



# Sustainability report

## 2021

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# A message from our CEO

Integrating sustainable practices into company strategy and operations is possibly one of the greatest challenges facing any organization. It requires essential radical changes in the way we think and act, led by frontrunners willing to set an example and pull everyone else in the same direction.

“As a global leader in nanoelectronics and digital technology, we strive for the impossible and aim for disruptive innovation.” We owe it to ourselves to seek maximum impact by providing sustainable solutions that improve overall quality of life, despite living in a world of increasing scarcity, pandemics, and geopolitical shifts.

2021 was marked by a search for renewed equilibrium, and imec was no exception to this. The two pandemic years presented their own set of complex challenges. Furthermore, the risks posed by climate change and shortages of raw materials have forced everyone to make more informed and responsible choices. The questions asked by our partners have also become more multifaceted, driven by an equal desire to find solutions to these challenges. For these challenges, we had to find appropriate, innovative answers, as presented in this sustainability report.

On the geopolitical front, the world has not immediately floated into calmer waters over the past 12 months. Yet also in this regard, we can discern the first signs of how we will eventually deal with these new geopolitical realities. As a semiconductor research center, imec wants to play an important role in the development of advanced chip technology. We will continue to act as the research center of choice, bringing together the global semiconductor industry and pushing the boundaries of chip technology.

This unique collaboration with the industry as a whole puts imec in a prime position to work on future generations of semiconductors, by fully focusing on sustainability throughout the entire value chain, taking both scarcity and rapidly changing climate conditions into account.

A good example is the launch of our Sustainable Semiconductor Technologies & Systems (SSTS) research program, tasked with identifying the environmental impact of chip development and manufacturing, with the aim of bringing together the global semiconductor ecosystem. Strengthened with insights from this research program, our partners can take concrete action to reduce their ecological footprint. This has generated great interest and created high expectations among the wider international semiconductor industry.



Luc Van den hove  
President & CEO imec

Imec is a world player in research & development in deep tech, using its expertise to innovate in virtually all sectors, including healthcare, food and agriculture, renewable energy, mobility, manufacturing and logistics, and ICT. With this background, we are optimistic for the future. In a world where digitization is becoming deeply embedded in society, we want to be the driving force for change. Together with our local and global partners, businesses, governments, academic institutions, and research organizations, we are working on the next wave of innovations that will help us all embrace a better and more sustainable future.

Perhaps my most important motivator is that, at imec, sustainability as a concept not only emanates from boardroom-level strategy meetings, but is a key priority among our employees and stakeholders.

What you have before you is our 2021 Sustainability Report, created thanks to all the efforts of our employees and trusted partners. I sincerely hope that it will persuade you, too, of our substantial efforts and results.

With pride,

Luc Van den hove



# 1. Imec – a driver of sustainable growth

## 1.1 At imec, we shape the future

Imec is a world-leading research and innovation center for nanoelectronics and digital technology. The combination of leadership in microchip technology and in-depth expertise in software and ICT makes imec unique. With its world-class infrastructure and local as well as global ecosystems in diverse sectors, imec delivers breakthrough innovations in areas such as healthcare, food and agriculture, mobility, logistics and manufacturing, energy, and education.

Founded in 1984, imec is an independent research organization. Radical, innovative solutions are not developed overnight, and do not arise from one individual expertise or singular technology. Instead, they come about at the end of a lengthy process of collaboration, of combining expertise and domains, and making scientific and technical breakthroughs. For example, almost every computer chip seen today contains technology that can be traced back to imec. At the same time, imec has managed to bring together innovation, talent, and capital from around the world.



Figure 1 | Overview of imec's international locations and activities

Imec is a registered trademark for the activities of IMEC International with headquarters in Leuven (a public utility foundation under Belgian law), imec Belgium (IMEC vzw, supported by the Flemish government), imec Netherlands (Stichting IMEC Nederland, a division of the Holst Centre and the OnePlanet Research Center, supported by the Dutch government), imec Taiwan (IMEC Taiwan Co.), imec China (IMEC Microelectronics (Shanghai) Co. Ltd.), imec India (Imec India Private Limited), and imec Florida (IMEC USA Nanoelectronics Design Center).

These links are legally realized through, among other things, the adoption of the IMEC Group Modus Operandi, set out by imec International's Board of Directors and subsequently accepted at individual entity level (except for the subsidiaries of IMEC vzw). The IMEC Group Modus Operandi provides that imec International is the controlling legal entity of the imec group, and that all the aforementioned entities comply with the directives of imec International with respect to business development, finance, human resources, and operations, while of course respecting the autonomy of each constituent entity of the imec group.



## Some imec key figures



## Vision and mission statement

“As a world-leading R&D center for nanoelectronics and digital technology, we strive for the impossible and aim for disruptive innovation. We maximize our social impact by providing smart, sustainable solutions to improve quality of life. At imec, we’re shaping the future.”

“As a trusted partner of businesses, startups, and academia, we bring together brilliant minds from around the world into 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 are accelerating progress toward a more connected and sustainable future.”

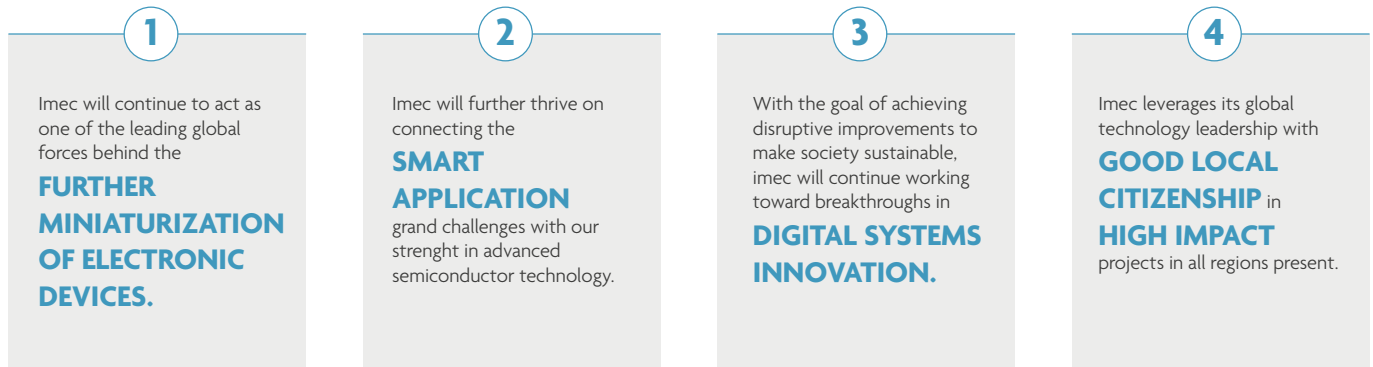
It is this vision and mission statement that runs through all of imec’s operations. From the relentless functional miniaturization of semiconductor technology, and disruptive sensor concepts for process optimization and personalization in the pharmaceutical industry, to a broad portfolio of other digital activities: everything is driven by a desire to have a positive impact, and contribute toward a better life within a sustainable society, all based around imec’s groundbreaking innovations.

This is also the foundation for imec’s guiding principles:

- To carry out pioneering and strategic research in the areas of nanoelectronics and digital technologies, in order to develop the building blocks that will contribute to a better life in a sustainable society.
- To bring new developments to market through partnerships or startups, helping businesses and universities gain access to new technologies.

## Strategic pillars

Based on its mission statement and the strong position it has built over the past decades, imec has outlined four pillars to drive its strategy for the coming years.



## Value chain – goods and services

Imec has a unique and advanced infrastructure, with one of the world's largest and most advanced R&D labs in the field of nanoelectronics. It is a lab that aims to turn disruptive research into chip manufacturing technology, based on leading microchip and digital technology, ready for industrialization. We call this “from lab to fab”.

Imec's globally integrated ecosystem of innovation and associated collaboration models covers the entire industry value chain. The organization can call on talented individuals and experts in a wide range of fields, from nanotech and AI, to biotech and renewable energy, to achieve these results.

Imec's offering is a response to the technological challenges facing a wide-ranging and dynamic global industrial landscape, aligned with specific concerns emerging from the policy goals set out by the governments imec works with.

“Imec's unique combination of infrastructure, expertise, and partnerships are the result of decades of building trust, collaboration and investment.”

Imec uses its microchip technology on various technological platforms, which in turn span many system platforms fostering smart solutions for healthcare, industry, mobility, cities, entertainment, energy, education, and agrifood. This is central to imec's strategy for innovation management.

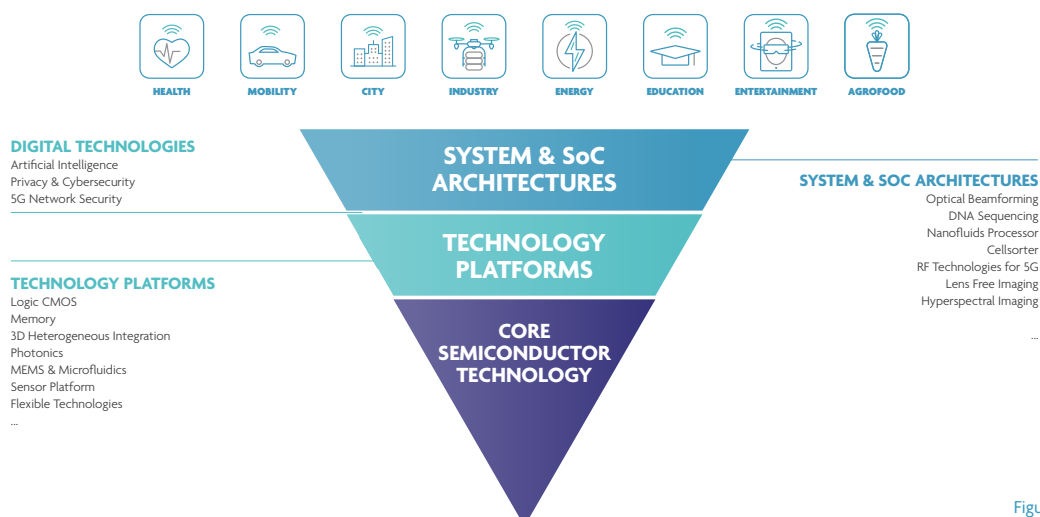


Figure 2 | imec's value chain

## Business models

Imec is known for its technological innovations. From the very beginning, these have stemmed from the organization's innovative business models, designed to promote imec's continuous growth. Collaborations are vital to what imec does today. Industrial players, research centers, and academia can work with us in a number of ways, from collaborations in R&D to development services and startup support.

In the early 1990s, collaborations with large businesses – often global players – would start off with a business model wherein partners would pool research costs and share results. Over the years, an increasing number of bilateral collaborations have followed. During this time, imec has become the **R&D hub** for the world of electronics, with hundreds of collaborations across the entire electronics value chain. All major global players in the chip industry come to imec to research and develop the technologies of the future.

Thanks to its growing expertise and extensive number of collaborations, imec has been able to use its expertise in nanotechnology in an increasing number of different fields. The organization has been making breakthroughs on a global scale, particularly in healthcare and life sciences. Furthermore, this R&D center develops disruptive technologies that enable sustainable innovations in areas such as renewable energy, low-power communications, agrifood, and smart mobility.

Imec brings together global industry leaders from across the entire semiconductor value chain, startups, academia, and knowledge centers for R&D in nanoelectronics and digital technology including advanced semiconductor scaling, silicon photonics, smart health solutions, smart energy, smart mobility and smart cities, artificial intelligence, and solutions beyond 5G and sensor technologies.

In addition to its R&D offering, imec uses its expertise and extensive international industry network to **support innovation in both smaller organizations with limited internal R&D resources, and their larger counterparts** – from the initial idea to the fully fledged end product, and from product or chip design to prototyping, testing and optimization, and manufacture.

Finally, imec supports technological **startups** with its tailored offerings. Imec.istart is imec's business accelerator and aims to help young tech startups successfully start their business. The imec.istart program offers a wide range of services such as an initial financial injection, professional and sector specific coaching and mentoring, access to technology and office facilities, access to a wide (inter)national network of partners and investors and much more.

Imec.xpand is an independent incubator fund for young companies, with imec technology, expertise and infrastructure as differentiators.

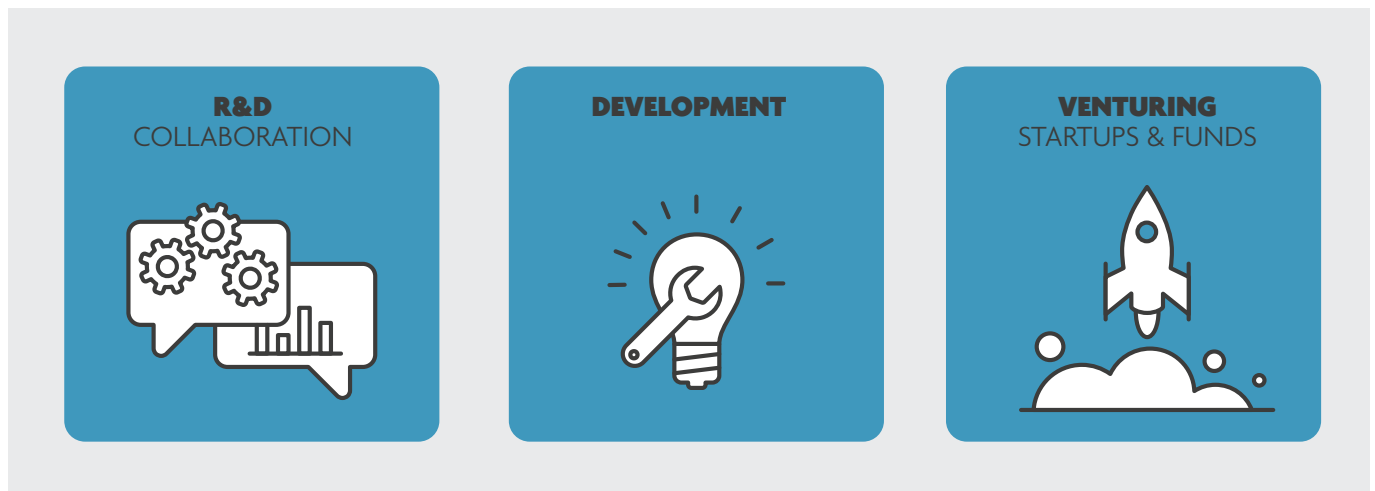


Figure 3 | Imec's business models are a response to industry demands, ensuring a smooth transition from the organization's R&D to impactful products and services



## 1.2 Our values and the UN Sustainable Development Goals – the guiding principles behind our long-term strategy

Imec strives toward sustainable development for the benefit of both current and future generations. This obliges the organization to think ahead regarding the choices it makes in the further development of the semiconductor industry in terms of the impact on people, the environment, and society. As an R&D hub, imec is ideally placed to inspire and involve the entire value chain in the search for sustainable and innovative technologies and solutions.

Imec did not choose its motto – ‘embracing a better life’ – lightly. It reflects the organization’s long-term vision to pursue a sustainable world through technology and innovation, one perfectly in line with its own core values:



Imec aims to use its core business, research and innovation, to respond to the many societal challenges emerging worldwide, through technology designed with the future in mind. Besides the urgent nature of these global social problems, the increasing demand from employees, new candidates, and partners also clearly demonstrates that pursuing a sustainable society is the only correct approach. These demands from all its stakeholders are helping imec define and prioritize its sustainability strategy and policy, ambitions, as well as both short- and long-term actions. They determine our material topics, which are depicted in a matrix below.

For imec, sustainability is structured around five major pillars: research, development, and innovation as drivers for a sustainable society; care for the planet; care for our people; ethics and good governance; and a commitment to entering sustainable partnerships. These policy areas and their underlying priority themes have been designed to mirror the United Nations’ Sustainable Development Goals (SDGs).

- 1 Developing technologies for a sustainable future
- 2 From curative to preventive healthcare technologies
- 3 Energy solutions for a carbon-neutral society
- 4 Enabling the digital transformation of education
- 5 Smart cities & smart mobility to improve quality of life
- 6 Venturing to support sustainable innovation
- 7 Guiding companies & organizations through digital transformation
- 8 Innovative technologies for more responsible production
- 9 Engaged & committed employees
- 10 Equality & inclusion
- 11 Recruiting
- 12 Learning & development
- 13 Employee health & safety
- 14 Ecological footprint
- 15 Energy
- 16 Materials, chemicals & waste
- 17 Water management
- 18 Mobility
- 19 Biodiversity
- 20 Ethics
- 21 Ethics & Good Governance
- 22 Stakeholder management & partnerships
- 23 Solidarity

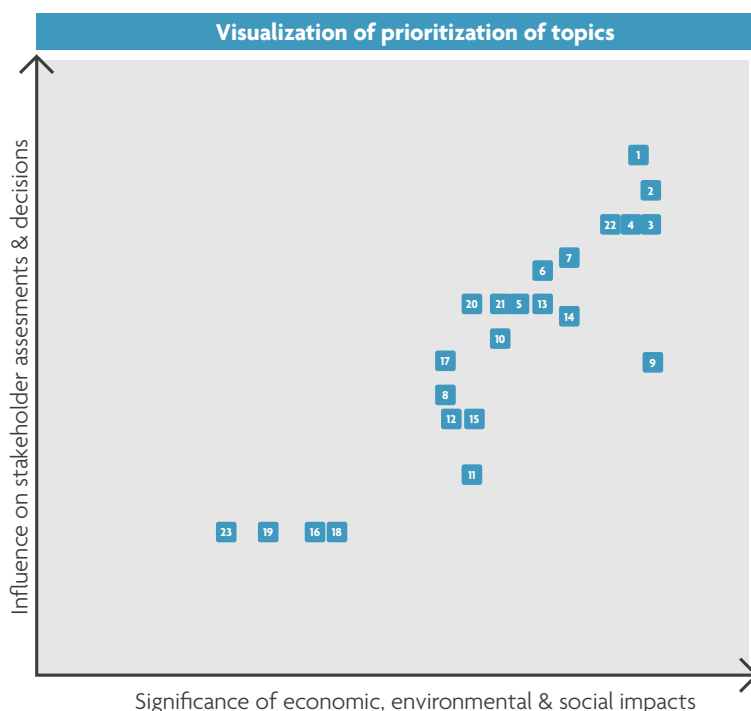


Figure 4 | Imec’s materiality overview: material themes and priorities for 2021

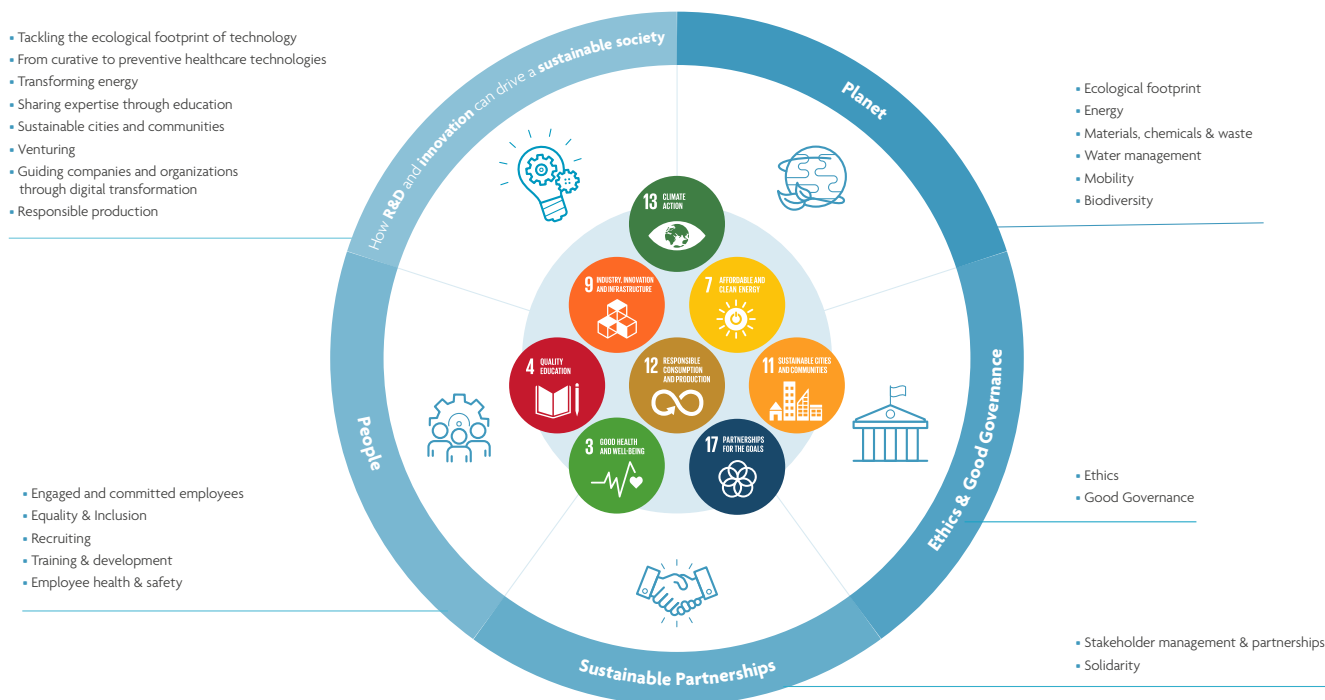


Figure 5 | Overview of imec's sustainability policy, coupled with the UN's SDGs

Objectives and progress are published via a dashboard, accessible to all employees. They are subject to annual review and adjustment, if necessary. As part of this monitoring, imec endorsed the Voka Charter for Sustainable Entrepreneurship (VCDO) in 2019, which should result in receiving the officially recognized UN SDG pioneer certificate after 3 years.

