

**SUS
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REPORT
2020**

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Statement of our CEO

'As a world leader in nanoelectronics and digital technology, we aspire the impossible and aim for disruptive innovation. Our goal is to maximize social impact by creating smart, sustainable solutions that enhance the quality of people's lives. At imec, we shape the future.'

Innovation is one of the main pillars to address the challenges facing our society, governments and businesses. It is also one of the main approaches to achieve a better world. But truly innovative solutions are not made in a day, and, neither do they spring from one expertise or technology. They appear at the end of a long process of smart questioning, combining expertise in a broad range of domains, and realizing scientific and technical breakthroughs.

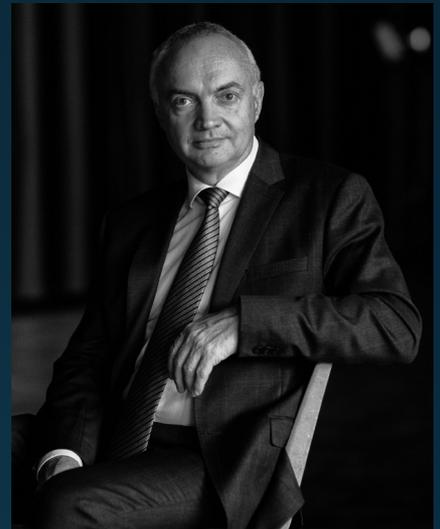
In the 40 years since it was founded, imec always aimed at realizing these breakthrough technologies. Almost every computer chip today, for example, has technology that originates from imec's R&D. In addition, imec has always expanded its expertise into application-oriented research in a broad range of domains, as well as its network of partners.

Today, we are at the dawn of the 5th disruptive innovation wave. The first four waves (the industrialization, technology, electronics and digital waves) have radically transformed our world in ways that each of us can recognise. Those waves build upon each other, rather than replacing each other. The emerging fifth wave, the deeptech wave that builds on a convergence of different technologies and expertise such as electronics, artificial intelligence, molecular engineering, nanotechnologies etc. has the potential to drastically transform the world we live in.

Imec is a global player in deeptech R&D, leveraging its expertise to innovate in areas such as healthcare, food and agriculture, sustainable energy, mobility, logistics, ICT...

With this background, we are optimistic about the future. In a world where the digital is deeply rooted into the society, we want to be the driving force of change. Together with our partners, locally and globally, companies, governments, academia and research organizations, we are working on the next wave of innovations that will help us all to embrace a better, more sustainable life.

In this first comprehensive sustainability report, imec aims to provide an insight into the sustainability efforts of the organisation. We highlight the initiatives in our core activities that contribute to a positive impact on people and the environment as well as on the day-to-day operations within our organization.



Luc Van den hove
President & CEO imec

1. Imec, a catalyst for sustainable growth

1.1 At imec, we shape the future

Imec is a world-leading research and innovation center in nanoelectronics and digital technologies. The combination of our widely acclaimed leadership in microchip technology and profound software and ICT expertise is what makes us unique. By leveraging our world-class infrastructure and local and global ecosystem of partners across a multitude of industries, we create groundbreaking innovation in application domains such as healthcare, smart cities and mobility, logistics and manufacturing, energy, education, ...

As a trusted partner for companies, start-ups and universities, we bring together more than 4500, brilliant minds from almost 100 nationalities. Imec is headquartered in Leuven, Belgium and has distributed R&D groups at a number of Flemish universities, in the Netherlands, Taiwan and the USA, and offices in China, India and Japan. In 2020, imec's revenue totaled 680 million euro.

Imec is an independent research organization, established in 1984. It is one of four Strategic Research Centers recognized and supported by the Flemish government. With 161 patent applications in 2020, imec is Belgium's number two in the list of the European Patent Office (EPO) and amongst the leading research organizations in its domains in Europe. With a portfolio of active participation in 184 EU-funded projects, it is safe to say imec's activities are in line with – and recognized by – the EU policies and strategic priorities.

