these domains.

As a result of the various Chips Act initiatives and further internationalization, a lot of attention was paid to imec's positioning this year.

In 2023, in addition to achieving good results, the foundations were also laid for future growth. The positive feedback from partners and the scientific advisory board, along with the international recognition of our scientific results, is evidence of our success. But the continuous focus on streamlining and increasing efficiency and the very solid financial results also lay firm foundations for the future.

Thanks to all these efforts, we are further shaping our strategy for the future. The different market evolutions, as well as the increasing complexity and demand for integrated solutions, oblige imec to continuously improve and deliver even greater value for the resources invested.

The further development of R&D platforms, built around imec's core CMOS technology, remains crucial. This is achieved within a sequential and highly connected innovation model that relies on a broad ecosystem of partners.

Our vision is still the same: imec wants to increase its positive impact on society and focus on activities and technologies that really make a difference. Incorporating sustainability in that vision is essential today.

In line with this perspective, the Sustainable Semiconductor Technologies and Systems (SSTS) program has been established. This program maps out the impact of choices made around the development of semiconductor technology (such as materials and infrastructure) on sustainability. Sustainability is therefore an intrinsic part of our operations. It is structured around five main pillars: research, development and innovation as a driver for a sustainable society; attention to the planet; attention to people; ethics and good governance; and sustainable collaboration. This means that we seek sustainable solutions to societal challenges, both in our operations and in our research and development. This includes, for example, sustainable energy use, and sustainable energy production and storage, as well as sustainable healthcare, mobility, communication, and smart cities.

Impact is created through three business models, which are determined by the sector and the partners we work with. Both the development of R&D platforms and imec services play an important role in this. With this strategic approach and focus, imec aims to be as flexible as possible in addressing macroeconomic uncertainty, especially in the microchip industry, while also capitalizing on potential opportunities.

The structural support of the Flanders Government remains crucial for imec. A significant proportion of the funding allocated under the covenant is consistently used to translate technological building blocks into more mature system platforms and prototypes. In this way, imec strengthens its impact in Flanders and across Europe.

Of course, imec's focus as an international group is not just on Flanders. Activities in the Netherlands will be strengthened, including through the allocation of investment from Growth Funds.

In the context of the US Chips Act, imec is looking at how it can use its expertise in pre-competitive semiconductor R&D to support its US ambitions. In this regard, we entered into various collaborations with leading universities. Meanwhile, imec is collaborating with the Japanese semiconductor company Rapidus on advanced semiconductor technology.

In addition, thanks to the EU Chips Act, imec is well placed in Europe to bridge the gap between academia and industry. Together with the other major European strategic research centers CEA-LETI and Fraunhofer, we aim to strengthen the existing European technology leadership in materials and device development through our chip process technology. We are also taking the lead in establishing a pan-European pilot line for prototyping future high-performance computing (HPC) and edge AI applications.

In every region and country where imec operates, we systematically strive to collaborate with the local authorities, with the aim of creating maximum positive impact and assuring long-term financing.

Due to new and growing activities, increasing complexity, and new business models, we are strengthening our support processes and governance, including risk management. In so doing, we constantly pay close attention to information security and the development of ICT infrastructure in its broadest sense. This is necessary for the further growth and support of imec's activities.

Despite the inherent uncertainties, imec has laid a solid foundation in recent years to face the future with confidence and achieve further growth.

9. About the sustainability information in this report and GRI content index

9.1 About this report

Imec is a registered trademark for the activities of imec International (IMEC International, a public utility founded under Belgian law), imec Belgium (IMEC vzw), imec Netherlands (Stichting IMEC Nederland), imec China (IMEC Microelectronics Shanghai Co. Ltd.), imec India (IMEC India Private Limited), imec San Francisco (IMEC Inc.), imec Florida (IMEC USA Nanoelectronics Design Center Inc.) and imec.IC-link USA.

Publication date

April 26, 2024.

Reporting period

January 1, 2023 – December 31, 2023, this is also imec's financial year for all the entities it covers. The sustainability report can be consulted online at http://www.imec-int.com/sustainabilityreport.

This sustainability report is published annually to provide information in a transparent and public manner about the ambitions and progress toward achieving imec's objectives.