This focus on sustainability across imec's activities is essential and requires an integrated approach. It is overseen by a steering committee made up of representatives from across all departments, meeting on a monthly basis to monitor the integration of sustainability goals across imec's core activities, to analyze the results, and to determine relevant internal and external communication activities.



In 2021 imec completed its first EcoVadis sustainable business rating and received a silver medal. Imec was awarded a low-risk status in the Responsible Business Alliance (RBA) assessment.

Creating a broad base of support is a key requirement for achieving these sustainability goals. That is why several SSTNBLTY Talks were once again organized in 2021. These sessions, featuring internal and external speakers, highlighted both the broader sustainability framework and specific themes from research and other activities. In addition to these inspirational sessions, the team is working on creating a community-driven environment designed to inspire, motivate, and engage imec employees in sustainability.

## A renewed look at impact and potential sustainability risks

At the end of 2021, imec decided to update its materiality analysis, encouraged by its conviction of the positive impact it is able to make. As part of this, imec will conduct a comprehensive sustainability risk and impact assessment update, along with an internal and external stakeholder survey. The results of this exercise will lead to an update of the sustainability policy and integration of sustainability goals into its policy-level reporting framework.



## 1.3 Some highlights of our achievements in sustainability in 2021

Research and innovation are the beating heart of imec as an organization, enabling us to build the world's most advanced technological platforms. Today, imec is ready to take the next step: system innovation. The research center is already working on the development of system demonstrators, for example, in collaboration with the pharmaceutical sector and emerging hydrogen sector. While the complexity of deep-tech innovation is enormous, building prototypes that demonstrate the potential of nanotechnology to imec's partners allow for quicker entry into the market:

- The delivery of a functional prototype rapid SARS-CoV-2 breathalyzer test in as little as 1 year, owing to this system innovation. This is an ultra-fast, accurate test with quick turnaround time which is less invasive, allowing for better management of future pandemics and increased comfort for those being tested.
- The signing of a partnership agreement with GSK following a year of joint exploratory research, examining how nanotechnology can accelerate the development and production of new vaccines. Nanotechnology will also be used to automate production processes and improve the control of bioproduction.
- The establishment of the Hyve consortium with two research centers and four industrial partners, to research the cost-effective and sustainable production of hydrogen by electrolysis on a large scale.
- The launch of imec's 'Sustainable Semiconductor Technologies & Systems' (SSTS) research program (with Apple as the first partner) to map the environmental impact of chip development and production.
- The continuous efforts to reduce energy consumption of artificial intelligence through modified circuits and redesigned architectures. In 2021, new startup Axelera AI raised fresh capital to develop an energy-efficient chip for edge AI applications.
- And finally, the outlining in 2021 of a disruptive roadmap for health, agriculture, and nutrition. The OnePlanet Research Center, a multidisciplinary collaboration between imec, Radboud University, Radboudumc, and Wageningen University & Research, bridges the gap between technology and application for agrifood and health.

While sustainability is not limited to imec's research and innovation, it is an essential part of its internal operations, the way its clean rooms are run, and how it deals with employees, partners, suppliers, and stakeholders:

- Annual reduction in mains water consumption.
- Further greening of the vehicle fleet, and increased bicycle use.
- More diversity and inclusion initiatives following 2021's renewed diversity and inclusion policy.
- Thorough review of the procurement policy in 2021, with consideration of all ESG aspects for new and existing suppliers, coming into effect in early 2022.

Imec is also using its expertise to support policy in the great challenges ahead. Not surprisingly, the featured highlights span the various social domains in which imec is active, from technological breakthroughs in pure chip technology to innovations that will contribute toward improved healthcare, agricultural and food policy, and a successful energy transition. The imec team has proven to be resilient, flexible, and inventive in its approach toward continuous, first-rate collaboration.



## 2. Research, development, and innovation as drivers of a sustainable society

Throughout its research portfolio, imec focuses on having a strong and positive impact by providing the building blocks for a better world in a more sustainable society. This ranges from reducing data center electricity consumption, developing technologies for more energy-efficient and powerful chips, and photovoltaic technologies, to new software for adaptive and personalized learning, and innovations for cheaper, more accurate, and more personalized healthcare.

### 2.1 Developing technologies for a sustainable future



Aspirations of a sustainable future are interwoven in just about all of imec's R&D activities.

#### Impact

Possibly one of imec's greatest added values is one that is difficult to quantify: **imec's role as visionary and pioneer**, stemming from its day-to-day immersion in the most advanced technologies and technological trends. This is translated not only into imec's selection of research domains, but also into its **collaborative models**. For instance, through its IIAP collaboration model (imec Industrial Affiliation Program), imec has been a **pioneer of open innovation** since its establishment in 1984, and today, imec is now increasingly focusing on **multidisciplinary collaboration**. Not only leveraging different scientific domains (think of the rise of biotech), but also combining **technology and human sciences**<sup>[1]</sup>.

With respect to **research methodology**, imec has set the tone with its 'Design Technology Co-Optimization' (DTCO), signifying that **technology development** should increasingly stem **from its application** rather than from the optimization of every individual component. For example, the best processor with the best memory capacity and the best display do not necessarily provide the most sustainable final solution if, when totted up, these different building blocks consume so much energy that they cannot be integrated into one single device.

DTCO, meanwhile, has since been complemented by **'System Technology Co-Optimization' (STCO)**. Emerging applications such as energy-efficient AI chips in data centers and devices require performance improvements beyond those of traditional CMOS scaling. One way to achieve these is by simultaneously innovating system architectures and technology requirements to enable the most efficient combination of building blocks for the required functionality and performance, i.e., system technology co-optimization (STCO). STCO starts with identifying the issues and challenges in existing systems. These are the starting point for the exploration of new system architectures and technologies. The research chain is then closed by evaluating these innovations – and their related integration – using prototypes or other hardware evaluation systems.

Thanks to its expertise across the technology stack – from semiconductors to software – and its infrastructure and ecosystem for prototyping and manufacturing, imec provides technology and systems companies with an STCO innovation platform for the joint development of the next generation of applications.

In recent years, the introduction of ever-smaller, more powerful, and more energy-efficient chips has resulted in considerably more sustainable smart devices. However, **the production of these chips itself has a substantial ecological footprint – something that imec aims to change going forward.**

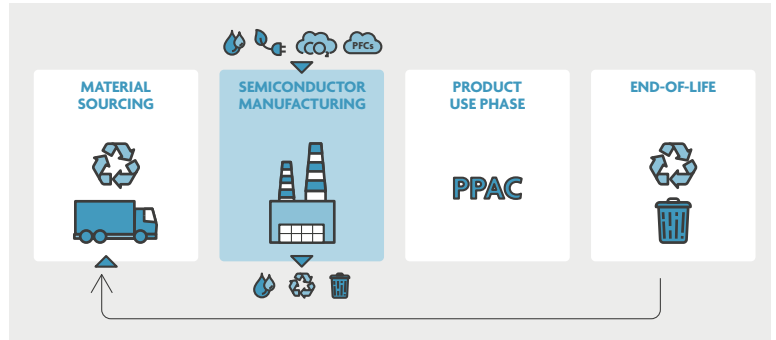
[1] Psychologie als Katalysator voor Technologie in de Gezondheidszorg ('Psychology as a Catalyst for Technology in Healthcare') | imec Vlaanderen

## Imec highlights from 2021

- To this end, in December 2020 imec presented, for the first time, a method to estimate the environmental impact of a manufacturing process can during its research phase. Imec has developed metrics to estimate energy and water consumption, along with the expected greenhouse gas emissions during the mass production process. This method enables imec to incorporate sustainability considerations into technological decisions early on in the development process<sup>[2]</sup>. Research with a potentially significant impact.

Imec's method to map the ecological footprint of chip production received a great response at its introduction in December 2020. Therefore, imec decided in 2021 to pursue this research **on a larger scale as launching the research program Sustainable Semiconductor**

**Technologies and Systems (SSTS)**. The program offering aims at drawing more resources, involving additional technologies, and, above all, attracting partnerships with the industry to drive the R&D. The new research program combines imec's insights in infrastructure, technology, equipment and processes and informs participating companies on the environmental impact of certain choices during the design phase of chip technology<sup>[3]</sup>.



In October 2021, **Apple became the first partner to join imec's SSTS program**<sup>[4]</sup>, and other companies

across the value chain followed. With the insights stemming from this research program, our partners can take concrete actions to reduce their ecological footprint.

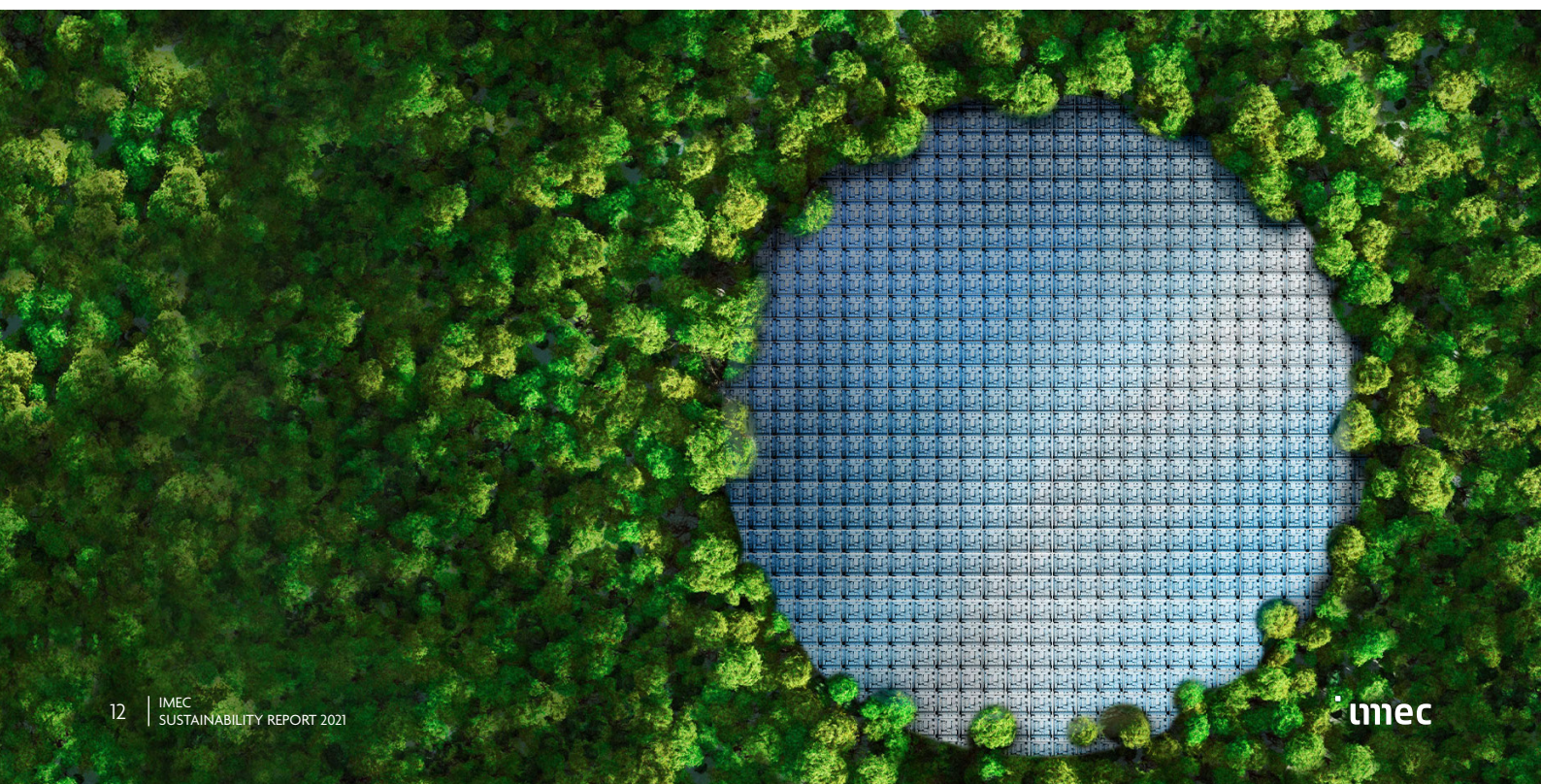
- Also in 2021, imec demonstrated a new forksheet device architecture with a performance surpassing that of nanosheet device architectures. The forksheet architecture also features an increased device density<sup>[5]</sup>.

[2] The environmental footprint of logic CMOS technologies | imec (imec-int.com)

[3] Sustainable Semiconductor Technologies and Systems | imec (imec-int.com)

[4] Apple joins new imec research program that aims to reduce the ecological footprint of the semiconductor industry | imec (imec-int.com)

[5] <https://www.imec-int.com/en/press/imec-reports-first-electrical-demonstration-integrated-forksheet-devices-extend-nanosheets>





## 2.2 From curative to preventive technologies in healthcare



During the pandemic, we experienced at first-hand the importance health and healthcare to society. What stood out was how the entire health sector needed to **react quickly to unpredictable developments**.

Vaccines and treatments were

developed or fine-tuned in record time, with a crucial role for technology and data.

Yet, wouldn't it be easier to prevent rather than to remedy? Within the medical community, the vision to **move towards more personalized and preventive forms of healthcare is gaining momentum**: the goal is no longer to manage each disease separately, but to manage a person's health as a whole.

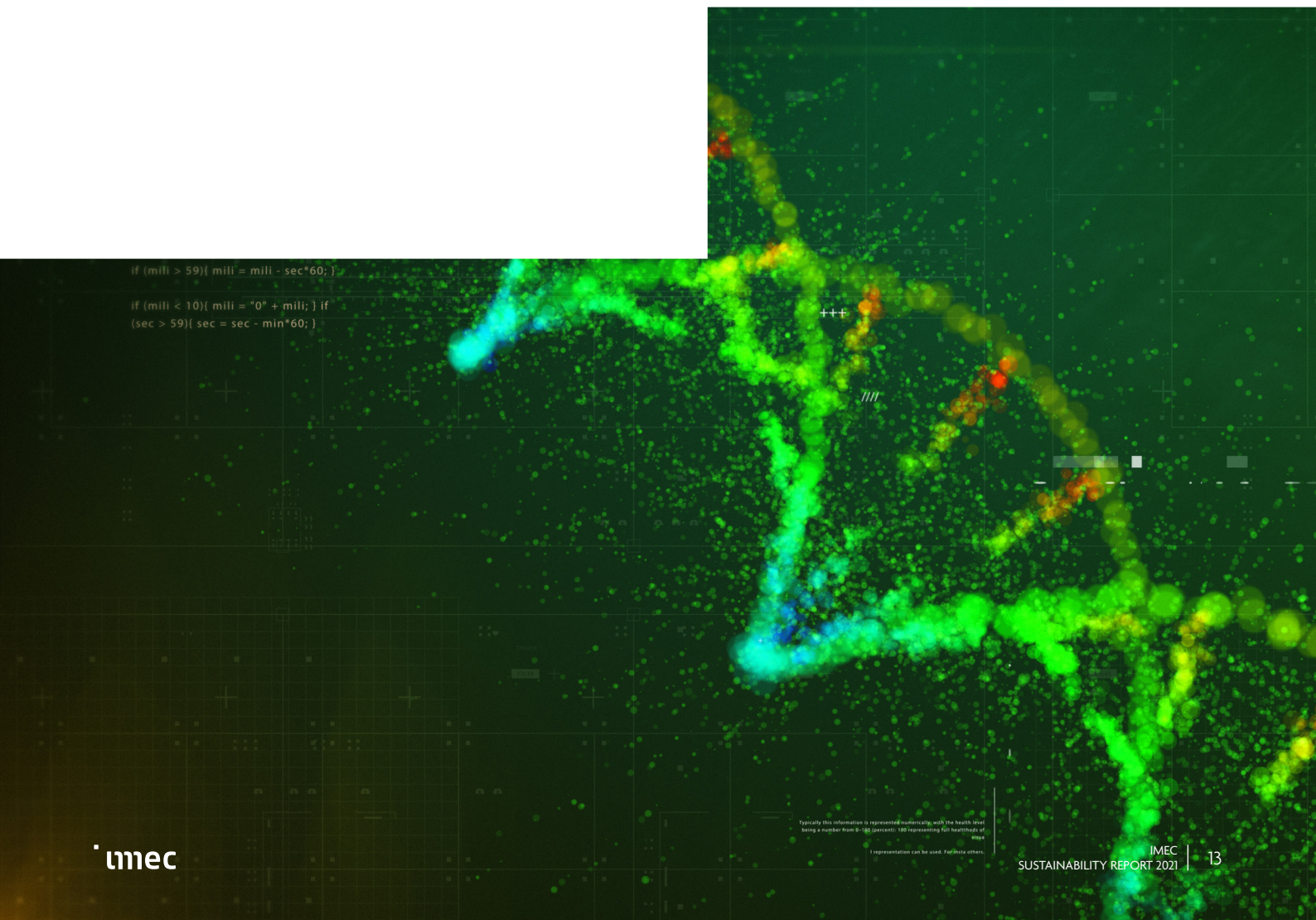
### Impact

Semiconductor technology is driving innovation in health and pharma in a number of ways, ranging from **cheaper and significantly miniaturized devices – that are not only accessible to wealthy and well-equipped laboratories, but can be used more widely** – to improvements in speed and accuracy or extending functionality, allowing for faster and more reliable analyses and diagnoses.

Imec is also leveraging its expertise to find innovative solutions to specific challenges such as the development of photoacoustic systems to measure blood glucose without the need to take a blood sample. Such technology has the potential to be integrated into smartphones and could mean patients with diabetes no longer have to prick themselves every day to measure their blood glucose level<sup>[6]</sup>.

Finally, the way data is used in this sector is of vital importance, especially because of the sensitive nature of personal medical information. Data exchange must not only be secure and reliable, but also correct and standardized, to ensure that relevant information concerning people's health is readily available to all those involved in the care process.

[6] Industry-ready sensor and actuator developments | imec (imec-int.com)



Typically this information is represented numerically, with the health level being a number from 0-100 (percent), 100 representing full health/level of life.  
Representation can be used. For/with others.



## Imec highlights from 2021

- The further development of an **ultra-fast Sars-CoV-2 PCR test using exhaled air**. Thanks to collaboration between different research teams, imec succeeded in turning a promising idea into a functional prototype in just one year. Imec's spin-off miDiagnostics acquired the technology under license and launched a pilot study at the Brussels Airport Test Center<sup>[7]</sup>.
- Iccovid, a Belgian initiative using **artificial intelligence to support radiologists in assessing CT scan images of COVID-19 patients' lungs**, grew into a European project, co-funded by the EU Horizon 2020 program. Iccovid was set up in March by UZ Brussel, KU Leuven, icometrix, and ETRO, an imec research group at VUB. What started as a local project is now being rolled out across 800 hospitals in Europe, supported by excellent research centers across the continent<sup>[8]</sup>.
- In November, imec entered into a partnership with GSK, a multinational pharmaceutical company whose R&D headquarters are located in Belgium. Together, they are investigating how biomanufacturing processes can be improved, and **how nanotechnology may be used to accelerate the development of new vaccines**<sup>[9]</sup>.
- Together with Austrian start-up Sarcura, imec is developing a solution for **automating cell therapy**, so that immunotherapies in the fight against cancer, for example, can become more widely applicable and affordable<sup>[10]</sup>.
- In 2021, imec developed a new method for **measuring blood pressure more accurately** using ultrasonic waves<sup>[11]</sup>. This can become a valuable tool for the early detection of cardiovascular disease. The solution comprises an ultrasound sensor that can be transformed into a small, portable device.
- To better measure and understand the complex information processing taking place inside the human brain, imec is developing technology that allows scientists to track the **activity of individual nerve cells over an extended period**. In 2021, imec introduced Neuropixels 2.0, a new generation of miniature neural probes<sup>[12]</sup>. The knowledge and data resulting from the use of these probes could make a significant contribution to understanding brain disorders such as Alzheimer's and our overall mental health.
- Researchers at imec's ExaScience Lab developed a new **software platform capable of analyzing a DNA sample in a couple of hours**<sup>[13]</sup>.
- Imec is also working on digital solutions to **make medical data from various sources accessible in a secure manner**. With a new technique introduced in 2021, it is not the data itself that is shared, but information regarding the data – which only AI can understand<sup>[14]</sup>. This enables algorithms to be improved without divulging patient-sensitive information or damaging commercial interests.
- As a partner in the European-funded Monument project (More nurturing and more empowerment nested in technology), imec is working on **digital support for caregivers of people suffering from (early-onset) dementia**<sup>[15]</sup>.