Globally, imec is partnering with over 800 companies and over 200 universities each year. As a result, imec is amongst the top contributors to globally leading conferences and peer-reviewed publications in its domains. In 2020, 161 new patent applications were submitted and up to 1,866 scientific papers were published

by imec researchers in leading journals such as Nature (14) and at leading scientific conferences such as IEDM (27), VLSI (17) and ISSCC (5). Many of these papers were co-authored by one or more leading academic or industrial partners in the field of semiconductor and digital innovations. In the course of the past years, imec created no less than 21 spin-offs. Since its launch in 2011, imec's business accelerator program imec.istart has helped more than 220 tech start-ups and spin-offs in a broad range of domains to become sustainable enterprises. In 2020, 27 new start-ups were selected for the imec.istart accelerator program.

Imec is a registered trademark for the activities of IMEC International (a legal entity set up under Belgian law as a "stichting van openbaar nut"), imec Belgium (IMEC vzw supported by the Government of Flanders), imec the Netherlands (Stichting IMEC Nederland, part of Holst Centre and 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).

This link is legally realized, among other things, through the approval of the IMEC Group Modus Operandi, issued by the board of directors of imec International and subsequently accepted at the level of the entities (with the exception of the subsidiaries of IMEC vzw). The IMEC Group Modus Operandi determines that imec International is the controlling legal entity of the imec group and that all the aforementioned entities will adhere to the corporate guidelines issued by imec International regarding business development, finance, human resources and operations, of course with respect for their own autonomy of each entity belonging to imec group.



Figure 1 | Overview of imec international locations and activities

Vision and mission statement

“As a world-leading R&D center in nanoelectronics & digital technology, we aspire the impossible and aim for disruptive innovation. We maximize societal impact by creating smart, sustainable solutions that enhance quality of life. At imec, we shape the future.”

“As a trusted partner for companies, start-ups and academia we bring together brilliant minds from all over the world in a creative and stimulating environment. By leveraging our world-class infrastructure and local and global ecosystem of diverse partners across a multitude of industries, we accelerate progress towards a connected, sustainable future.”

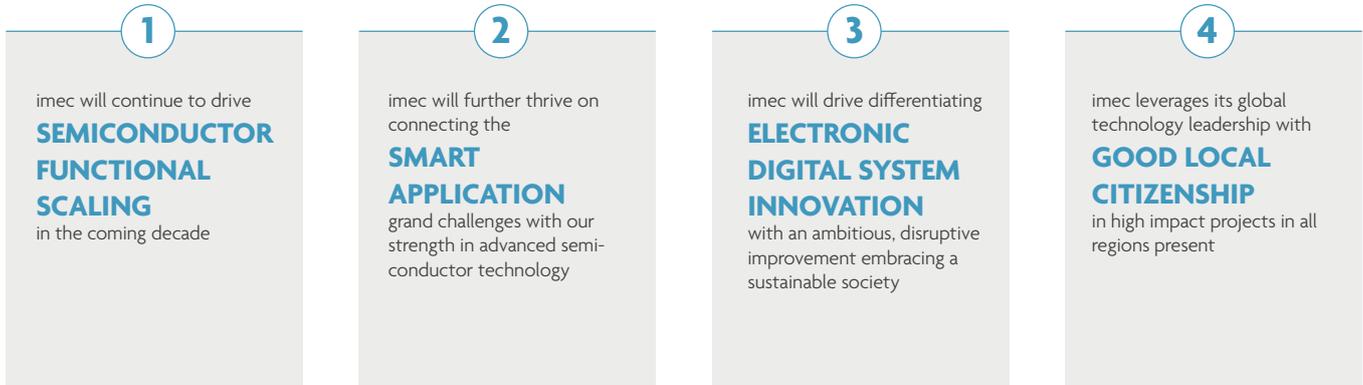
Imec’s vision and mission statement determine all imec’s activities. From the relentless functional scaling of semiconductor technology, over disruptive sensing modalities to next-generation sequencing and a wide portfolio of other digital activities: all is driven by the desire to have a positive impact, contributing to a better life in a sustainable society based on breakthrough innovations developed at imec.