Reporting standard and approach

Imec reports in accordance with GRI guidelines. Imec International has reported in accordance with GRI Standards for the period 01/01/2023-31/12/2023. The GRI content index can be found on pages 127 to 130. The scope for the KPIs and deviations are explained in the relevant chapter. The structure and content of the report are based on imec's sustainability policy and material themes. The management approach is included in the description of each material theme.

Contact details

For any questions regarding this report, please contact Wim Fyen, director sustainability: sustainability@imec.be

Disclaimer

The information and materials contained in this report are provided "as is" without any explicit or implied guarantee of any kind. Imec shall not be liable for any damages whatsoever due to the use of or inability to use the information or materials contained in this report.

External safeguarding

This sustainability report has not obtained external assurance. However, internal verification and recommendations were performed and applied with internal experts and management.

This sustainability report provides an accurate insight into imec's social, environmental, and ethical performance, relevant to both imec's stakeholders and imec itself.

Production

Storyline and copy: imec, Woordspraak and Studio D

Management approach and data collection: imec

Design: imec

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9.2 GRI content index

Statement of use	Imec International has reported in accordance with the GRI Standards for the period 01/01/2023-31/12/2023.
GRI 1 used	GRI 1: Foundation 2021
Applicable GRI Sector Standard(s)	Not applicable

GRI standard/ other source	Disclosure	Location	Omission		
			Requirement(s) Omitted	Reason	Explanation
General disclosures					
GRI 2: General disclosures 2021	2-1 Organizational details	p. 19			
	2-2 Entities included in the organization's sustainability reporting	p. 19, p. 126			
	2-3 Reporting period, frequency and contact point	p. 126			
	2-4 Restatements of information	p. 79-81, extension scope 3			
	2-5 External assurance	p. 126			
	2-6 Activities, value chain and other business relationships	p. 19-21, p. 25-27			
	2-7 Employees	p. 19, p. 62, p. 67			
	2-8 Workers who are not employees	p. 62, p. 67			
	2-9 Governance structure and composition	p. 91			
	2-10 Nomination and selection of the highest governance body	p. 91			
	2-11 Chair of the highest governance body	p. 91			
	2-12 Role of the highest governance body in overseeing the management of impacts	p. 30, p. 91			
	2-13 Delegation of responsibility for managing impacts	Not disclosed in this report but publicly available through website.			
	2-14 Role of the highest governance body in sustainability reporting	p.126			
	2-15 Conflicts of interest	p. 99			
	2-16 Communication of critical concerns	p. 92-95			
	2-17 Collective knowledge of the highest governance body	p. 27 - 28, p. 126			
	2-18 Evaluation of the performance of the highest governance body	Not disclosed in this report but publicly available through website.			
	2-19 Remuneration policies	p. 71-72, p. 91-92			
	2-20 Process to determine remuneration	Not disclosed in this report but publicly available through website.			
	2-21 Annual total compensation ratio	Not disclosed	Annual total compensation ratio	Confidentiality constraints	Information is not publicly available
	2-22 Statement on sustainable development strategy	p. 4-5			
	2-23 Policy commitments	p. 31, selection of policies publicly available through website			
	2-24 Embedding policy commitments	p. 24-26, p. 31			
	2-25 Processes to remediate negative impacts	p. 27-28, p. 68, p. 92-94			
	2-26 Mechanisms for seeking advice and raising concerns	p. 27-28, p. 68, p. 92-94			
	2-27 Compliance with laws and regulations	Not disclosed	Compliance with laws & regulations	Confidentiality constraints	Information is not publicly available
	2-28 Membership associations	p. 26, p. 31			
	2-29 Approach to stakeholder engagement	p. 25-27			
	2-30 Collective bargaining agreements	p. 63			