[7] Imec signs licensing agreement with miDiagnostics to commercialize its patented technology for fast and reliable COVID-19 diagnosis based on exhaled breath

[8] Belgian initiative for AI lung scan analysis in fight against COVID-19 goes European | imec (imec-int.com)

[9] GSK and imec to collaborate on disruptive innovation in pharma | imec (imec-int.com)

[10] SARCURA and imec to collaborate on high throughput cytometry solution for automated (T-)cell separation, tackling manufacturing challenges of cell and gene therapies. | imec (imec-int.com)

[11] Imec's Ultrasound Sensor Technology Yields Accurate Pulse Wave Velocity and Blood Pressure Values | imec (imec-int.com)

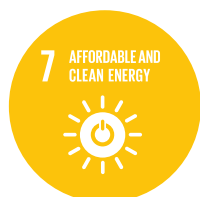
[12] Latest Neuropixels probes can track neurons over weeks | imec (imec-int.com)

[13] Software optimizations make variant calling 8 to 16 times faster | imec (imec-int.com)

[14] New privacy-preserving AI can have a profound impact on the future of medicine | imec (imec-int.com)

[15] The Monument project - Supporting caregivers of people living with dementia | imec (imec-int.com)

## 2.3 Energy solutions for a carbon-neutral society



It is clear that we are in the midst of an energy (r)evolution. To achieve the European goal of carbon neutrality by 2050, we need to further reduce our reliance on fossil fuels. Alongside a decreasing reliance on nuclear power, this requires a dramatic increase in renewable energy sources, such as wind and solar energy (PV). **The challenges lie not only in energy generation, but also in its management, storage, and conversion** (e.g., into hydrogen). The right balance of sustainable practices has to be achieved through the entire value chain of the proposed solutions, and for their entire life cycle (from production to 'end-of-life'). It is also essential to bring our **energy requirements under control**, for although the growth in global energy demand appears to be slowing, it still continues to increase by one to two percent per year<sup>[16]</sup>. While energy-efficient electronics (such as those developed by imec) can help, they can only have an impact in conjunction with a sustainable behavioral change.

### Impact

Building on the substantial progress already made, the challenge remains to further **improve PV technology efficiency**. With classic silicon-based cells gradually reaching their theoretical limits, **new materials** (such as perovskites) and **new architectures** (such as tandem solar cells that stack, as it were, two or more solar cells of different materials on top of each other to make maximum use

of the solar spectrum) are currently being explored. The impact of these developments will be a greater reduction in cost per kWh generated, allowing PV technology to further position itself as a widely deployable, lower-cost energy source.

In addition, other aspects are gradually starting to come to the fore. Consider, for instance, the **efficient maintenance** of large solar parks to ensure optimal efficiency and longevity, or '**end-of-life**' scenarios in design and in business models to avoid the possibility of soon being left with a mountain of waste from discarded PV plants. Such research into circular models is already being conducted, for example, as part of the EU H2020 CircuSol program, of which imec is a member<sup>[17]</sup>.

In terms of energy storage and conversion, a key challenge lies in making it as efficient as possible so that there is **maximum efficiency between the energy generated and the energy which is ultimately consumed after intermediate storage**, including the consideration of sustainability aspects in the production of battery technologies, or the conversion of electricity into hydrogen (and vice versa). Knowledge of materials and surface chemistry can make a crucial difference in this regard. Additionally, processing techniques familiar to the world of semiconductors, such as the development of very precise and reliable nanoscale structures, can also give rise to innovations within the energy sector.

[16] Energy Production and Consumption - Our World in Data

[17] Circular business models for the solar power industry | CircuSol



## Imec highlights from 2021

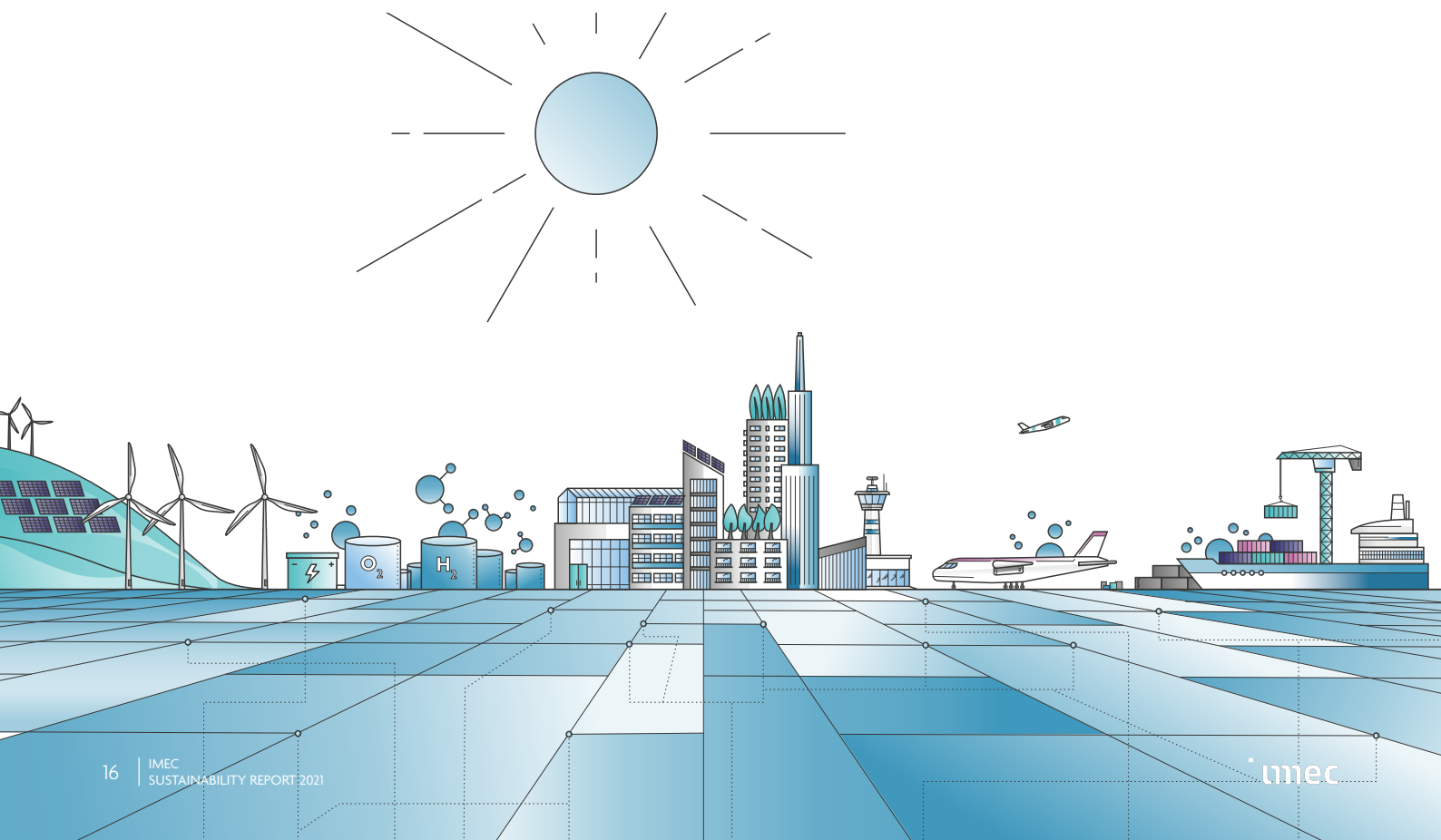
- In recent years, researchers from imec and KU Leuven in EnergyVille have developed a new material for energy storage and conversion, dubbed nanomesh<sup>[18]</sup>. To scale up the development of nanomesh and maximize this innovation's impact, **Hyve** was established in 2021<sup>[19]</sup>. Four Belgian industrial players (Bekaert, Colruyt Group, DEME, and John Cockerill) are investing in further development of the technology to deploy it in a variety of applications. As such, imec and its partners envision the **introduction of green hydrogen across the entire value chain**, and consequently the accelerated decarbonization of industry and heavy transportation.
- Following demand from – and in collaboration with – industrial partners, the imec.icon project Analyst PV developed software for a more efficient **management of large PV plants**<sup>[20]</sup>. Solar parks can easily count several tens of thousands of panels, and sometimes even more than one hundred thousand. The software developed within the Analyst PV project gives energy managers a more accurate and detailed insight into the performance of their parks by automatically detecting issues and providing relevant solutions. The solution **optimizes the energy yield and the return on these major investments in renewable energy**.
- EnergyVille's project 'Toward a sustainable energy supply in cities' made it to the **final of the 2021 REGIOSTARS awards**<sup>[21]</sup>. The project was nominated in the Green Europe category, which recognizes resilient communities in urban environments. The REGIOSTARS Awards are an annual competition organized by the European Commission's Directorate-General for Regional and Urban Policy. They highlight innovative projects that can serve as inspiration for other regions and project managers.

[18] Nanotechnologie: hoe een voetbalveld in een blikje frisdrank onze toekomst kan veranderen ('Nanotechnology: how a soccer field in a soda can could change our future') | VRT NWS: nieuws

[19] Flemish expertise centers join forces with industry to push green hydrogen production forward | imec (imec-int.com)

[20] Kostenbesparend beheer van zonneparken ('Cost-effective solar park management') | imec

[21] EnergyVille haalt nominatie binnen voor REGIOSTARS awards 2021 ('EnergyVille secures nomination for 2021 REGIOSTARS awards') | imec Vlaanderen





## 2.4 Enabling digital transformation through education



'Quality education' is one of UN's Sustainable Development Goals, with digitization being an essential part of it. Not only during the pandemic, when our education system faced the unprecedented challenges of organizing **socially-distanced learning**, but also in everyday situations when

purely physical or analog learning environments are not always the best option (e.g. in highly remote areas (worldwide) or in instances of **lifelong home-based or workplace learning**). There is also a significant role for **knowledge on digitization** itself, with a focus on general digital literacy, and also a growing need to **find qualitative and reliable sources within the oversupply of digital information**.

### Impact

A considerable part of imec's activities in this area is embodied in the Smart Education Program. This program focuses on the targeted **use of educational technology in classic education and lifelong learning contexts** (continuing education, corporate training, on-the-job training, etc.). At the same time, technology's

potential has yet to be adequately tapped in the field of education, particularly with regards to its ability to make both in-person and distanced learning processes more interactive and collaborative. Equally, there is still progress to be made in the field of lifelong learning, where technology has a similar and equally underutilized level of potential. Smart Education is an inter-university, strategic research program on educational technology, centered around four pillars: (1) strategic basic research, (2) technology development, (3) validation in learning environments, and (4) impact on the economy and society. By addressing the entire supply chain, this program increases the likelihood of new insights, knowledge being used effectively and having an impact.

In addition to this strategic program, imec's activities also have added value at other levels in the digitization of education, and the deployment of technology for qualitative and lifelong learning. Think about data-based techniques to optimize personalized learning paths in the workplace, or the further development of specific knowledge to optimize virtual environments such as augmented and virtual reality, or to make them more widely accessible.

### Imec highlights from 2021

- **During the 2021-22 school year, a large number of primary and secondary schools started using the online i-Learn MyWay portal**, a project from imec and KU Leuven. The free portal brings together various digital educational tools for teachers to create customized learning paths for their students. I-Learn MyWay's strength lies in the fact that students are actively engaged in the process themselves, plotting their own educational path, at their own pace.
- Like every year, (since 2009), imec presented the results of the **imec.digimeter** of the former year<sup>[22]</sup> and conducted a new survey<sup>[23]</sup>. The imec.digimeter monitors trends in the possession and use of media and technology in Flanders, shedding light on **attitudes and expectations concerning new technologies**. Insights from this survey provide important information on digital literacy for policy makers, with regard to topics that need to be addressed, and platforms that can be used to reach the right target groups.
- Together with VRT NWS, Brightlab and other partners, imec developed **two new EDUboxes** in 2021: (1) 'Pandemie: Een uitdaging voor mens en wetenschap' <sup>[24]</sup> ('Pandemic: A challenge for people and science') and (2) '**Duurzaamheid: nu maken voor de toekomst**'<sup>[25]</sup> ('Sustainability: preparing now for the future'). EDUboxes provide secondary school teachers with a mix of didactic tools for discussing current topics, and are also **available to anyone wishing to commit to lifelong learning**.

[22] Digimeter 2020 | imec Vlaanderen

[23] imec.digimeter 2021 | imec Vlaanderen

[24] In afwachting van hun coronavaccin: 'EDUbox Pandemie' voor jongeren ('Waiting for their coronavirus vaccine: 'EDUbox Pandemic' for young people') | VRT.be

[25] Nieuwe EDUbox brengt thema duurzaamheid tot in de klas ('New EDUbox brings topic of sustainability into the classroom') | imec Vlaanderen

- Also relevant was the designation of EDMO BELUX (European Digital Media Observatory for Belgium and Luxembourg) as a **national network against disinformation**<sup>[26]</sup>. This European Commission-funded hub, of which imec is a member, will bring together a network of over 100 experts in disinformation.
- As part of the imec.icon project COSMO, and in collaboration with Flanders Make, imec has developed a system for operators in the manufacturing industry to support them with optimal guidance on assembly<sup>[27]</sup>. Based on data analysis, the system estimates an operator's skill level, and **adapts the work instructions shown in augmented or virtual reality**. The system was evaluated in manufacturing firms, showing that personalization of work instructions leads to increased learning efficiency, while also reducing strain on the operators. With such a system in place, manufacturing firms can reduce training costs and at the same time **support the well-being of their operators**.

[26] Europese Commissie selecteert EDMO BELUX als nationaal netwerk tegen desinformatie voor België en Luxemburg ('European Commission designates EDMO BELUX as national network against disinformation in Belgium and Luxembourg') | imec Vlaanderen

[27] Het imec.icon project COSMO biedt een antwoord op de nood aan een betere begeleiding in de productiesector ('The imec.icon COSMO project provides an answer to the need for better guidance within manufacturing') - Ittec (kuleuven-kulak.be)

## 2.5 Smart cities and smart mobility for a better quality of life



Cities, and by extension regional and built-up areas, pose **daily challenges when it comes to the complexity and intertwined nature of sustainability goals**. Amid the blend of living, working and relaxation, meetings and privacy, staying and going, they need to strike a balance to improve the quality of

our lives and our journeys. At the same time, they need to **guard against tensions** between economics and ecology, collective and individual interests, etc.

### Impact

A smart city – which could also be a municipality or region – structurally rethinks the use of technology in the public space, making the lives of its **residents, visitors, businesses, etc., as comfortable as possible**. In a smart city, cutting-edge technology does not need to be present yet. Beyond general technological advances, there are two aspects in which data and technology can have a significant impact on a (sustainable) smart city's goals: datafication and interoperability.

The more clearly defined the (policy) objectives of a city or region, the better relevant supporting **data** can be generated and gathered for that purpose. Vice versa, the more relevant the available data is, and the higher its quality, the better the analyses, insights, and conclusions.

Another challenge lies in making all that data, from a multitude of sources, exchangeable and combinable in a standardized manner. Such advanced **interoperability** is essential to provide an impactful and quality experience for the end user.

An illustration of this human-centered approach is also reflected in the terminology, which is moving away from the 'smart' connotation that has become erroneously intertwined with the use of technology. For example, the concept of the '15-minute city' is growing in importance, with the core idea that residents should be able to find all daily amenities within 15 minutes' walk or cycle, having immediate positive effects on quality of life as well as on the environment<sup>[28]</sup>.

[28] Technologie en 15 minutensteden ('Technology and 15-minute cities') | imec City of Things



## Imec highlights from 2021

- Since 2016, the five-year **City of Things** research program has grown from a **digital living lab into a social incubator for digital transformation in Flanders**, placing quality of life at its core and using technology to facilitate it<sup>[29]</sup>. Key achievements include: a digital living lab, Digital Twins to support policy, a widely supported Open Data Charter, and a multitude of knowledge development and pilot projects on Open City architecture, mobility, and water quality.
- In June 2021, imec published its report '**Measuring and modelling air quality in smart cities**', summarizing the knowledge acquired over five years of research on this topic and providing recommendations for governments, citizens, and industries alike<sup>[30]</sup>.
- Working with citizens and community initiatives, environmental sensors were tested to identify **environmental sounds** that could impact livability within urban environments<sup>[31]</sup>. Imec also published its roadmap '**Citizen science** voor lokale besturen' ('Citizen science for local authorities'). The tools provided in this roadmap can play a key role in a broad-based approach toward several areas of sustainability.
- In November 2021, the Flemish Minister of Mobility, Lydia Peeters, along with Flemish Minister of Innovation, Hilde Crevits introduced a **new generation of smart traffic lights** throughout Flanders in 2022–2023, a key moment in the **Mobilidata** project. Mobilidata aims to position Flanders as a leader in the use of data and technology for smoother, safer and more sustainable, traffic<sup>[32]</sup>.
- Imec researchers were world-first to map out the electromagnetic **radiation emitted by a commercial 5G network**, confirming that the radiation measured **meets WHO standards**<sup>[33]</sup>.

[29] Vijf jaar City of Things: van digitale proeftuin in de stad tot maatschappelijke incubator voor digitale transformatie in Vlaanderen ('Five years of City of Things: from digital living lab in the city to social incubator for digital transformation in Flanders') | imec Vlaanderen

[30] Download the report on measuring and modeling air quality in cities | imec City of Things

[31] Hackable City of Things: brengt stadsgeluiden in kaart ('Hackable City of Things: mapping out the sounds of the city') | imec City of Things

[32] Mythes en waarheden over intelligente verkeerslichten ('Myths and facts around smart traffic lights') | Mobilidata

[33] Primeur voor Vlaamse wetenschappers: elektromagnetische stralingswaarden gemeten op commercieel 5G-netwerk voldoen aan WHO-normen ('A first for Flemish scientists: electromagnetic radiation values measured on commercial 5G network meet WHO standards') | imec Vlaanderen

## 2.6 Supporting sustainable innovation



All sustainable innovations start with a good idea. However, turning such an idea into a thriving and sustainable startup requires dedication, talent, and entrepreneurship. With imec.istart, imec.xpand and imec's own spin-off support, imec possesses a strong

portfolio when it comes to helping entrepreneurs transform their ideas into successful products and ventures, targeting the right markets, with the right teams, and supported by the right investors.

**Imec.istart** is imec's business accelerator, aiming to help young tech startups to successfully launch their businesses. The imec.istart program offers a wide range of services, including an initial financial injection, professional and sector-specific coaching and mentoring, access to technology, office facilities, a broad national and international network of partners and investors, and much more.

**Imec.xpand** is an independent incubator fund for young businesses, with imec's technology, expertise and infrastructure as distinguishing factors.

### Impact

Imec's added value is evidenced by the number of active spin-offs and startups, along with its ability to attract external follow-on funding. In 2021, 176 projects were submitted to the various imec.istart calls, of which 26 were selected. 27 new startups signed imec.istart contracts (including a few selected at the end of 2020). Since its launch in 2011, imec.istart has helped more than 250 tech startups grow into sustainable businesses, nearly 85% are still active. Together, they have already created more than 2,200 full-time jobs, and generate a combined revenue of over 170 million euro. Given the young profile of these startups, these figures are growing at a rapid pace. In terms of both employment and revenue, these companies achieve a growth rate of 20% or more per year.



Imec.istart sets itself apart from other incubation and acceleration initiatives with an approach that provides access to technology. Together with imec experts, imec.istart actively looks into imec's new technologies and/or the technological know-how to support the startups' product development and to give them a (sustainable) competitive edge.

2021 was a successful year for imec.xpand as well, with a good inflow of new ideas in the venturing process, the establishment of several new (deep-tech) spin-offs and startups (see highlights), and the growth of existing startups into fully-fledged scale-ups. Hence, imec is filling a gap within the investment market where it is difficult to attract external capital. As such, imec.xpand is preventing that valuable ideas might fail to reach maturity.