This leads to imec’s driving principles:

- Perform groundbreaking research in the domain of nanoelectronics and digital technologies contributing to the building blocks of a better life in a sustainable society.
- Bring disruptive innovation to market through partnerships and spin-offs, facilitating access to technology for companies and academia.

Strategic pillars

The imec vision & mission statement is put into action by four main pillars that drive imec's corporate strategy



Value chain – services and products

Industry-relevant innovation with a balanced research portfolio

Imec stands out through its unique value proposition of having a fundamental, multidisciplinary understanding of different technology layers and its ability to bridge these innovative concepts to an industrial validation. The latter is enabled by its lab to fab strategy and world-class research infrastructure.

Imec's offering caters the technology challenges in a wide and dynamic industry global landscape while aligning with specific points of focus in the policy goals of the governments we're working with.

As detailed in Figure 2, imec leverages its microchip technology in various technology platforms, which in turn cover a multitude of system platforms that enable smart solutions for health, industry, mobility, cities, entertainment, energy, education and agrofood. This is the heart of imec's innovation management strategy.

An important goal in the coming years is to extend imec's research roadmaps in its core activities through system technology co-optimization (STCO). This will enable imec to focus its research on microchip technologies with high potential for disruptive innovations at the system level, and to deepen its relations with leading system companies to further supplement imec's ecosystem. By expanding its chip technology with elements such as sensors and actuators, network components and artificial intelligence, imec enables disruptive integrated systems that address the world's crucial challenges. For example: affordable, compact systems that enable decentralized healthcare (such as portable DNA sequencers), technology for converting renewable energy into valuable molecules (such as hydrogen), and indoor localization systems that are important drivers for smart factories where humans and AI robots work together.

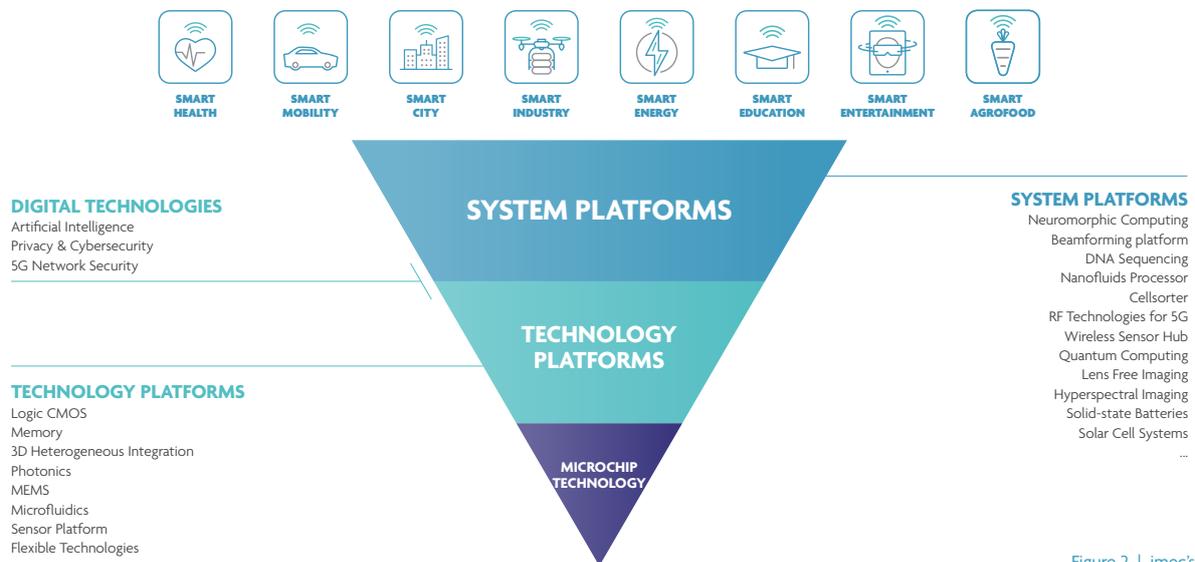


Figure 2 | imec's value chain

Business models

Imec is known for its technological innovation. From the very beginning however, this is combined with business-model innovations to support imec's continued growth.