Material topics					
Making sustainable impact through research and development and venturing					
GRI 3: MATERIAL TOPICS 2021	3-1 Process to determine material topics	p. 27-30			
	3-2 List of material topics	p; 29-30			
Developing technologies to accelerate the decarbonization of industry, the built environment, and the power and transport sector					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 34-36			
IMEC 1 - no GRI disclosure	Imec program description & outlook	p. 36-39			
Research to improve the ecological efficiency of chip production					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 34-36			
IMEC 2 - no GRI disclosure	Imec program description & outlook	p. 40-43			
Developing solutions that use energy more efficiently					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 34-36			
IMEC 3 - no GRI disclosure	Imec program description & outlook	p. 43-47			
Leveratging our digital and nanotechnology competences to enable smart applications that contribute to a thriving society (health, cities, logistics, mobility, agrifood)					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 34-36			
IMEC 4 - no GRI disclosure	Imec program description & outlook	p. 47-53			
Creating and supporting start-ups with a positive impact on society					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 54			
IMEC 5 - no GRI disclosure	Imec program description & outlook	p. 54-59			
Working sustainably with our people					
HR policy at imec					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 62-64			
GRI: 401: Employment 2016	401-1 New employee hires and employee turnover	p. 64, p. 71			
	401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees	p. 71-72			
Promoting a healthy work-life balance + Supporting a solid health and safety culture					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 62-64, p. 75			
GRI 403: Occupational Health and Safety 2018	403-1 Occupational health and safety management system	p. 75-77			
	403-2 Hazard identification, risk assessment, and incident investigation	p. 75-77			
	403-3 Occupational health services	p. 64-65, p. 76			
	403-4 Worker participation, consultation, and communication on occupational health and safety	p. 62-63, p. 76-77			
	403-5 Worker training on occupational health and safety	p. 75, p. 77			
	403-6 Promotion of worker health	p. 64-66			
	403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	p. 75-77			
	403-8 Workers covered by an occupational health and safety management system	p. 63			
	403-9 Work-related injuries	p. 77			
Stimulating diversity and inclusion					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 66-70			
GRI 405: Diversity and Equal Opportunity 2016	405-1 Diversity of governance bodies and employees	p. 66-68, p. 91			
GRI 406: Non-discrimination 2016	406-1 Incidents of discrimination and corrective actions taken	p. 68			

Investing in engaged and talented employees					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 73-74			
GRI 404: Training and Education 2016	404-1 Average hours of training per year per employee	p. 73-74			
	404-2 Programs for upgrading employee skills and transition assistance programs	p. 72-74			
	404-3 Percentage of employees receiving regular performance and career development reviews	p. 74			

Working sustainably respecting the environment

Measuring our carbon footprint					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 78-80			
GRI 305: Emissions 2016	305-1 Direct (Scope 1) GHG emissions	p. 79-80			
	305-2 Energy indirect (Scope 2) GHG emissions	p. 79-80			
	305-3 Other indirect (Scope 3) GHG emissions	p. 79-80			
	305-5 Reduction of GHG emissions	p. 81-90			

Increasing responsible and circular use of energy and materials in our own operations, mobility and infrastructure					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 81			
GRI 302: Energy 2016	302-1 Energy consumption within the organization	p. 81-85			
	302-4 Reduction of energy consumption	p. 81-85			
	302-5 Reductions in energy requirements of products and services	p. 81-85			

Efficiently using and reusing water and effluents					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 85-86			
GRI 303: Water and Effluents 2018	303-1 Interactions with water as a shared resource	p. 85-86			
	303-2 Management of water discharge-related impacts	p. 85-86			
	303-3 Water withdrawal	p. 85-86			
	303-4 Water discharge	p. 85-86			
	303-5 Water consumption	p. 85-86			

Minimizing and repurposing waste streams					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 86-88			
GRI 306: Waste 2020	306-1 Waste generation and significant waste-related impacts	p. 86-88			
	306-2 Management of significant waste-related impacts	p. 86-88			
	306-3 Waste generated	p. 88-90			
	306-4 Waste diverted from disposal	p. 88-90			
	306-5 Waste directed to disposal	p. 88-90			

Working sustainably through good governance

Using an ethical charter and SDG's as a compass for our research projects					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 91-95			
IMEC 6 - no GRI disclusure	Imec program description & outlook	p. 91-95			

Maximizing data security and customer privacy					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 95-98			
GRI 418: Customer Privacy 2016	418-1 Substantiated complaints concerning breaches of customer privacy and losses of customer data	Not disclosed	Substantiated complaints concerning breaches of customer privacy and losses of customer data	Confidentiality constraints	Information is not publicly available

Engaging in responsible procurement and devoloping supply chain due diligence					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 98-99			
GRI 204: Procurement Practices 2016	204-1 Proportion of spending on local suppliers	p. 98			

Employing thigh standards of good governance on anti-corruption and fraud					
GRI 3: MATERIAL TOPICS 2021	3-3 Management of material topics	p. 29-30, p. 99			
GRI 205: Anti-corruption 2016	205-1 Operations assessed for risks related to corruption	p. 99			

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