## Imec highlights from 2021

- Sustainability is increasingly important in the selection of relevant startups within the imec.istart program. In the screening and selection process, startups are evaluated for their relevance in relation to the United Nations Sustainable Development Goals. Around 60% of startups within the imec.istart portfolio are active in one or more domains of these Sustainable Development Goals, with this proportion expected to further increase over the coming years.
- 2021 was again a year in which many companies were heavily impacted by the pandemic. Despite this, the imec.istart portfolio appears to be in good shape, with only one startup from the entire portfolio having ceased operations (through voluntary liquidation or bankruptcy) in 2021 as a result of the crisis.
- The **imec.istart Fund** attracted a number of new partners in 2021 (Verhaert, Nuhma, Vlaamse EnergieHolding and EFIN), receiving a substantial capital injection<sup>[34]</sup>. Moreover, the Fund was **converted into an evergreen fund**, allowing proceeds from successful exits to be reinvested in a new generation of startups.
- In 2021, a new spin-off **Azalea Vision** was launched, by imec and UGent. Thanks in part to **imec.xpand**, Azalea was able to raise the necessary funds to further develop a **smart contact lens based on technology developed at imec and UGent**. Azalea Vision aims to make smart lenses accessible to people with visual impairments or neuro-ophthalmological disorders<sup>[35]</sup>.
- In recent years, imec has made important breakthroughs in reducing the energy consumption of artificial intelligence through custom circuitry and new architectures. Last year saw the birth of Axelera AI, whose goal is to develop an **energy-efficient chip for edge AI applications**<sup>[36]</sup>. Again, imec.xpand was a key investor and driver of the first round of capital raising.
- A number of already-established **spin-offs** were able to continue their success stories in 2021, including imec and UZ Leuven spin-off **Pulsify Medical**, a spin-off that is developing a small ultrasonic patch for continuous monitoring of cardiac performance<sup>[37]</sup>.

[34] Imec.istart trekt investeringen in technologische start-ups fors op. ('Imec.istart significantly ramps up investment in technological startups') | imec Vlaanderen

[35] Azalea Vision closes € 8 million Series A to develop a smart contact lens for light sensitivity and ocular disorders | imec (imec-int.com)

[36] Dutch AI Semiconductor Startup Axelera AI Launches With \$12 Million Seed Round | imec (imec-int.com)

[37] Pulsify Medical closes second round Series A funding of EUR 5.4 million for wearable ultrasound heart monitor patch | imec (imec-int.com)



## 2.7 Helping businesses and organizations with their digital transformation



An important part of imec's role is in sharing its technological leadership with businesses to drive their digital innovations. Not all companies have a sufficiently high level of R&D, or a high R&D budgets to engage in bilateral research collaborations. Therefore, imec

continuously invests in low-threshold business models, promoting a collaborative approach.

With imec.icon and imec.IC-link, imec offers a unique portfolio of tools to **help businesses translate, from an entrepreneurial perspective, available knowledge of advanced technology into relevant and impactful applications.**

**Imec.icon** (Interdisciplinary Cooperative Research) is a demand-driven model for applied research, with collaborative projects that stem from a need for technology in Flemish businesses. Innovation challenges are tackled together by imec researchers, universities, and businesses. The program's accessible nature is evidenced by the high percentage of companies participating in imec.icon for the first time, along with the good mix of small and large businesses.

**Imec.IC-link** helps companies by providing them access to IC design, prototyping, and manufacturing in small volumes. These small volumes make it extremely difficult for companies to gain access to the leading foundries, and consequently the latest semiconductor technologies. This is where imec can help.

### Impact

As a neutral player, imec is a loyal knowledge partner for organizations, governments, and businesses during their digital transition, helping them take the right forward-thinking decisions in **cybersecurity, artificial intelligence, or other digital technologies.**

Equally important is imec's guidance during the implementation and the **translation of generic knowledge to specific applications.**

### Imec highlights from 2021

- In 2021, the long-term mission, vision, and ambition of the **Flanders AI research program** was outlined as committing to groundbreaking AI research with a meaningful impact on people, industry, and society. Its approach to achieve this – strategic basic research in AI – contributes to: (1) a **sustainable and prosperous digital future** centered around people's well-being, and (2) **innovation and economic growth**. This brings the program in line with the European digital agenda and ambitions for 2030. The program focuses on **human-centered AI** (reliable, ethical, easy to use, etc.), **sustainable AI** (energy-efficient yet still highly performing), and **data-efficient AI** (systems requiring little data, whose performance is determined by combining data with domain knowledge and the experience of experts).
- In 2021, **imec.icon** welcomed a number of new projects with a direct link to different areas of sustainability: (1) AJM: support for **surgical navigation** using Augmented Reality; (2) AI4FoodLogistics: optimization of the logistics chain for **fresh food**; (3) Surv-AI-llance: **privacy-friendly** analysis of **surveillance images**; and (4) WISH: improvement of **poultry welfare**. Among the imec.icon 'alumni', two projects with a strong sustainability profile were completed in 2021: (1) SmartWaterGrid: real-time localization of water leakage in public **water infrastructure**<sup>[38]</sup>, and (2) COSMO: personalized immersive technology to **increase learning efficiency among industry operators**.
- The imec.icon project DIASTOLE (**cardiology**) developed a **digital method of safely performing 4D scans** as input for simulating cardiac valve surgery prior to the actual procedure<sup>[39]</sup>.
- Launched in 2021, the Physical Internet Living Lab (PILL) project, coordinated by imec, is developing a groundbreaking, digital technology-supported vision for the **transport sector** using 'The Physical Internet'<sup>[40]</sup>. How can you help the sector achieve better planning and utilization of capacity, and therefore greater efficiency? How can you switch to greener modes of transportation? These are just some of the challenges 'The Physical Internet' is tackling.

[38] SmartWaterGrid - imec.icon | imec (imec-int.com)

[39] Cardiology Prepared For The Fourth Dimension | imec (imec-int.com)

[40] The Physical Internet: a next-gen vision on logistics | imec (imec-int.com)

## 2.8 Innovative technologies for a more responsible production



By 2050, the world will need to produce 70% more food than in 2006/2007 to feed its growing, more affluent population, which is expected to reach 9.8 billion. Due to the limited amount of crucial nutrients, increasing water stress and soil degradation, this huge amount

of food will have to be produced using half of the resources. At the same time, additional challenges are emerging, such as climate change, changing consumer demand, and demographics. The biggest challenges on a global and regional scale will be: (1) trying to match supply with the rapidly increasing demand for food from a larger and wealthier population, and doing so in both an environmentally and socially sustainable manner, and (2) eradicating extreme hunger in the world's poorest areas. This will require fundamental changes in the way food is produced, stored, processed, distributed, and consumed.

The 2019 launch of imec's new **OnePlanet partnership**, a multidisciplinary collaboration between imec, Wageningen University & Research, and Radboud University, was an important milestone. Within the framework of OnePlanet imec develops **innovative technologies** such as sensors, robotics, AI, (big) data analytics, and digital connectivity in an accurate, controlled, and sustainable manner, improving production and processes in domains such as food, agriculture, and health.

### Impact

Imagine we lived in a world where the quality of fruits and vegetables, along with the health of plants and farmed animals, could be autonomously and continuously monitored – and adjusted where necessary – at the right place and the right time. This would make agriculture and food processing significantly more sustainable, producing higher quality products using less fertilizer, water, agrochemicals, and human labor. It would also cut methane, nitrous oxide, and carbon dioxide emissions, while helping preserve biodiversity. The management of cultivation would be data-driven, proactive, optimized, and individualized. It would also provide new opportunities for fresh food production in locations with limited space, such as urban areas, and retailers could significantly reduce their food miles by locally growing fresh produce in greenhouses.

**Imec is investigating how nanotechnology and digital technology, can contribute to the transition toward sustainable precision agriculture.** In Flanders and across the rest of Europe, imec is developing technology for the food industry. The European Smart-sensor-systems-4-agrofood platform is a further extension of the local i-FAST platform ([www.ss4af.com](http://www.ss4af.com)).

### Imec highlights from 2021

- In 2021, OnePlanet presented a **disruptive roadmap dedicated to the relationship between health, food, and nutrition**<sup>[41]</sup>. The roadmap included the development of ingestible sensors to monitor our digestion and thereby support a healthier diet or detect any problems at an early stage, and the development of technology and data to optimize our agriculture according to crop health, reducing its impact on the planet. The **'Emerging Sensing'** innovation trajectory will include advanced (combined) sensors to measure the ripeness of fresh fruits and vegetables in a non-invasive manner, while also exploring how to measure plant health. The second innovation trajectory, **'Indoor Autonomous Farming'**, OnePlanet is developing a sensor-based integrated data platform to enable autonomous greenhouse farming. In the longer term, this trajectory aims to enable fully controlled vertical farming systems. The third innovation trajectory, **'Digital Orchard'**, envisions the collection and integration of data on fruit trees, to predict their health and harvest quality.

[41] 2021 in 14 highlights | imec ([imec-int.com](http://imec-int.com))





- In 2021, a European proposal, in collaboration with the food and packaging industry, was submitted and approved. As part of that ERDF project, **VISION2REUSE** demonstrates the applicability of different smart cameras for the automatic monitoring of the quality of reusable packaging in the food and packaging industry (e.g. by detecting scratches, tears, contamination). Reusable packaging is a key pillar in toward more circular packaging. To encourage uptake of reusable packaging, many research and implementation questions need to be answered, e.g., concerning accurate and automated detection methods for defects and/or contamination. This is critical to ensure consumer safety as well as economic viability. The project is coordinated by Flanders' FOOD, together with project partners Pack4Food and imec<sup>[42]</sup>.
- In 2021, the collaboration between Flanders' FOOD and imec-OnePlanet continued. Moreover, the relationship with the Flanders Research Institute for Agriculture, Fisheries and Food (ILVO) was also strengthened. In partnership with ILVO, Flanders Make and other partners, imec is working on a Industry 4.0 Smart Farming living lab to test the detection of diseases in potato and fruit cultivation using hyperspectral cameras. ILVO has also launched its own research projects, featuring various hyperspectral camera systems provided by imec, enabling their application within the agrifood sector. One of the projects is a pilot study to detect fish fraud.

[42] VISION2REUSE

# 3. Extraordinary people delivering extraordinary results

Imec's combination of world-class R&D infrastructure and extraordinarily talented individuals – who give their best each and every day – has been crucial to its success. That's why imec named its people strategy for the future 'extraordinary people delivering extraordinary results'. This strategy is based on the foundations laid over recent years. Imec defines its priorities for the future from the perspective of its people, with their competence, commitment, and sense of autonomy. To achieve these, the organization has set out core priorities at various levels: the individual and their integral experiences as employee; the many teams and their leaders; and the business mechanisms making imec the healthy, connected, and sustainable workplace that it is today.

## 3.1 Engaged and committed employees

Imec puts its employees central to everything it does. This has required a shift to a new employee-centric business model in which teams pay attention to what employees care about most. The model delivers differentiated experiences to maximize engagement and build trust. This approach fits in with imec's 'GROW Impact' program, focused on boosting local and regional impact by attracting and developing the best talent within the sector.

In an especially competitive environment for high-tech talent, it is becoming increasingly difficult to find the right people at an affordable price. The sector is home to many large, attractive businesses and exciting startups, giving candidates a wide range of opportunities. In order to set themselves apart, imec offers its employees not only career and quality-of-life services, but also an attractive salary package, along with a performance-based bonus system. With this system, imec promotes career development within the organization, rewarding the exceptional performances of teams or individuals.

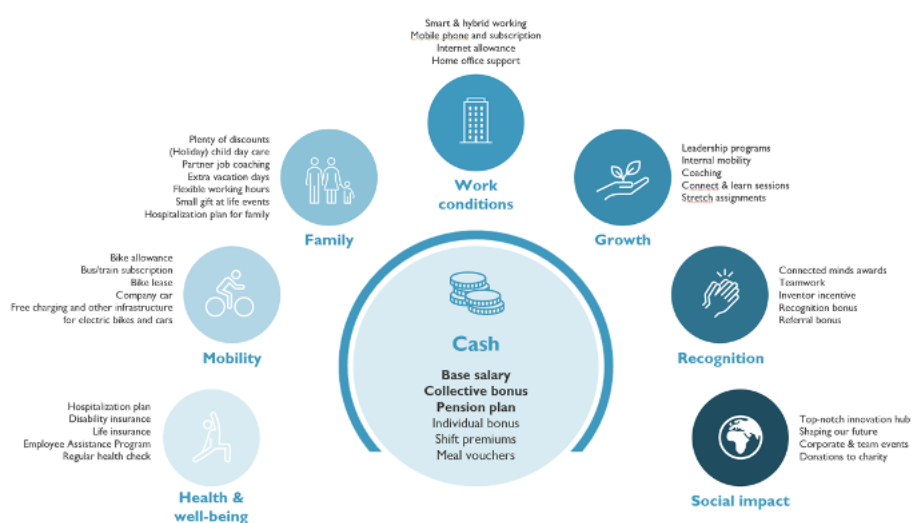



Figure 6 | A selection of standard employee benefits



 In 2021, imec actively went about communicating its role as an attractive talent hub, participating in panel discussions and publications, while also picking up a 'Pioneering Employer' certificate and 'Employee Engagement' award. To achieve the former, imec underwent a learning process to develop and follow up on action plans based around the themes of travelling less and more green, while working in a hybrid, people-oriented manner.

A major step in realizing this new vision of hybrid working was the launch of the 'Future of Work' program, based on the principle of how employees can work best, and how imec can actively support them to do so. For example, employees receive a voucher that they can spend on materials to create an ergonomic working environment at home, and imec has looked into how foreign employees can work hybrid hours during family visits in the future. All this can improve employee experience.



Imec CHRO team wins Corporate HR Award for Best Employee Engagement Initiatives 2021

In a constantly and rapidly changing environment, an organization has to simultaneously be and remain effective and flexible, maximize its results and stay relevant in the future. The best way to achieve all that is to listen to employee feedback, and then act on it quickly.

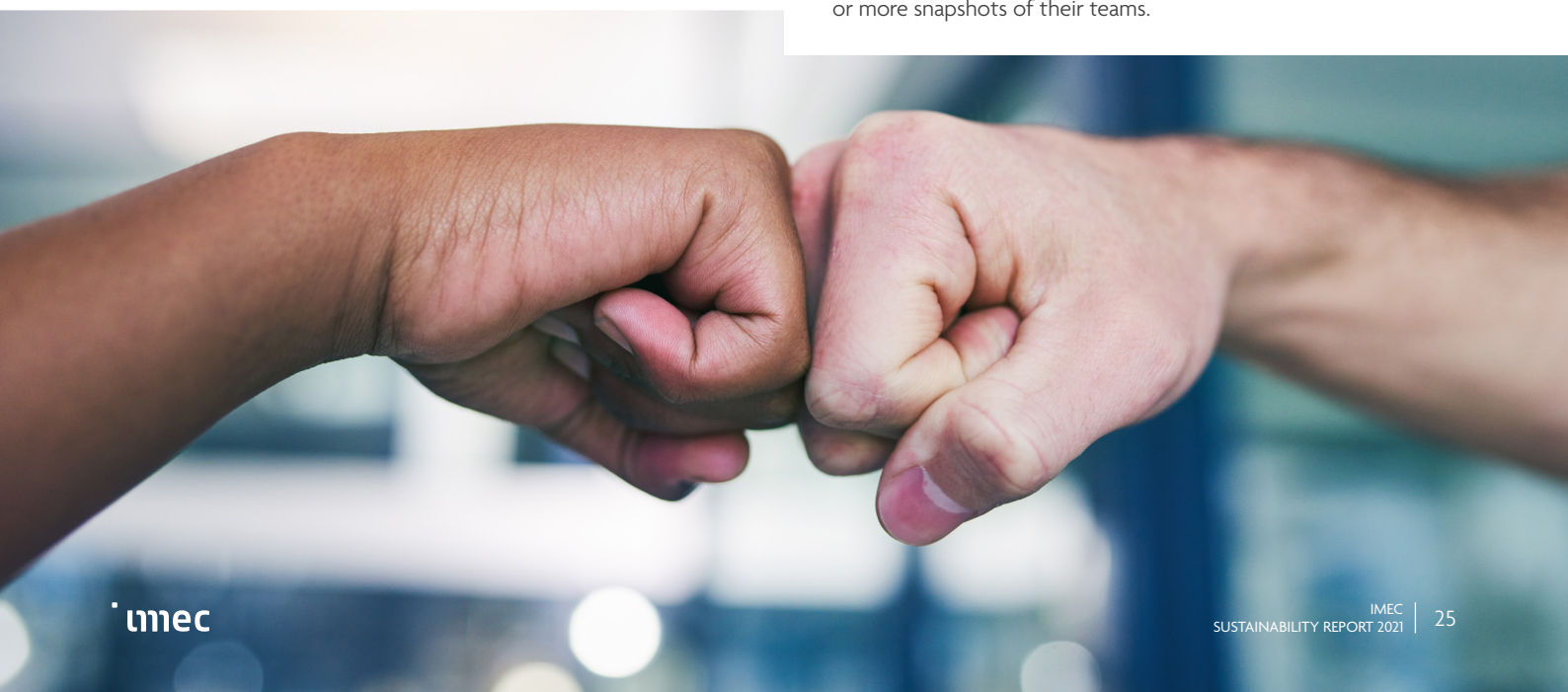
Since 2020, imec implemented a new method of asking for and listening to employee feedback. Imec wants to create a working environment that provides the freedom to exchange ideas and thoughts in full transparency – which is essential for facilitating innovation. The connected.minds initiative is testament to imec's ambition to connect through listening. It combines imec-wide surveys with new and frequent team surveys. These are short surveys covering the overall employee experience at imec – including all aspects of involvement, engagement, vitality, and leadership. The results are visualized using a user-friendly and easy-to-interpret dashboard.

This invaluable, wide-ranging feedback allows for a rapid response, with actions in the areas of individual recognition, diversity and inclusion, and fostering collaboration across all departments.

“Our action plan aims to promote collaboration across our teams, to provide recognition to every employee within the organization, and to show that everyone is able to feel at home here, regardless of their background.”

Evelien Kippers - HR project leader

In 2021, the feedback raised from our 'Corona Connect' and 'Future of Work' surveys helped us successfully navigate the challenges of the coronavirus pandemic. 2021 also saw imec place increased emphasis on conducting narrower team surveys. By using this 'pulse survey' tool, managers are easily able to gather information from their teams, which speeds up the implementation of suggested improvements. In 2021, 40% of managers were able to gather one or more snapshots of their teams.





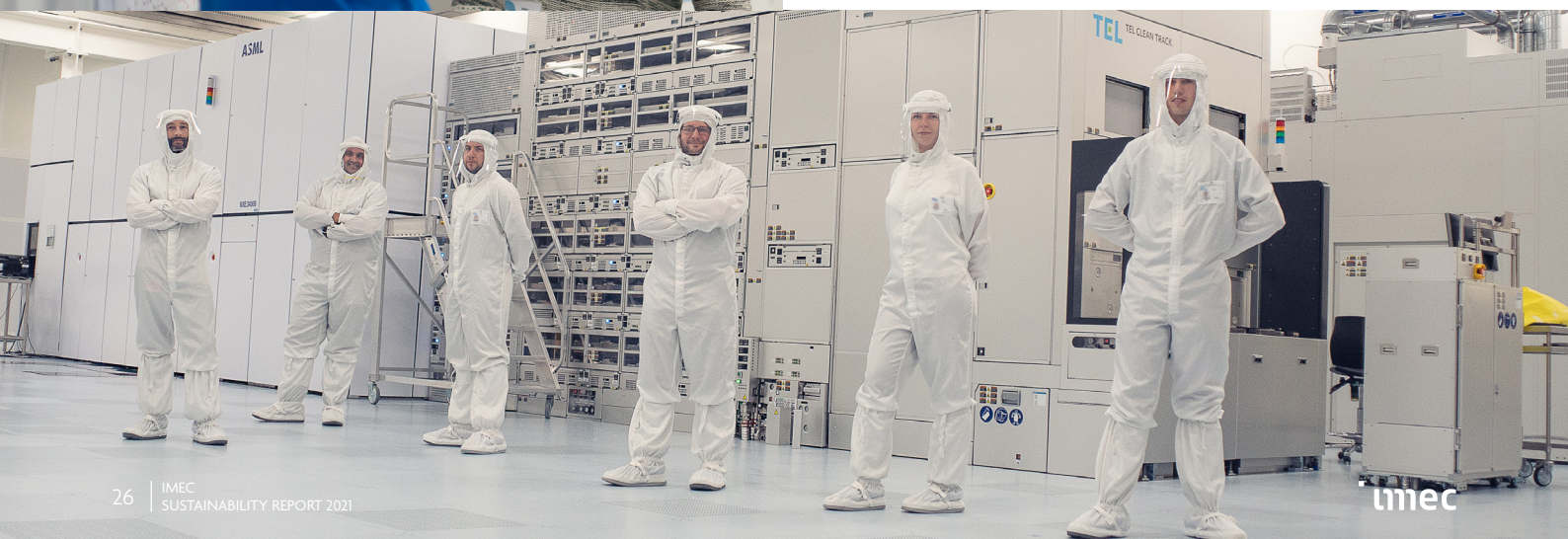
## Connected.minds

In early 2022, a second extensive connected.minds survey was conducted across imec, centered on the themes of engagement, vitality, and inclusion. With a response rate of 73.6%, the results were in line with or exceeded those of similar businesses. In 2022, imec achieved an average eNPS score of no less than 24, compared with 7.2 in 2020.