In the early 1990s, collaboration with large companies, often global players, started in a business model in which research costs and results were shared between the partners. Over the years, more and more bilateral collaborations were set up. Meanwhile, imec has become the R&D hub of the electronics world, with hundreds of collaborations covering the entire value chain of the electronics world. All the major global players from the chip industry come to Leuven to perform research and development on technologies of the future.

With this growing expertise and broad collaborations, imec was able to leverage its nanotechnology expertise in more and more other domains. World breakthroughs were achieved, particularly in the field of healthcare and life sciences. But the R&D centre is also developing disruptive technologies that enable sustainable innovation in areas such as renewable energy, low power communication, agrofood, smart mobility, ...

Today, collaborations are vital to what we do. Industry, research center and academia can work together with us in many ways: R&D collaborations, development services and support for startups.

Imec unites world-industry leaders across the semiconductor value chain, national and international companies, start-ups, and academia and knowledge centres, for R&D in nano-electronics and digital technologies, including advanced semiconductor scaling, silicon photonics, smart health, smart energy, smart mobility and smart cities solutions, artificial intelligence, beyond 5G and sensing technologies.

Next to its R&D offering, imec also leverages its expertise and large international industry network to support smaller organizations that have limited in-house R&D resources as well as larger companies with their innovation process from initial idea to fully functioning product, from the design of a product or chip, to prototyping, testing and optimizing, and manufacturing.

Finally, imec supports tech start-ups and scale-ups with a tailored offering. Imec.xpand, an independently managed value-add venture capital fund, supports deeptech start-ups in which imec's technology, expertise, network and infrastructure play a differentiating role. The imec.start program is a business acceleration program that provides tech entrepreneurs with specialized coaching, facilities and overall support to help them grow their businesses, while the imec.scale-ups program focuses on larger innovative tech scale-ups looking to conquer the European market.