2020 THEMES	
Involvement	7.4
Engagement	7.3
Vitality	6.7
2022 THEMES	
Inclusion	7.8
Engagement	7.4
Vitality	6.4

For all countries where imec operates, internal guidelines and procedures for employees are available in accordance with local laws and regulations, such as the Law on Employment Contracts of July 3, 1978 ('Wet betreffende de arbeidsovereenkomsten') in Belgium, and the Working Conditions Act ('Arbowet') in the Netherlands. These are complemented in Belgium by two collective labor agreements: the 2015 CLA for operators, and the CLA on meal vouchers. In 2021, HR policies for the various international teams were further harmonized and strengthened. In the Netherlands in particular, a great deal of effort was put into streamlining HR procedures, ranging from the implementation of the Future of Work program (hybrid working), and the launch of a regulation on undesirable behavior, to the alignment of the collective bonus mechanism with the system in Belgium. With the hiring of a local EHS officer, imec in the Netherlands was also able to make great strides in getting safety plans up to date, as well as defining the roles and responsibilities for properly implementing and monitoring these plans. To that end, a dedicated EHS team was established at both the Eindhoven and Wageningen sites.

Imec wants to be a transparent and sustainable organization, both in terms of business and human resources. To achieve this, having a good social dialogue with employee representatives on the Works Council, and in the Committee for Prevention and Protection at Work, is important. The Works Council, which comprises representatives of both imec management and employees, has a dual mission: to advise and consult on financial and economic issues on the one hand, and on issues relating to the organization of work and working conditions on the other. It meets monthly and is elected every four years. In November 2020, 1130 registered voters elected new representatives to both the Works Council and the Committee for Prevention and Protection at Work. The Committee was an important actor in the development of the Connected Minds program.



## 3.2 Equality and inclusion

Diversity and inclusion (D&I) is becoming increasingly important in every organization, and imec is no exception. Its workforce comprises no fewer than 92 nationalities. On average, around 1/3 of imec staff in its different teams are female, which reflects the underrepresentation of women among STEM researchers worldwide. Imec's vision, mission, and values are based around respect and diversity. The organization actively embraces all types of diversity, since it 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 free from harassment or behavior that might be offensive or humiliating. Imec promotes and accepts equal opportunities for all.

In 2020, imec developed new policies and initiatives designed to reinforce these principles within its culture, leaving no room for hurtful behavior or harassment. Eventually, this resulted in the launch of a formal diversity and inclusion policy in 2021. This policy outlines the organization's vision of fostering a "diverse" and "inclusive" work environment, along with how this can be achieved, including measures to address unwelcome behavior.

Establishing a culture of openness and respect is something that is generally done at an informal level. Imec is achieving this by means of digital learning modules, as well as through daily informal communications with an increased emphasis on events that are important to minority groups, such as different New Year celebrations (e.g., for colleagues in South and Southeast Asia), national holiday celebrations (e.g., King's Day in the Netherlands), or religious events (e.g., Ramadan).

**Throughout 2021, several initiatives generated greater attention for and effort toward addressing these topics:**

- A Women in Tech jobinar on International Women's Day (March 8) resulted in 3 hires.
- A blended learning training initiative called 'Hack your bias!' was introduced, to help imec employees recognize their own biases, and give them tools to challenge or overcome them. The initiative was voted by imec employees as the top diversity initiative of 2021, with 85 employees, including members of the management team, participating in the live sustainability talk on the subject. In total, 145 'Hack your bias!' e-learning modules were followed.
- A diversity planning, along with related communications and campaigns, illustrated the value of our global workforce. Among other things, employees' photos from their countries of origin have adorned all our campuses ('Hidden Gems'), expat testimonials have livened up imec's internal communication channel as well as its most important staff event open.minds ('United by Diversity'), and D&I and international Yammer communities have provided lively debate.
- Finally, a brand new gender equality plan has outlined imec's ambitions for 2022 onward, in terms of female representation in R&D departments and management positions, as well as improving overall female inclusion. Imec aims to have 25% of its leadership roles filled by women by 2025, and 30% by 2030].



Download the 'Gender Equality Plan 2021' from imec

### Orange the World

During UNESCO's 'Orange the world' campaign, which took place in November–December 2021, imec illuminated its Leuven clean rooms in orange. This was to express the organization's backing for this two-week global campaign, which raises awareness of gender-based violence, and calls for action to be taken against it.



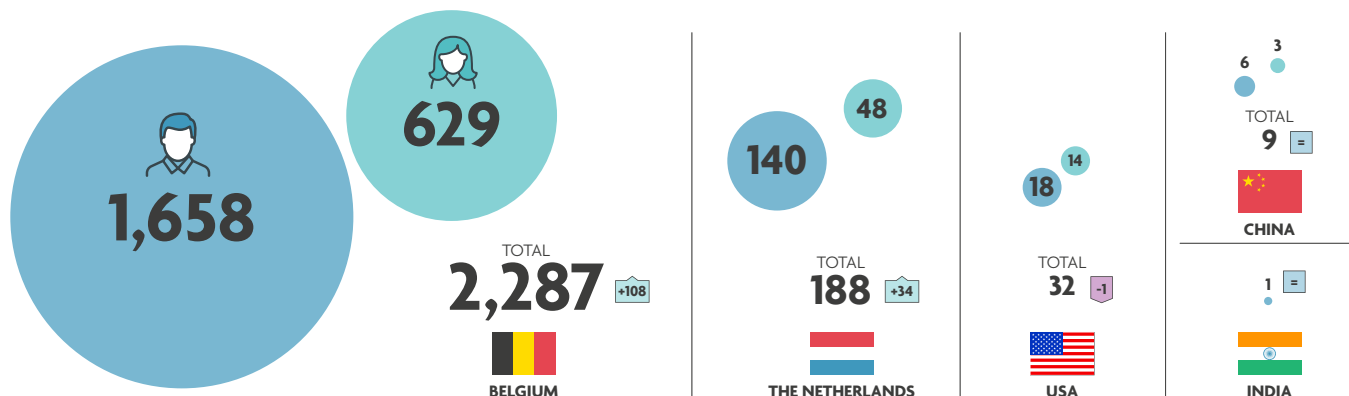
**+5,000** IMEC  
EMPLOYEES

OF WHICH

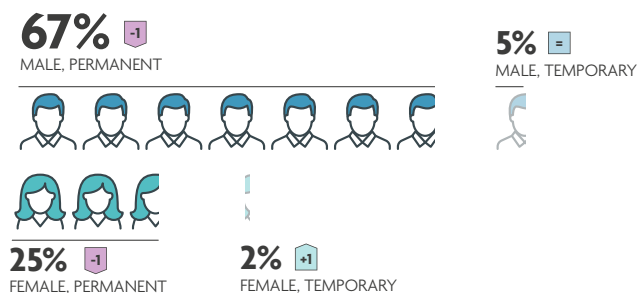
**51%** ARE  
PAYROLL

**49%** ARE  
NON-PAYROLL

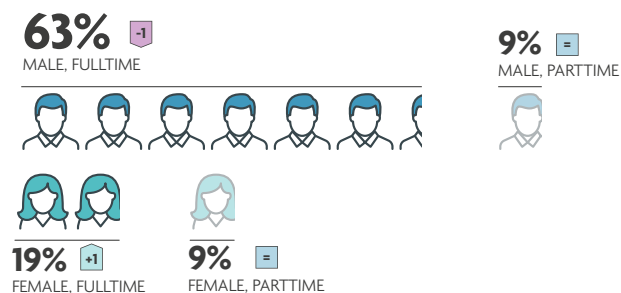
#### HEADCOUNT IMEC SITES EXCLUDING NON-PAYROLL WORKERS



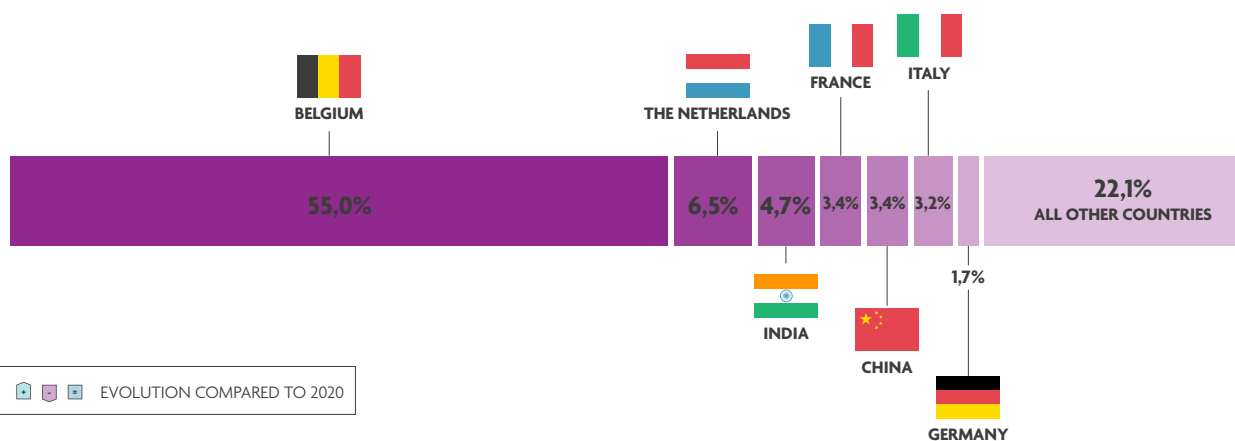
#### CONTRACT TYPE PER GENDER FOR ALL IMEC EMPLOYEES ON PAYROLL (HEADCOUNT)



#### EMPLOYMENT TYPE PER GENDER FOR ALL IMEC EMPLOYEES ON PAYROLL (HEADCOUNT)



#### COUNTRY OF ORIGIN FOR ALL IMEC EMPLOYEES (PAYROLL & NON-PAYROLL)



EVOLUTION COMPARED TO 2020



Imec's workforce totals over 5,000 employees, of whom 51% are contracted, and 49% non-contracted. This last group consists mainly of guest researchers and industrial residents, here as part of specific programs, as well as doctoral students. ImeC's workforce has become steadily more internationally diverse over the past decade. This is apparent at all levels, including right at the top. ImeC continues to recruit researchers from all over the world. After Belgium and the Netherlands, the top five countries are India, China, France, Italy, and Germany.

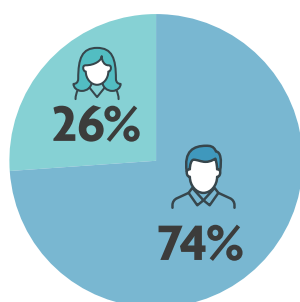
The age distribution of imec's staff is relatively stable, with 18% aged 50 years or older, 12% under 30, and the largest group (70%) aged between 30 and 50. The representation of women at management level has stabilized in recent years, but remains below 30%. Looking to the future, improved female representation forms part of our diversity and inclusion strategy over the next five years.

To that end, imec's recently-revised diversity and inclusion policy emphasizes the importance of improving female representation within the organization, with a particular focus on the presence of women in leadership positions.

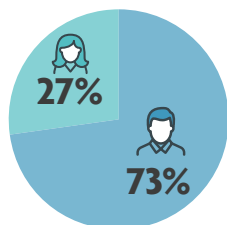
The diversity and inclusion policy is driven by two internal sponsors, providing direction to the D&I project team, along with helping to determine the priorities and level of ambition. In doing so, they act as active speakers on these topics, representing not only HR's vision, but also that of the entire organization.

### PERCENTAGE OF MEN AND WOMEN FOR ALL IMEC EMPLOYEES ON PAYROLL, % FTE

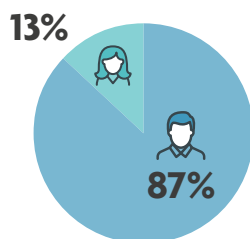
#### ALL FUNCTIONS & LOCATIONS % FTE



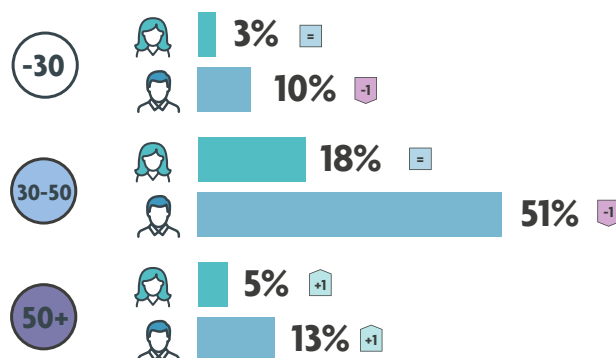
#### BOARD OF DIRECTORS



#### MANAGEMENT TEAMS % FTE

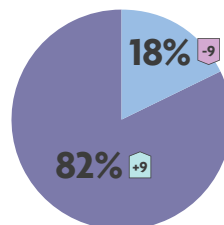


### AGE GROUP DIVISION BY GENDER FOR ALL IMEC EMPLOYEES ON PAYROLL, % FTE

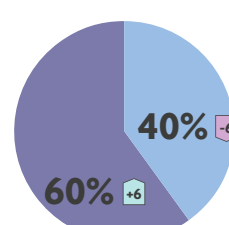


### AGE GROUP DIVISION FOR ALL IMEC EMPLOYEES ON PAYROLL, % FTE

#### BOARD OF DIRECTORS



#### MANAGEMENT TEAMS % FTE



● 30-50 ● 50+

EVOLUTION COMPARED TO 2020

### 3.3 Recruitment – from ‘attract and retain’ to an integrated HR business approach

Over the past 10 years, imec has grown by more than two and a half times its size. This growth requires an ever-increasing effort to attract talent. For this, HR works closely with the various departments to attract the right people, thereby strengthening the teams. Here, managers play a central role from first contact, throughout their team members’ entire journeys.

The referral app that imec uses to supplement the existing process is a perfect example of how the organization’s entire network works together to scope out new talent. The app, launched mid-2018, allows all imec employees to easily identify any job openings and refer friends or acquaintances. Following the app’s launch, the number of referrals immediately tripled, and today up to 10% of vacancies are filled by imec’s own employee network.

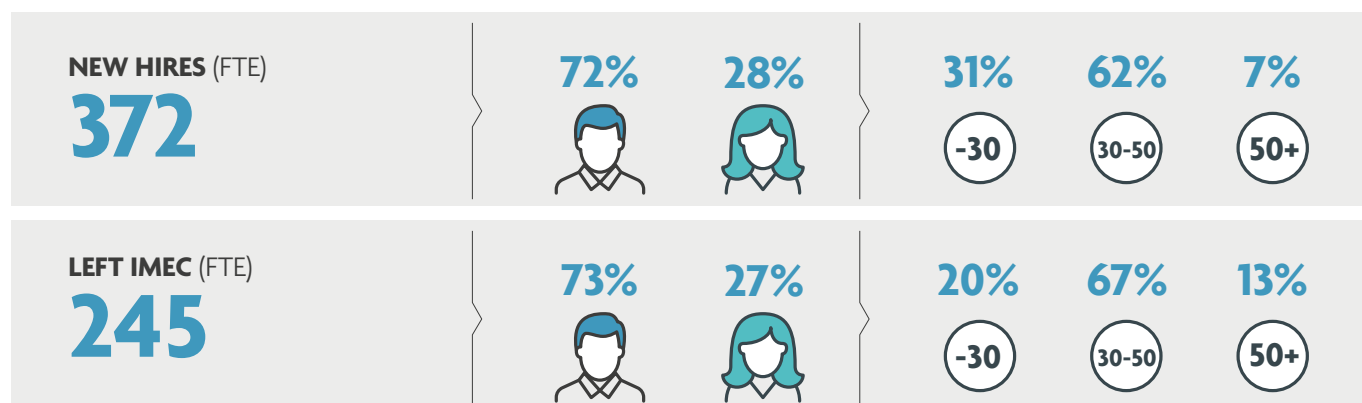
Imec’s HR teams also concentrate on those vacancies that are hard to fill, partly through internal mobility. Today, up to 28% of all job openings are filled this way. In 2021, the internal mobility policy was expanded, offering employees short-term swaps or ‘job shadowing’ opportunities. In 2022, imec wants to push this further by means of communication and the launch of a dedicated careers page. Beyond this, individual teams also focus on innovative and tailored external searches. As such, imec is developing its own approach to attracting employees and helping them acquire the appropriate skills and competences. Imec School is an important initiative in response to this recruitment challenge, with the organization also intending to use this proven technique for filling bottleneck vacancies in 2022.

For some time now, the WelcomeApp has been used to help organize preboarding following the recruitment phase. The app provides newcomers with useful imec-related information, including its mission statement and organizational structure, as well as practical information or locations that may prove useful during their first few days. Employees can use the app for all kinds of administrative purposes, even prior to their actual start date. Inspired by this, 2022 will see the organization overhaul its onboarding, crossboarding and offboarding processes, using an equally attractive tool that is fully integrated into its personnel system.

Naturally, an employee’s first few days at imec are also crucial. This is exactly why imec.academy places a great deal of emphasis on the onboarding of new employees. In 2020, imec.academy introduced the imec Discovery Day, allowing all newcomers to get to know the many aspects of imec faster, more efficiently, and in a more playful way – thanks to the help of gamification. The employee’s first day is followed by mandatory e-learning modules covering security of information, quality assurance, intellectual property, and digital collaboration. In 2021, the list of mandatory e-learning courses was expanded to include the topics of privacy, environment, and health and safety.

Imec also puts great effort into avoiding high employee turnover. HR monitors any incomings and outgoings on a very regular basis, using information from exit interviews to keep a close eye on the workforce’s evolution. 2022 will see an increased focus on making resource planning more transparent to managers, enabling them to better anticipate impending staff changes.

On a similar note, 2021 saw imec develop an improved follow-up of PhD students. Using follow-up interviews and surveys, it is possible to explore at an earlier stage whether certain profiles qualify for any specific position at imec. In the case of expats, this is crucial information, given the short amount of time they have between completing a doctorate and returning to their home country.



### 3.4 Training and development – supporting talent to be the best possible version of themselves

The cornerstone in the development of our employees is the separation of objectives from employee development.

#### Alignment of objectives

The continuous (dynamic) and 'lean' defining, adjusting, feedback providing, completing, etc. of objectives is followed up with the tried and trusted method, but is organized according to our new vision and in a completely different way. The aim of this process is not to evaluate employee performance, but to help our managers and employees continuously align themselves and (re)define their priorities.

#### Supporting growth

One brand new process is that of having a review of talent within each team twice per year, in order to determine the next steps and development measures to be taken. Conversations regarding development are greatly encouraged. To that end, new tools have been introduced that offer support for providing feedback or discussing qualities or talent. By contrast, evaluation (scores) have been abandoned altogether.

#### Recognizing positive contribution and talent

Recognizing talent and special contributions is important, in ways other than purely financial. In 2021, imec designed and introduced an updated rewards strategy. Its focus is on the overall compensation package, with the new framework leaving more room for managerial input.

An annual salary 'health check' based on both the employee's sustained performance level and desired market/salary position has replaced the annual 'merit' list. This health check is more focused on the longer term. Adjustments are made if the salary no longer corresponds to the level of performance and/or market position.



#### Imec.academy

Imec.academy is an important tool for realizing imec's ambitions. It encourages every employee to take charge of their own growth, supporting them throughout their personal and professional development. Imec has supplemented traditional classroom training with digital (smart) learning solutions, resulting in a more hybrid approach, combining the best of both worlds. Its safety training course using virtual reality reality, its onboarding program, and its remote leadership training course are all testament to the organization's training approach.

"We encourage our employees to engage in lifelong learning through our imec.academy, and to share knowledge during Connect & Learn sessions."



**23.5**

AVERAGE NUMBER OF HOURS OF TRAINING PER EMPLOYEE



**17%**

WELFARE, HEALTH  
AND SAFETY TRAINING  
(% HEADCOUNT)



**47%**

ETHICS, ANTI-CORRUPTION, AND  
EXPORT MONITORING TRAINING  
(% FTE)



### Teams leading teams

Leadership development is becoming increasingly important. Guidance and support from (senior) leadership is beneficial in helping to implement the organization's overall vision and changes. The way they manage their teams, as well as the individuals within their teams, shapes the organization.

During 2021, a new leadership model was drawn up in collaboration with imec's senior executives, which clarified the leadership culture imec wishes to develop, based on its company values. Following its launch in the fall of 2021, the framework received a lot of attention via the quarterly update, during Connect & Learn sessions, and via a very wide-ranging values campaign involving testimonials, banners, and teasers.

Significant progress was also made on a second objective in 2021, with a tailored development program implemented for no fewer than 20 management teams. This involved providing mentoring in their leadership skills, thereby increasing their self-awareness and encouraging their development as leaders.

The third objective – to expand and improve imec's individual leadership development initiatives – saw a complete overhaul of 'first time' manager training, leading to significant progress being made in that regard. In 2022, imec plans to work with even greater intensity and focus in this area.

“Hearing that my passion gives my team meaning and energy means the world to me. People sometimes ask me the secret to my energy levels. However, there isn't really that much to it. I am simply passionate about what I do, which gives me more energy than I know what to do with. Thus, every day you spend making a difference is a good one. In my role at imec, I feel blessed that I often have days like this!”

Lisbeth Decneut – EVP CHRO



## 3.5 Health and safety in the workplace

Imec can only continue to deliver top performance if the entire organization is healthy and working in the safest possible conditions.

"Our mission at imec is to have everyone go home at night as healthy as they arrived in the morning."

How does imec realize this healthy 'home'?

### Creating a healthy work environment

Thanks to the ongoing feedback loops between managers and employees, within teams, and between teams and the organization, imec has its finger continuously on the pulse when it comes to employee health and well-being, and is always aspiring to do better. In the 2021 employee engagement and well-being poll, imec scored a reassuring 7.1/10 for 'effective stress management', with a healthy work-life balance scoring slightly lower, at 6.6/10. These scores were strongly affected by the second and third lockdowns, but by the end of 2021 had returned to pre-pandemic levels. The most recent edition in 2022 yielded scores of 6.8/10 for 'effective stress management' and 6.3/10 for a healthy work-life balance. There is also a higher fatigue rate. That is why a 'take care' welfare campaign will be launched in 2022, aimed at improving employee welfare and their working environment. The campaign will focus on both interactive information and the designation of approachable individuals who can help direct employees with specific needs toward the most appropriate support channels on welfare-related issues.

### Promoting a healthy lifestyle

Imec encourages its employees to follow a healthy lifestyle, keeping them motivated with locally-organized initiatives, such as the 2021 Move More Challenge, Yoga@The Office, and participation in Levensloop.



### Imec moves

- **Move more:** 900 participants, 13,000 hours of exercise
- **Weekly online yoga classes** over the course of one month
- **Imec move festival 2021:** 850 colleagues participated in the walks





### Providing support channels and procedures that are known both internally and externally

Only with the right balance of internal and external support channels can imec support as many people as possible. Internally, employees can rely on their manager, the official trusted advisor, and their HR Business Partner. Externally, they can call on the company doctor, prevention advisors for psychosocial issues, and the employee assistance program. In late 2022, work will be done to appoint specific EHS business partners with a view to improving cross-departmental collaboration between the prevention service and the various departments within imec.

In 2020, the pandemic highlighted the undeniable importance of safety in the workplace. In this regard, imec truly outdid itself during this period of crisis. In 2021, imec managed to keep the number of infections down, thanks to a strict policy that involved an internal contact tracing system, along with the close monitoring of the mandatory and imec-specific measures. The latter involved analyzing infections and formulating tailored measures to avoid further spread of the virus.

In essence, this meant that accident prevention, risk management, and compliance – which are the basis of a sound environment, health and safety (EHS) vision – were reinforced by an EHS management system targeting continued improvement, management leading by example to achieve true excellence, and a supportive culture of engagement and mutual trust.

Health and safety are particularly important issues for imec, its employees, its customers, and the surrounding community. As a Seveso company (i.e., a company whose activities include the handling, production, use, or storage of hazardous substances), imec is required to comply with the relevant directives set out by federal regulations implementing the European Seveso Directive that apply to its activities. To ensure this is the case, imec implements specific and comprehensive policies, procedures, and control mechanisms.

"In 2021, we made a strong commitment to reevaluate and improve the safety of all explosion-prone areas. In 2022, we will continue to work on new improvements. Moreover, in 2022 we plan to further focus on improving the training of the R&D departments as part of imec's 'Safety Leadership' program."

Imec continuously monitors the safety of and the health risks posed to its employees. In 2021, imec reported an accident rate of 1.13 (based on 1/1,000,000 hours worked) for both contractual and non-contractual employees. The majority of reported injuries incurring medical costs were related to incidents following physical contact with chemicals that required preventive follow-up, as well as other minor injuries. Accidents leading to temporary absence are

primarily caused by working with chemicals, falls or trips.

Imec's operations are governed by an EHS manual, which outlines the organization's policy, its core principles, and the activities it undertakes in terms of managing risks and preventing incidents. These principles apply to imec's technological research groups, and supporting logistics groups, as well as third parties carrying out assignments on imec sites, particularly those in Leuven, Genk, Eindhoven, and Wageningen. The Prevention Advisor and Quality Manager update the safety manual when imec's dynamic risk management system detects previously unknown risks. In accordance with regulations, a hierarchical structure has been introduced to monitor, analyze, and adjust policies and procedures. Risks should be reported to the person in charge of the team or site according to existing procedures and guidelines.

This system of care is updated according to legislation on well-being at work, such as the Belgian royal decree on dynamic risk management systems and the Dutch Working Conditions Act ('Arbowet'). The system was set up in accordance with OHSAS 18001 and is always striving for continuous improvement. Furthermore, this document sets out the policy for the prevention of serious accidents, as defined in Article 9 of the Seveso cooperation agreement.

To ensure proper knowledge of the rules and procedures, the policy statement and system of care are also available digitally to all imec employees. Every new employee (those on permanent contracts, researchers, those on scholarships, students, and contractors) is assigned a personal supervisor who informs them from their very first day about evacuation procedures, the use of PPE, and all other procedures necessary to ensure safe working conditions. Everybody has to complete a mandatory EHS training plan, some parts of which must be repeated every three years. Should an employee fail to comply with this policy, their access badges will be blocked. 2022 will be all about revamping the existing training programs. This will involve revisiting certain learning objectives, along with reformatting some of the material.

In 2021, imec created a sizable area within the imec intranet where employees could go with all EHS-related queries and concerns. In the knowledge center, they can look up all the necessary information or ask additional questions via the dedicated case management system. In addition, employees can submit service requests regarding badge access, task analysis, device risk analysis, workshop analysis, etc. Following the successful launch of this digital environment, the team plans to continue its efforts in 2022 in making this innovation more widely known, and further encouraging its use.



“For the team, the variety of issues we deal with as an EHS prevention service is both challenging and exciting. In addition, the amount of cross-team collaboration with different departments serves to create a fun and enriching atmosphere.”

Nausikaa Van Hoornick; imec EHS Manager

To protect workers on particular workstations or undertaking particular tasks, the departments responsible systematically analyze the related health and safety risks. These analyses focus on maternity protection, ergonomics, screen work, load handling, equipment, and chemicals with an EHS code.

The manufacturing process of semiconductors and related technologies involves the use of a number of potentially hazardous chemicals that come in many forms. The prevention department maintains an inventory of all known EHS risks associated with semiconductor processing and related technologies. Before new materials or hazardous substances are used for the first time, the project is reviewed by the Material Introduction Board, which, among other duties, analyzes the EHS risks and approves or rejects the project.

A strict green light system is used for the procurement of new equipment. There are also procedures and standards in place when it comes to workers' personal protective equipment. At all entrances to the sites, laboratories or premises, a visual display shows which protective equipment is mandatory for entry. Lastly, EHS risks are also analyzed when new devices, equipment or processes are introduced.

In 2021, an additional lab policy was drawn up with the aim of achieving an even higher level of safety and uniformity at lab level. This policy will be rolled out in 2022, with training provided to embed it as part of employee knowledge.

Fire risks are particularly elevated during the production of semiconductors and related technologies due to the raw materials, manufacturing techniques, and construction materials used. This is evident, based on the fire statistics from within our industry. Imec has therefore made significant investments in people and resources around prevention related to technical installations and organization.

# 4. Reducing our environmental impact

Sustainability is an important driver for imec – not only in its research projects, but also in its operational departments. Imec is aware that its own activities have a considerable ecological footprint. For this reason, it has a clear ambition to reduce its carbon and water footprint. Imec has a three-pronged strategy (remove, reduce, compensate) with specific ambitions for its carbon footprint, water usage, and mobility. In 2021, imec took substantial steps in these three strategic pillars. With new insights, knowledge, and result-oriented short- to medium-term measures, this transformation is gradually taking shape.

## REDUCE CARBON FOOTPRINT

- Construct energy balance (Cool, Heat)
- Minimize energy needs
- Reduction of natural gas consumption
- Reduce process emissions.
- Reduce mobility contribution

## OPTIMIZE WATER USAGE

- Minimize water need
- Reduce city water
- Maximize water re-use

## MOBILITY

- Travel policy
- Company car
- Work-home travel

## 4.1 Carbon footprint

In 2015, imec Leuven calculated its carbon footprint for scopes 1 and 2 (reference year 2014) for the first time. In 2019, its footprint was calculated according to the Bilan Carbone method and the Kyoto Protocol, with scope 3 also being added to the calculation (reference year 2018). In 2021, the parameters for the calculation of process emissions for scopes 1, 2, and 3 were updated.

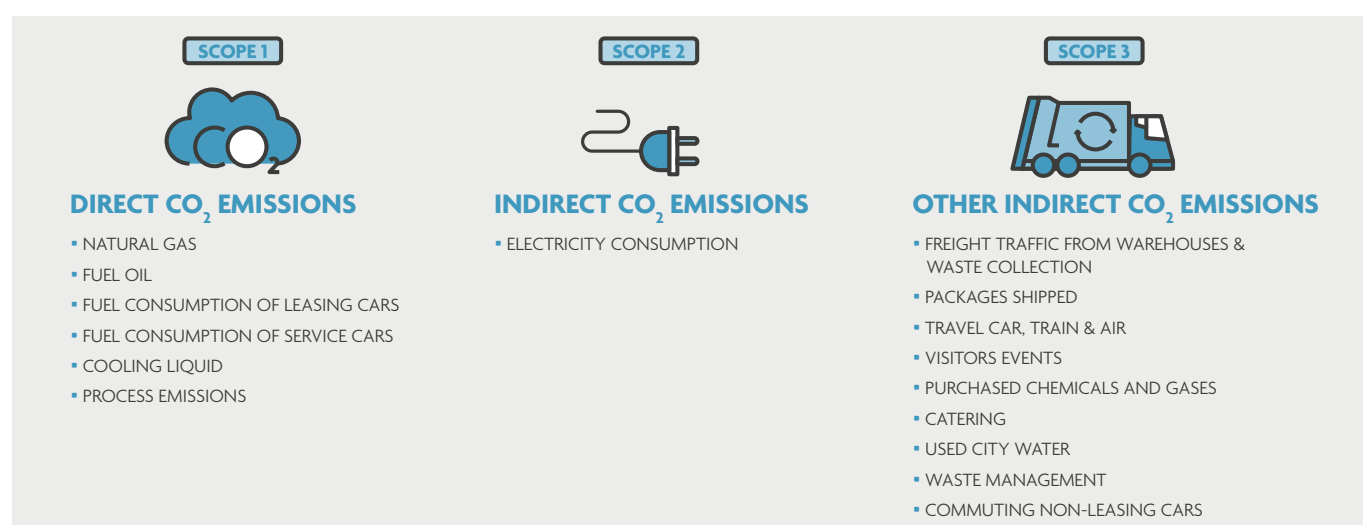


Figure 7 | Overview of Scope 1, 2, and 3 categories

Imec aims to reduce its carbon footprint by 65% by 2030 relative to the 2014 baseline for scopes 1 and 2, and has put together an action plan to that end. By 2050, imec is aiming to be fully climate-neutral.

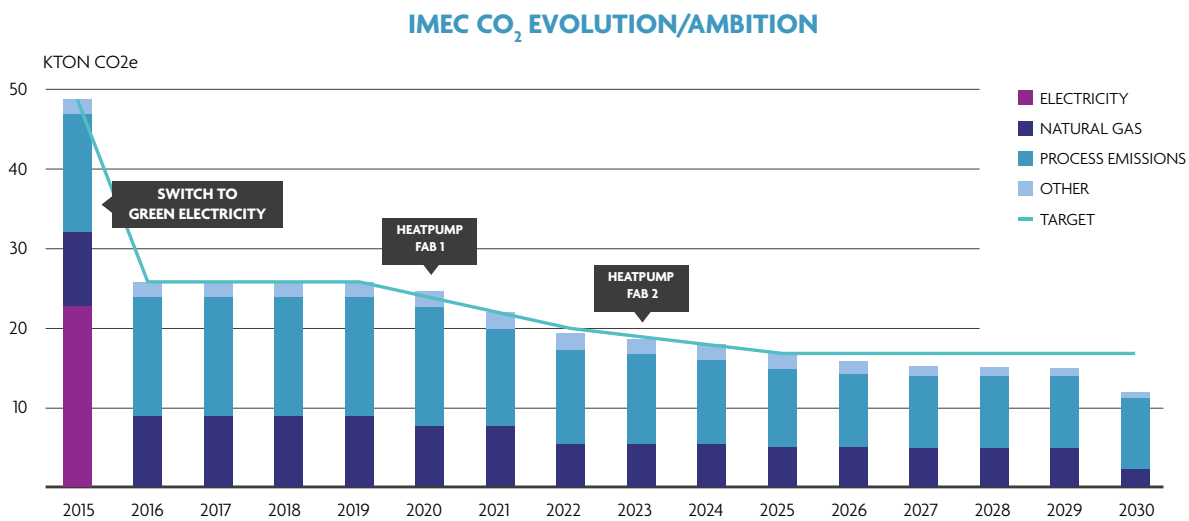


Figure 8 | imec's CO<sub>2</sub> emission reduction plan for scopes 1 and 2 at imec Leuven

An overview of the plans and effective achievements toward achieving this ambition:

#### Electricity

Full transition to green or renewable energy since 2015.

#### Replacing natural gas to achieve climate-neutral heating and cooling

Gradual replacement of natural gas in the clean rooms (fabs) with heat pump and heat recovery systems:

- A heat pump in FAB1 in 2019.
- A heat pump in CUB (Central Utility Building)/FAB2: completed in 2021, operational in May 2022, one year earlier than its projected operational date of 2023.
- A heat pump is also planned for the expansion of FAB3, and is due to be operational in October 2023. The heat required for the FAB3 extension is to be generated by the installation of a heat pump, helping imec to expand its infrastructure without impacting its carbon footprint.
- For new projects, such as the planned new building on the Leuven campus (imec 6 project), climate neutrality is already being envisaged, including the installation of a heat pump.

Following a 2021 feasibility study, it was concluded that the idea of connecting all Leuven campus imec buildings to a heating/cooling network needed to be revised. Based on these conclusions, imec is going to develop an updated master plan exploring alternative options, the first outlines of which are expected by the end of 2022.



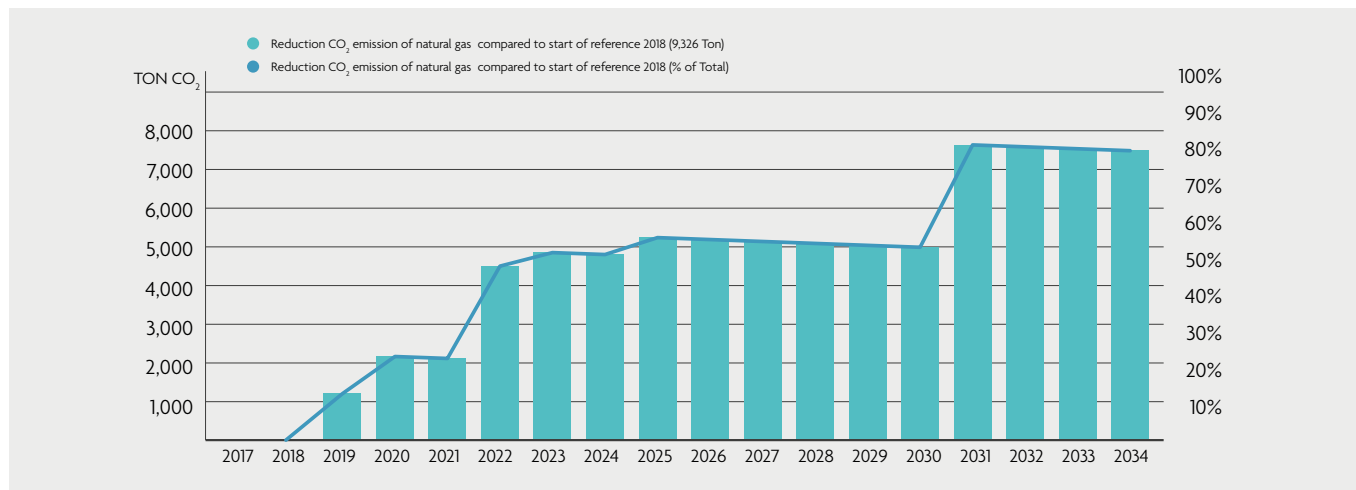
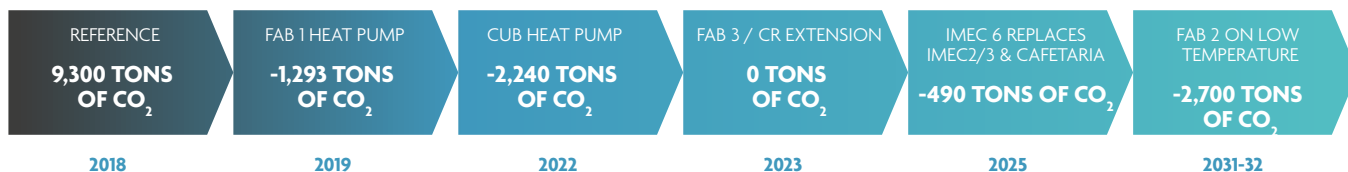


Figure 9 | Natural gas CO<sub>2</sub> emissions reduction program

### Process emissions

The process emissions (part of scope 1) today amount to 12,198 tons of CO<sub>2</sub>e per year. Compared to 2018, imec achieved a decrease in process emissions of 14%.

Imec is exploring options for reducing process emissions. The biggest culprits were identified (SF<sub>6</sub>, C<sub>4</sub>F<sub>8</sub>, CF<sub>4</sub>, and NF<sub>3</sub>), and a detailed measurement plan was established for effective consumption, leakage testing during periods of operational shutdowns, and losses during the replacement and flushing of cylinders. At the high level, there are only three viable options for reducing the CO<sub>2</sub> impact of process emissions: reducing consumption (including correct mapping of said consumption), replacing it with a gas that has a lower GWP, or treating the emitted residual gases (abatement). The last of these, abatement, is the action that should have the greatest impact. Today, imec employs two 'abatement' technologies to reduce its environmental impact, namely a burner abatement system and a dry scrubber. Burner abatement systems have the added benefit of lowering CO<sub>2</sub> emissions, while dry scrubbers have little effect in this regard. In 2021, the two main consumers – the gases **SF<sub>6</sub>** and **NF<sub>3</sub>** – were analyzed across both abatement systems. For NF<sub>3</sub>, which is commonly used in conjunction with burner abatement systems, we witnessed a significant impact. For SF<sub>6</sub>, which is mostly used in combination with a dry scrubber, we saw no positive effect. To treat SF<sub>6</sub>, a plasma abatement system is needed to reduce its CO<sub>2</sub> footprint. This technology is not employed by imec yet, but will be further explored in 2023. In some instances, burner abatement systems operate on natural gas, while the manufacturers of these systems also look to H<sub>2</sub> and electricity in order to initiate combustion. This aspect is also included in our research.

Imec's emissions with respect to scope 3 decreased sharply in 2021 compared to data from 2018. This was mainly due to the steep decline in business travel. While new mobility procedures have been developed, imec expects business travel relating to scope 3 to increase in 2022.

### EVOLUTION TON CO<sub>2</sub> 2018-2021

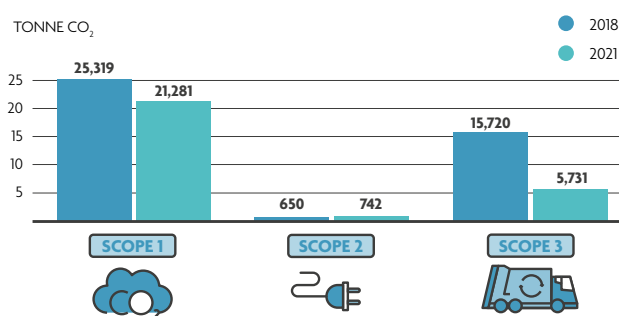


Figure 10 | Evolution in tonnes CO<sub>2</sub>e 2018-2021 (scope imec Leuven and Genk for 2021, scope imec Leuven for 2018; the carbon footprint of the Genk site is less than 1% of total CO<sub>2</sub>e emissions)

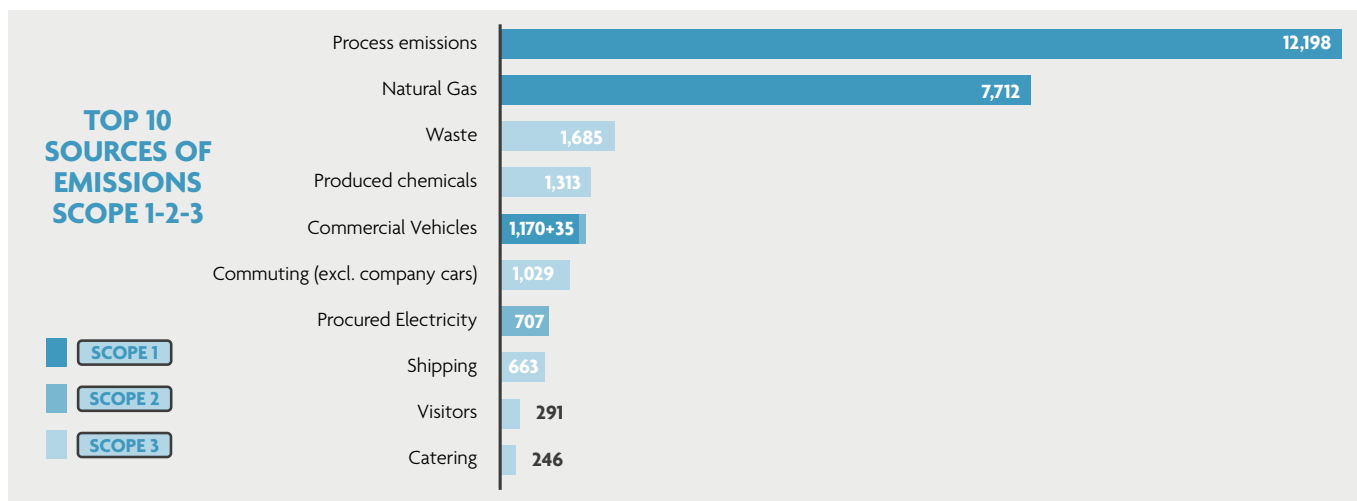


Figure 11 | Top 10 sources of emissions in 2021 (tonnes CO2e)

Emission category	2018					2021					Evolution
	SCOPE 1 tonne CO2e	SCOPE 2 tonne CO2e	SCOPE 3 tonne CO2e	Total	%	SCOPE 1 tonne CO2e	SCOPE 2 tonne CO2e	SCOPE 3 tonne CO2e	Total	%	
Energetic	9.332	650		9982	24%	7.720	707		8.427	30%	▼
Non-energetic	14.769			14.769	35%	12.391			12.391	45%	▼
Freight	49		1.261	1.310	3%			762	762	3%	▼
Transport (personnel)	1.217		11.661	12.878	31%	1.170	35	1622	2.827	10%	▼
Materials & services			1.414	1.414	3%			1559	1.559	6%	▲
Direct waste & water	129		1.206	1.335	3%			1788	1.788	6%	▲
Totaal	25.496	650	15.542	41.688		21.281	742	5731	27.754		

Figure 12 | Evolution of main emission categories 2018–2021 (scope: imec Leuven 2020; imec Leuven and Genk in 2021)

The Carbon footprint was drawn up by Futureproofed on behalf of imec Leuven. The footprint was calculated on the basis of the Bilan Carbone method and the Greenhouse Gas Protocol, for scope 1, 2 and 3 (partially) based on figures supplied by imec. Scope 1: direct CO<sub>2</sub> emissions Scope 2: indirect CO<sub>2</sub> emissions from energy generation Scope 3: other indirect CO<sub>2</sub> emissions. With the update of the carbon footprint 2021, it was advised to also update the data reported for the year 2018, taking into account the changed guidelines for the calculations of process emissions. As a result, the reported process emissions rose in 2018 from 10.3 to 14.3 K tons of CO<sub>2</sub>e.



## A sustainable construction and remodeling approach

When renovating existing office buildings, waste streams from the buildings to be renovated are identified and solutions are sought via the circular economy to encourage reuse, repurposing, and recycling. Design specifications included in application calls also maximize the integration of circular solutions, such as the mandatory provision of variants for office partitions with a view to circular deployment.

When it comes to loose furniture, in addition to ergonomic quality, the preferred option is always furniture that can be completely dismantled. This allows for repairs on a part-by-part basis, thereby extending the furniture's life cycle.

For new construction projects, imec consciously strives for, where technically viable, to maximize the implementation of a climate-neutral, circular approach in the design phase.

## 4.2 Energy

Each year, imec selects investments that reduce energy consumption, in line with the energy policy agreement in place in Flanders. The measures stem from a (four-yearly) energy audit and are also determined by an internal 'green energy' task force. Through its efforts to reduce natural gas and oil consumption, imec achieved a CO<sub>2</sub>e emission reduction of about 16% in 2021 compared to 2018.

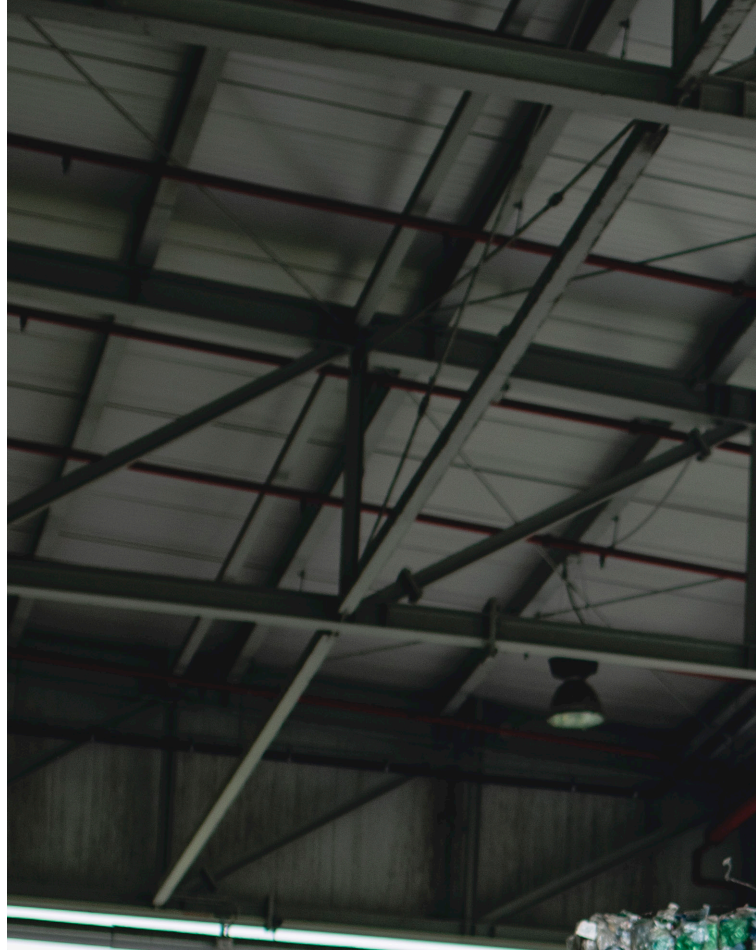
		Unit		Tonne CO <sub>2</sub>
<b>ENERGY CONSUMPTION</b> (owned and leased facilities)	Total consumption of energy from renewable resources within the organization	GJp	1,056,609.50	707
	Total consumption of energy from non-renewable resources within the organization, converted into tonnes of CO <sub>2</sub>			7,913
	i. Heat consumption – gas	kWh	31,618,000	7,712
	ii. Cooling consumption (R1234a and R407c)	Kg	145.5	193
	iii. Heating oil	l	2,650	8
	Norms, methods, hypotheses, and/or calculation tools used	Internal calculations by imec based on data provided by suppliers		
<b>REDUCTION OF ENERGY CONSUMPTION</b>	Energy consumption reductions realized as a direct result of cost-cutting and efficiency measures	GJp	32,865.00	8,620
		Calculation basis: An energy plan based on an energy audit must be submitted every four years. In 2017, imec determined that energy consumption should be reduced by approximately 100,000 GJp.		

Figure 13 | Overview of imec's energy consumption in 2021 at the main consumption sites of Leuven and Genk



## 4.3 Waste

Imec has three fabs on its campus in Leuven: FAB1, FAB2, and FAB3. Previously, most of the effluents produced by the three fabs were collected and processed externally. In recent years, imec has invested in a local purification plant for FAB2 and FAB3, and has significantly reduced the amount of externally processed liquid waste. To facilitate this, imec separated the different waste systems (types of chemicals) at source. At FAB2 and FAB3, imec has more than 10 different drain types. FAB1, the oldest fab, does not have a detailed system with separated drainage.



### LIQUID WASTE

- waste solvents
- waste oil
- waste acids and caustics
- EKC 265 solvent
- photo lacquers
- lab waste
- residues of CMP slurry
- sludge electrocoagulation
- expired products
- grease from grease trap
- sulfuric acid solution
- nitrate-containing waste water
- lime milk solution WFW installation
- plastic cans with residues of chemicals
- cleaning water
- TMAH (developer)
- water / grease / sludge



### HAZARDOUS SOLID WASTE

- batteries
- electrical scrap
- glass beads
- quartz glass
- empty tarnished glass packaging
- empty tarnished metal packaging
- empty tarnished plastic packaging
- disposal waste
- hazardous medical waste
- silicon wafers
- fluorescent lamps
- contaminated material
- filter cake DKD installation



### NON-HAZARDOUS SOLID WASTE

- glass kitchen
- wood
- kitchen waste
- class II waste
- paper and cardboard
- PMD waste
- residual kitchen waste
- toners ink cartridges
- metals

Figure 14 | Overview of imec's waste groups in 2021 at its Leuven location




		2020 (tonne)	2021 (tonne)
GENERATED WASTE	Total weight of generated waste (excluding effluents): hazardous waste	254.9	226.8
	Total weight of generated waste (excluding effluents): non-hazardous waste	434.6	451.6
	Total weight of generated waste	689.6	678.4 ▼
SORTED WASTE	Total weight of separated waste (excluding effluents): hazardous waste – prepared for reuse	0.0	0.0
	Total weight of separated waste (excluding effluents): hazardous waste – recycled*	0.0	0.0
	Total weight of separated waste (excluding effluents): hazardous waste – other forms of recovery	144.9	135.3
	Total weight of separated waste (excluding effluents): non-hazardous waste – prepared for reuse	0.0	0.0
	Total weight of separated waste (excluding effluents): non-hazardous waste – recycled*	0.0	0.0
	Total weight of separated waste (excluding effluents): non-hazardous waste – other forms of recovery	246.3	270.2
	Total weight of separated waste	391.2	405.5 ▲
LANDFILL OR INCINERATED WASTE	Total weight of incinerated hazardous waste (with energy recovery)	0.0	0.0
	Total weight of incinerated hazardous waste (without energy recovery)	7.5	7.1
	Total weight of hazardous landfill waste	52.9	40.3
	Total weight of hazardous waste disposed of by other means	49.5	44.1
	Total weight of disposed hazardous waste	109.9	91.5 ▼
	Total weight of incinerated non-hazardous waste (with energy recovery)	187.9	181.4
	Total weight of incinerated non-hazardous waste (without energy recovery)	0.0	0.0
	Total weight of non-hazardous landfill waste	0.0	0.0
	Total weight of non-hazardous waste disposed of by other means	0.0	0.0
	Total weight of disposed non-hazardous waste	187.9	181.4 ▼
	Total weight of disposed waste	297.9	272.9 ▼


Scope: All waste from the major waste-generating sites (Leuven and Genk) for 2020 and 2021, excluding effluents. Calculations are based on formal data, collected and reported according to Belgian regulations.

\*The data for recycled waste is included in the total for separated waste – other forms of recovery.

Details of treatment (recycling or other method) according to waste group.



GROUPS OF HAZARDOUS WASTE FOR RECYCLING OR OTHER WASTE TREATMENT (EXCLUDING EFFLUENTS)		
	2020	2021
Glass recycling	3%	5%
Conversion of sulfuric acid into ammonium sulfate	11%	13%
Waste oil and photo lacquers (reused as fuel)	54%	50%
Wafer waste (recovery of silicon)	3%	3%
Used plastic (recovery of plastic)	8%	10%
Sludge from electrocoagulation (reused in the cement industry)	8%	6%
Electronic waste	2%	2%
Batteries	0%	0%
Other	9%	10%



NON-HAZARDOUS WASTE AND RECYCLING OR OTHER FORMS OF WASTE TREATMENT (EXCLUDING EFFLUENTS)		
	2020	2021
Metal	30.2%	37%
Glass and plastic	11%	2%
Paper and cardboard	54%	20%
Construction waste	3%	5%
Wood	8%	34%
Expanded polystyrene (EPS)	0.3%	0.4%
Kitchen waste	2%	2%

## 4.4 Water management

With more and more parts of the world – including Europe – facing water stress as a result of global warming, responsible water management is now an absolute priority. The clean rooms at imec consume a large amount of water. Significant progress has been made in city water consumption, water recovery, and wastewater reuse, all of which remain important goals for imec.

As well as limiting wastewater flows, imec plans on proactively investing in reducing the need for highly purified water, for which it currently uses city water as a source. Imec began recycling wastewater in 2018, investing €300,000. A pilot facility was built to find the best solution for wastewater reuse. Subsequently, a new filter plant was commissioned and taken into use to finalize the water management plan.

As a result of the efforts made, imec managed to grow the organization, along with its output, without increasing the amount of city water required. In 2020, an initiative was launched to find out what it would take to drastically reduce the amount of city water being used (-50%). Since then, a roadmap has been drawn up, and the first pilot facilities will be built in 2022. The impact of these initiatives is expected from 2023-2024 onward.



			2018	2021	evolutie
<b>Total water consumption</b>	Total usage of external water (city water)	m <sup>3</sup>	746.622	748.766	▲
<b>Water discharge</b>	Total discharge into surface water	m <sup>3</sup>	614.640	610.410	
	Total water discharge (sewage)	m <sup>3</sup>	18.767	14.461	
	Total water discharge (external treatment, including effluents)	m <sup>3</sup>	1.321	1.711	
	Total water discharger	m <sup>3</sup>	634.726	626.582	▼
<b>Evaporation</b>	Evaporation	m <sup>3</sup>	134.190	114.523	▼

Figure 15 | Overview of imec's water consumption and discharge in 2021 at the main discharge sites of Leuven and Genk

Currently, at its Belgian sites with the highest water consumption, imec consumes approximately 2,000 m<sup>3</sup> of water per day for its operations, equivalent to 748,722 m<sup>3</sup> of city water per year.

In 2021, more than 219,331 m<sup>3</sup> of wastewater was reused, equivalent to 600 m<sup>3</sup> per day. This reduces the need for city water. In 2018, imec used approximately 800,000 m<sup>3</sup> of city water, compared to 748,722 m<sup>3</sup> in 2021, and 746,622 m<sup>3</sup> in 2020. Therefore, in 2021, more than 50,000 m<sup>3</sup> of city water was saved.

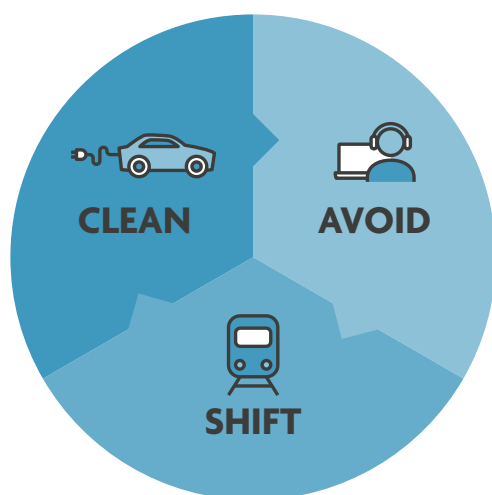
Given that water consumption is one of the main concerns within the clean rooms, ambitious targets were set in this area. In 2021, imec explored the possibility of further increasing water reuse in the long term. The initial results of the study point to a potential 50% reduction in the need for city water. Imec will continue to develop concrete action plans to achieve this reduction in 2022, in conjunction with a corresponding investment plan.



Alongside reducing wastewater flows, imec plans to proactively invest in the reduction of Highly Purified Water (HPW). To this end, imec conducted an analysis of clean room equipment that could be considered for a possible reduction in idle usage. Subsequently, in 2021, a few modifications were made to some devices, which could lead to an annual 73,400m<sup>3</sup> reduction in HPW consumption. This also contributes toward the goal of consuming less city water. In 2022, imec is continuing this research in the hope of making additional improvements.

## 4.5 Mobility

One impactful effect of the coronavirus pandemic is a changed view on mobility. Since mobility accounts for nearly a 10% share of current carbon emissions, any improvement and shift toward green mobility solutions would be a real step forward. As a research institution that contributes to knowledge and innovation in the field of mobility, it also goes without saying that we ourselves are working on new perspectives in this area. With the insights gained over this recent period, imec's existing mobility approach could be further explored with new campaigns and initiatives. Using the results of a mobility survey, imec was able to gain a better sense of employees' needs and expectations, thinking about win-win scenarios that would remove barriers toward achieving a behavioral shift.



### REDUCING: Reducing commuting in itself

Here, the connection to 'hybrid working' is obvious, which explains why imec wants to help facilitate this by providing tools and financial incentives. Even before the pandemic, around 10% of people worked from home an average of one day or more per week. The comprehensive 'Future of Work' program launched in September 2021 provided guidelines and tips related to team agreements and team management, along with healthy practices and technical support for those working from home.

#### Future of Work

Creating a framework for hybrid working, inspired by the vision centered around employee health and well-being. In 2021, an online store was opened where employees who regularly work from home could order ergonomic office equipment using a voucher. This initiative supports hybrid working, thereby avoiding a great deal of commuting.

### CHANGING MINDSET: More sustainable modes of transport for commuting for a reduced reliance on cars

Leaving the car behind and opting for a sustainable alternative, be it public transport or cycling, contributes to reducing our overall carbon emissions. The current successful bicycle leasing policy encourages employees to choose this sustainable option. Employees are also reimbursed for each bicycle ride to and from work. Today, around half of the employees on imec's payroll occasionally cycle to work.

	2020	2021
Number of bicycles ordered	247	366

#### The imec cycling app ('fietsapp')

In October 2021, imec launched an internally developed cycling app that allows cyclists to more accurately record their bike usage and mileage. In addition, a SSTNBLTY talk was organized around the theme 'Why (not) bike to work?', with imec also running a 'Week van de mobiliteit' ('Mobility Week') comprising a variety of initiatives:

- Additional info regarding the bicycle leasing program.
- Drawing attention to road safety.
- Launching a competition to plant a forest together with Natuurpunt.
- A small gift was provided to employees who chose to use a sustainable mode of transport on September 16 (car-free day)].

## MAKING THINGS CLEANER: Reducing emissions from vehicle commuting

In 2020, imec launched a new car policy that provides an additional budget for employees opting for a more environmentally friendly car. Imec has also invested in charging point infrastructure for electric cars in recent years. At the end of 2021, imec had 478 cars in its fleet, of which 33% were more environmentally friendly vehicles (hybrid, plug-in hybrid, and electric), up from 17% in 2020. The average emissions of imec's fleet were measured at 96 g CO<sub>2</sub> per km. In 2021, 86% of the cars ordered were green alternatives, averaging 36 g of CO<sub>2</sub> per km.

CARS IN OPERATION				
	2020		2021	
Diesel	250	55%	205	43%
Gasoline	127	28%	116	24%
Gas	1	0%	1	<0%
<b>(Plug-in) hybrid</b>	<b>70</b>	<b>15%</b>	<b>134</b>	<b>28%</b>
<b>Electric</b>	<b>5</b>	<b>1%</b>	<b>22</b>	<b>5%</b>
TOTAL	453		478	
Average CO <sub>2</sub> emissions per km	111g		96g	

Where imec stands in relation to the ambitions set out for 2023:

- Average fleet CO<sub>2</sub> emissions (g/km) – target max. 100 g => 2021: 96g
- 50% greener cars in fleet – target 50% => 2021: 33%

In 2022, imec plans a number of initiatives that will further promote making the switch to greener cars. For example, it is rolling out a pilot project on the provision of vacation rentals as a temporary replacement for fully electric cars, and further efforts are being made to raise awareness and provide information on the range of cars available according to both budget and charging options.

## Travel policy

As imec is an outward-looking international organization, its employees were very frequent travelers before the pandemic. In light of this, the travel policy has been thoroughly reviewed in order to reduce the impact of business travel. The new policy provides firm guidelines for travel within the EU, as well as clear advice for international travel. For destinations that are 5 to 7 hours by train from Brussels (for employees in Belgian offices), flying is discouraged (with a few exceptions), with alternative transportation options such as train, bus, or carpooling being recommended.

A travel request uses four criteria to assess the need for travel: Does the travel plan cover more than one meeting or business activity? Are these external meetings with partners outside of imec? Does it involve activities that cannot be done virtually, by tele- or videoconferencing? Has the required minimum number of employees to participate in the activity been verified? As certain circumstances dictate that flying is the only option, a CO<sub>2</sub> compensation scheme has also been introduced.

Also in 2021, the CO<sub>2</sub> impact of business travel was further reduced due to the pandemic travel restrictions. Once business travel starts returning close to previous levels, there will be a renewed focus on proper implementation of the travel policy.





## 4.6 Biodiversity

Humans are consuming more food, energy, and raw materials than ever before. This results in an imbalance in the use of natural resources. Imec also feels a sense of responsibility for nature conservation and biodiversity. As a general rule, imec strives to avoid any contamination of the local environment, whether with liquid or exhaust emissions. Liquids are collected locally, and then treated internally or externally, before being released into a nearby river or sewer. Exhaust emissions are treated by purification systems before being released into the air.

Imec has also entered into an agreement with Natuurpunt, signing their ByeByeGrass charter. With this, imec has committed itself to promoting biodiversity on its own sites, with tailored advice from experts.

### Working with Natuurpunt

Thanks to imec's financial support, in 2020 Natuurpunt was able to purchase 3 hectares of land in the Molenbeek Valley (near Leuven) to create a new nature reserve: the Dalemhof. While the Dalemhof meadowlands have not been used for quite some time, they are well preserved and have great potential for nature restoration. The same is true for the entire Molenbeek Valley: it is a complex of nature reserves that strengthen one another. Since 2020, Natuurpunt has worked on developing the rich biodiversity, which in turn can contribute toward offsetting climate change.

Imec also plans to involve its employees in nature conservation and guided nature walks. Such initiatives help imec increase biodiversity awareness among its employees and create a broader and stronger support base for conservation and biodiversity. In the fall of 2021, several activities were organized in the nature reserve, with imec employees participating in the maintenance and improvement of the site.



### ByeByeGrass charter

Imec, along with other Leuven-based businesses and organizations, signed the City of Leuven and Leuven 2030 ByeByeGrass charter, thereby committing themselves to promoting biodiversity on their sites. This will be done with the help of tailored expert advice.



# 5. Commitment to good governance

## 5.1 Good governance

Imec's policy on good governance is reflected in its Good Governance Charter. This charter describes the principles of good governance according to imec and the monitoring thereof. For example, imec has an Audit Committee, and Appointment & Remuneration Committee as part of its governance structure. Potential conflicts of interest are avoided by carefully monitoring the deliberations in the respective management boards. The boards of directors of all imec entities conscientiously adhere to and monitor compliance with the guidelines and generally accepted principles within this framework.

Like any other organization, imec is exposed to various internal and external risks that, if they occur, can mean serious consequences for its stakeholders, operations, environment, and financial situation. Managing these risks is therefore extremely important, and is monitored by an Enterprise Risk Officer who reports directly to the Chairman of the Audit Committee. Additionally, imec has implemented a cohesive Enterprise Risk Management approach, which led to the establishment of a risk register in 2019. In the past year, this register has been supplemented by specific risk and control frameworks, including environmental and social risks.

## 5.2 Ethics

With its research and related efforts, imec is aiming for the long-term prospect of a better life in a better society. An ethics policy on fraud, corruption, bribery, and conflicts of interest is therefore a requirement. In 2021, we published our updated Ethics Code of Conduct. This code of conduct is a guide that helps us handle ethical dilemmas and determines what action should be taken in problem situations. To ensure compliance, imec set up an Ethics Committee, which was invaluable in providing advice on certain specific cases in 2021.

Besides an internal code of ethics, imec also has a Code of Conduct for imec partners, which was also updated in 2021. Imec believes that mutual respect for this code of conduct is a guarantee of reliable, fruitful, sustainable, and professional cooperation with partners such as suppliers, research bodies, and clients.

In addition, imec uses specific contractual clauses related to contract management, privacy and data protection, information security, animal welfare and biosafety, export controls, etc. Partners and potential partners (employees, customers, and

suppliers) are systematically screened for compliance with export regulations, using a global list of more than 350 restricted persons, embargoed countries, and businesses owned by these prohibited entities. Furthermore, imec uses an external tool for identifying risks of fraud and corruption. Last year, the whistleblowing procedure was fine-tuned.

Additionally, last year also saw new training courses being organized to make imec employees more aware of its ethical values. For example, how aware are employees that ethics are part of imec's research, or that you always start from a position of bias? Plus, how do you undertake a conversation about ethics? Such pertinent questions are answered with the help of relevant experts.

## 5.3 Scientific integrity

Scientific integrity is an essential element of imec's organizational culture. For its policy on the promotion of good research practices, imec uses the codes of conduct set out at the Belgian ([www.belspo.be](http://www.belspo.be)) and European ([www.allea.org](http://www.allea.org)) levels as frames of reference. Imec's Scientific Integrity Committee addresses potential violations, such as plagiarism and data falsification or manipulation. An internal Research Integrity Officer is responsible for monitoring this integrity policy. Imec is also a member of the Flemish Committee for Scientific Integrity (VCWI). The entire imec group maintains a transparent internal and external communication policy, both from a management perspective and from an operational and logistical perspective, with attention given to the timing, serenity, and objectivity of the communication.

## 5.4 A sustainable procurement policy

Imec's Procurement Department also places importance on the principles of good governance and sustainability. Every supplier must adhere to the Code of Conduct for imec partners when signing a contract. Sustainability was further integrated into the procurement process in 2021.

New suppliers are now comprehensively screened using a pillar system that evaluates them based on quality, necessity, budget, impact, and complexity. Depending on which category they belong to, they have to complete a 'risk-based' questionnaire gauging their ESG sustainability performance. Do they have their own environmental management system in place? Do they have a policy on respect for human rights within the supply chain? Are they transparent with regards to their subcontractors? The assessment of these and other questions is considered in the process of choosing a final supplier. Once a contract is in place, the suppliers undergo a reevaluation on a yearly basis. This also looks at whether they are actually living up to their sustainability claims.

Furthermore, the Procurement Department set a target of making 40% of its purchases from within the local ecosystem – a target that was met in 2021. The idea behind this target is for imec to contribute toward the sustainable economic growth of the communities in which it is active.

Imec is also engaged in circular procurement. New forklifts were procured through leasing. With this approach, there are no downsides: it means less maintenance, fewer technicians required, less fuel consumption, etc. The forklift batteries are charged using green energy. And at the end of the leasing period, the leasing partner refurbishes the forklifts and sells them on the second-hand market.

The leasing of ICT equipment for imec employees is completely carbon neutral. We make an impact through our servers and laptops, which receive a digital cleanup after four years and are then offered second-hand.

Over the past year, most of our procurers attended a training course on sustainable procurement, giving them a chance to get inspired and come up with new ideas. This has helped to install a culture of innovation, shifting toward a more sustainable, yet more consolidated, procurement approach. The Procurement

Department wants to be an ambassador for sustainability, engaging both internal stakeholders and suppliers in creating a positive story. After all, the department would rather be a profit center than a cost center. Conveying imec's strength and impact: that's what it's about.

“As a Procurement Department, we want to act as an ambassador for sustainability, thereby evolving from a cost center to a profit center.”

Wouter Machiels, Procurement director

## 5.5 Information Security

For imec, R&D data and more generic data are considered crucial assets. They are extremely valuable and must therefore be well protected against an ever-increasing number of risks. This entails information security and the correct application of all relevant legislation. Imec protects its information through an appropriate set of technical control measures, as well as through non-technical measures such as policies, processes, procedures, and guidelines (e.g., sending out phishing emails to test whether employees are handling them correctly).

Expanding an efficient and effective Information Security Management Framework (ISMF) involves understanding and influencing human behavior, including attitudes, and implementing the required controls in terms of contracts, organization, processes, and techniques. Imec uses a structured and documented ISMF to improve its information security, together with risk management and control, all based on industry best practices such as ISO 27001, and the Cyber Security Framework (CSF), and from the Center for Internet Security (CIS). This Information Security Management Framework applies to all imec entities, with the organization providing any required education and training to ensure that all employees are familiar with, understand, and comply with information security policies.

In addition to information and data security, privacy protection is also an important pillar. To that end, imec complies with all applicable privacy laws, including GDPR. Imec has appointed a Data Protection Officer (DPO), and has implemented all the necessary policies and procedures.

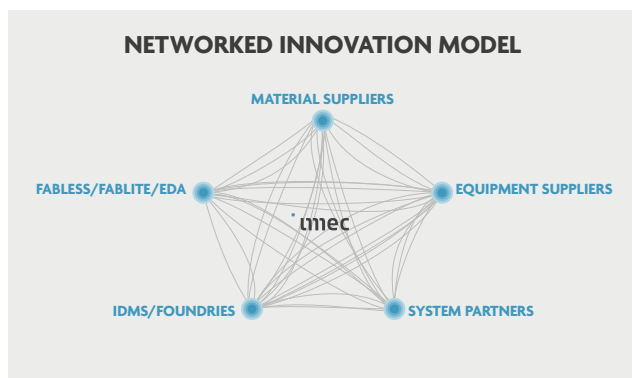


## 6. Sustainable partnerships



*Despite the current geopolitical context, imec is convinced that conducting joint research and collaboration with businesses, organizations, and governments, both on international and regional levels, can yield groundbreaking results in contributing toward sustainable development. No organization can address the challenges facing the world today by themselves. In other words, we have to join forces.*

Imec's R&D programs gather all the key players from the global semiconductor industry: leading equipment and materials suppliers, integrated device manufacturers (IDMs), chip manufacturing plants, fabless and fab-lite companies, application partners, and leading academic institutions and knowledge centers for groundbreaking R&D developments. By bringing these top players together, imec is changing its innovation model from a sequential model – transferring innovation from one link of the value chain to another – to a network-based model. It all starts from system-level requirements and tries to identify how innovative processes and materials should be developed.

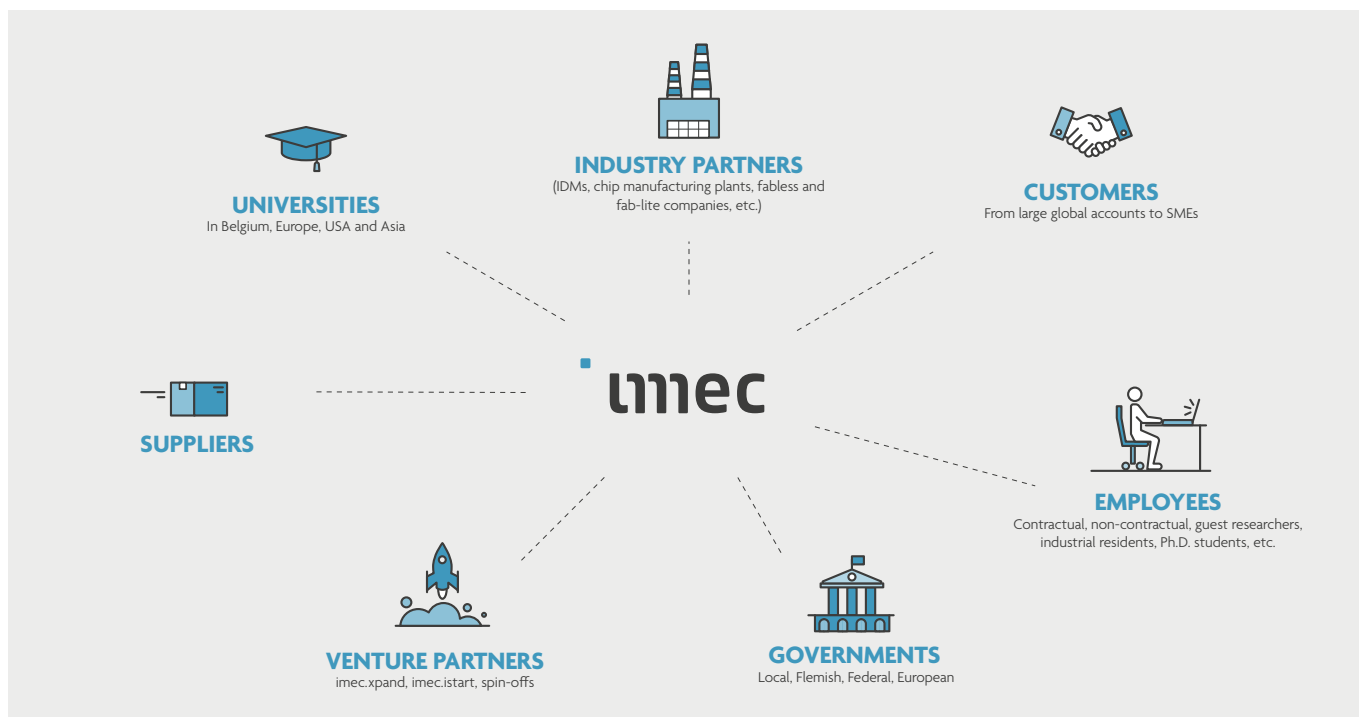


Imec has created a unique partnership model, providing a neutral environment to develop and test the entire chip manufacturing process. Over more than 30 years, imec has built a relationship of trust with a variety of players. In a way, it is very much the Switzerland of the chip sector – the neutral but crucial link in the process of research and development.

**“In a way, imec is very much the Switzerland of the chip sector – the neutral but crucial link in the process of research and development.”**

imec's CEO Luc Van den hove talked up the institute's role as mediator, describing it as the 'Switzerland of semiconductors'. Politico Cyber Insights, July 7, 2021

Imec works with over 200 universities around the world. These academic partnerships fuel its long-term pipeline, while also creating a fundamental understanding of its research. With its R&D test line, imec transforms academic innovations into industrial innovations. This is made possible by the significant proportion of leading equipment and material suppliers that are part of imec's supplier hub. Together, they develop new concepts, as well as industry-leading technology platforms. These platforms help provide support to numerous startups, many of which would otherwise not have access to such top-level technology.



## The Flemish ecosystem

Since its inception in 1984, imec has been supported by the Flemish government, making it possible to conduct long-term research. In 2021, imec concluded a new management agreement with the Flemish Region. Imec is part of the Flemish innovation ecosystem, working with key organizations so that technology and know-how are transferred to industry and non-profit organizations, thereby enhancing its overall impact.



## Solidarity

Guided by the UN SDGs' slogan "Leaving no one behind", imec believes it is important to focus on engagement and solidarity, both in local communities as well as globally. Over the years, as well as being prompted by current events, examples of this can be observed in imec's structural collaborations.

- In collaboration with Brightlab, efforts have been made to provide opportunities for young people, inspiring them to pursue STEM studies through new education packages linked to the UN SDGs. In addition, EDUboxes covering the pandemic and the circular economy were created, and pilot STEM projects were launched with schools (e.g., 'Yes, We Make it'), youth movements, and so on. More info at <https://www.brightlab.be>
- At the beginning of 2021, imec challenged its employees to become more physically active, by raising money based on the number of participants (nearly 900) and the number of active hours. This encouraged imec employees to adopt a more active lifestyle, which was then coupled with supporting cancer research via a donation to Levensloop.
- Imec employees provide structural support for various projects, including the 'Empowering Girls Through Education' project in Kenya, Knitting for Alzheimer's, and an annual donation via the Sinterklaas Fund to organizations where imec employees work as volunteers.
- By promoting imec's online card shop sending New Year's wishes to imec partners, donations were secured for the Warmest Week.
- Imec ran a solidarity campaign for those affected by the Belgian floods of summer 2021.
- In addition, imec staff organized a solidarity campaign (via Indian NGOs) for people in India directly or indirectly affected by COVID-19.

### Empowering Girls Through Education

"[...] I hope this letter reaches you well. I would like to take this opportunity to thank you for your support and for your concern about my study. It has been a great experience and a privilege to be among the "Empowering Girls through education" of our friends at imec, with special thanks to them for their support until the completion of my high school studies. [...] Words cannot express how grateful I am and I hope you will continue to support me in the next degree of my studies [...]" Gitura Eliza



© Lieve Blancquaert



# 7. About this sustainability report

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

*In many ways, 2021 was a remarkable year. Not only did we have the pandemic, which forced everyone to respond in a very flexible and human way, rethink priorities, and act accordingly, but it was also a year in which imec managed to finalize its business plan for the next five years, which was validated by the Flemish Government. This was the perfect opportunity for imec to fully establish its purpose – to embrace a better life – and to integrate it into its long-term strategy, both from the outset and by design.*

## Reporting

**Publication date:** 28 July 2022

**Reporting period:** January 1, 2021 - December 31, 2021, also corresponding to the fiscal year for all entities in the imec group. The sustainability report can also be accessed online at [www.imec-int.com/en/sustainability](http://www.imec-int.com/en/sustainability)

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. This report has been prepared according to the GRI standards (core option). The GRI content index can be found on pages 50-53. The scope of the KPIs and omissions are explained in the relevant chapter. The structure and content of the report are based on imec's sustainability policy and material topics. The management approach is included in the headings for each material topic.

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

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## Disclaimer

The information and materials contained in this report are provided "as is" without any express 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.

## Production

**Storyline & copy:** imec & Studio D  
**Management approach and data collection:** imec  
**Design:** imec

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## 8. GRI-index

GRI STANDARDS	DISCLOSURE	PAGE NUMBER IN SUSTAINABILITY REPORT 2021	OMISSION
<b>GRI 102: GENERAL DISCLOSURES 2016</b>			
Organisational profile			
102-1	Name of the organization	p. 4	
102-2	Activities, brands, products, and services	p. 3; p. 4-7	
102-3	Location of headquarters	p. 4	
102-4	Location of operations	p. 4	
102-5	Ownership and legal form	p. 4	
102-6	Markets served	p. 4-5; p. 50-51	
102-7	Scale of the organization	p. 4	
102-8	Information on employees and other workers	p. 28-29	
102-9	Supply chain	p. 6-7; p. 50-51	
102-10	Significant changes to the organization and its supply chain	Not applicable	
102-11	Precautionary principle or approach	p. 33-35; p. 41-44	
102-12	External initiatives	p. 8-10; p. 52	
102-13	Membership of associations	p. 50-51	
Strategy			
102-14	Statement from senior decision-maker	p. 3	
Ethics and integrity			
102-16	Values, principles, standards and norms of behavior	p. 8-9; p. 27-29; p. 48-49	
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102-18	Governance structure	p. 4; p. 48	
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102-40	List of stakeholder groups	p. 50-51	
102-41	Collective bargaining agreements	p. 24-26	
102-42	Identifying and selecting stakeholders	p. 8-9; p. 50-51	
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103-46	Defining report content and topic boundaries	p. 8-9; p. 53	
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103-49	Changes in reporting	Not applicable	
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## MATERIAL TOPICS: MANAGEMENT APPROACH 2016 AND GRI TOPIC SPECIFIC DISCLOSURES

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IMEC 1 - NO GRI DISCLOSURE	Imec program description & outlook	p. 11-12	

### From curative to preventive healthcare technologies

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IMEC 2 - NO GRI DISCLOSURE	Imec program description & outlook	p. 13-14	

### Energy solutions for a carbon-neutral society

GRI 103-1 GRI 103-2, GRI 103-3	Management approach	p. 15	
IMEC 3 - NO GRI DISCLOSURE	Imec program description & outlook	p. 15-16	

### Enabling the digital transformation of education

GRI 103-1 GRI 103-2, GRI 103-3	Management approach	p. 17	
IMEC 4 - NO GRI DISCLOSURE	Imec program description & outlook	p. 17-18	

### Smart cities and smart mobility to improve quality of life

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### Venturing to support sustainable innovation

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### Guiding companies and organizations through digital transformation

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### Innovative technologies for more responsible production

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GRI 418 CUSTOMER PRIVACY 2016			
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GRI 418-1	Substantiated complaints concerning breaches of customer privacy and losses of customer data	p. 49	No substantiated complaints to be reported
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