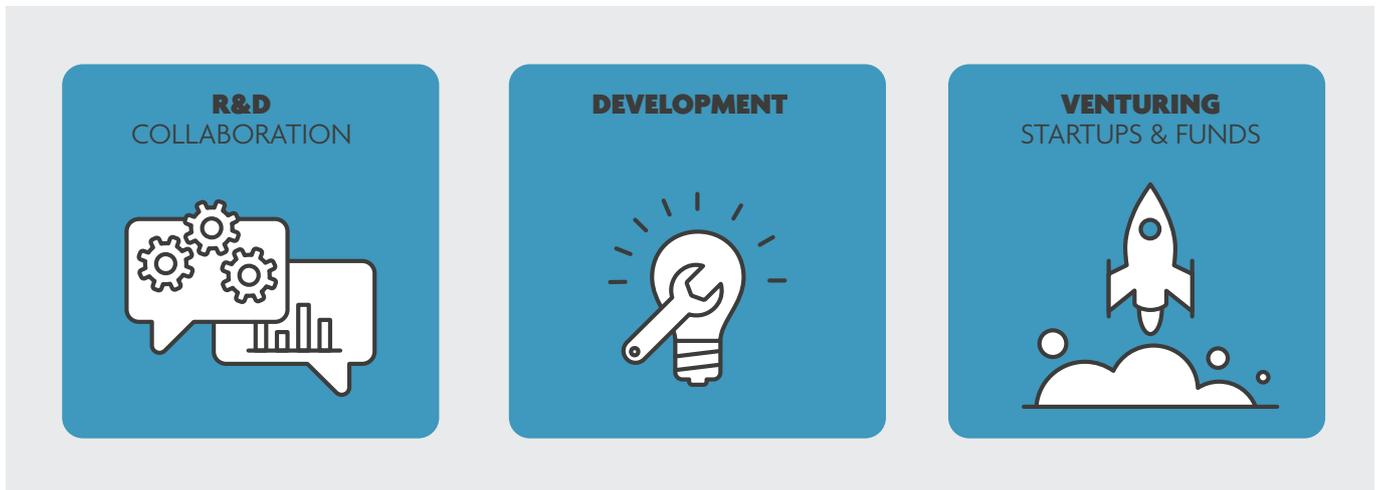


Figure 3 | imec's business models cater to the demands of the industry and ensure a fluent transition from imec R&D into their impactful products and services

1.2 Our values and the UN SDGs as guides for our long-term strategy

Striving for sustainable development for current and future generations should be at the heart of any organization. Imec therefore wants to inspire other companies and organizations within our ecosystem. Imec maximizes the social relevance through sustainable solutions that improve the quality of life. In this way impact is created. The imec tagline “Embracing a better life” is not just randomly chosen, but reflects imec’s long-term vision for the pursuit of a sustainable world through technology and innovation and is in line with our values. This set of imec values function as a guideline for ethical conduct, business and respect when working for imec.

- 1** WE GUARANTEE **INTEGRITY** IN EVERY ASPECT OF OUR RESEARCH.

RESEARCH INTEGRITY’ IS ESSENTIAL FOR A RELIABLE AND PROFESSIONAL RESEARCH CENTER.
- 2** WE STRIVE AT ALL TIMES TO **CREATE OUTSTANDING VALUE** FOR OUR PARTNERS.

DELIVERING ‘OUTSTANDING VALUE FOR OUR PARTNERS’ IS CERTAINLY A CENTRAL THEME, BUT IN NO WAY DOES IT DETRACT FROM OUR FIRST COMMITMENT.
- 3** WE SUBSCRIBE TO **COMMITMENT** TO EACH OTHER AND TO THE ORGANIZATION.

‘INVOLVEMENT WITH EACH OTHER’ INDICATES HOW WE DEAL WITH ONE ANOTHER AND WITH IMEC RESOURCES
- 4** WE ARE COMMITTED TO ACHIEVING **SOCIETAL RESPONSIBILITY** IN SUSTAINABLE ENTREPRENEURSHIP.

THE CONTRIBUTION THAT OUR RESEARCH MAKES TO ‘SOCIETAL RESPONSIBILITY’ IS SO IMPORTANT THAT A SEPARATE COMMITMENT HAS BEEN LINKED TO IT.

It is imec’s ambition to leverage its main activities, research and innovation to provide an answer to the many societal challenges that arise worldwide. Since no individual, organization, country or continent can handle this on its own, imec has therefore endorsed the UN Sustainable Development Goals (SDGs). A global framework in the long term and a commitment that encompasses all domains of sustainability and allowing one to use the same language and monitor progress.

Not only the urgency of these global societal problems, but also the increased demand from employees, candidate employees and partners clearly indicate that striving for a sustainable society is the only right way forward. These questions from our stakeholders help us to define and prioritize the elements in our sustainability approach and strategy, our ambitions and short-term actions.

Over the years, several teams within imec worked on a materiality exercise. In workshops, the employees determined the stakeholder groups, and defined a list of material topics. This exercise was updated in the course of 2021 and a broader exercise will be implemented in the near future.

The set of material topics that was determined can be split into the core activities of imec on the one hand, and the internal functioning of the organization and the external impact of these activities on people, society and the environment on the other hand.

“Sustainability is a key priority for imec, not just in our research activities but also in the way we execute and manage our operations.”

- 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

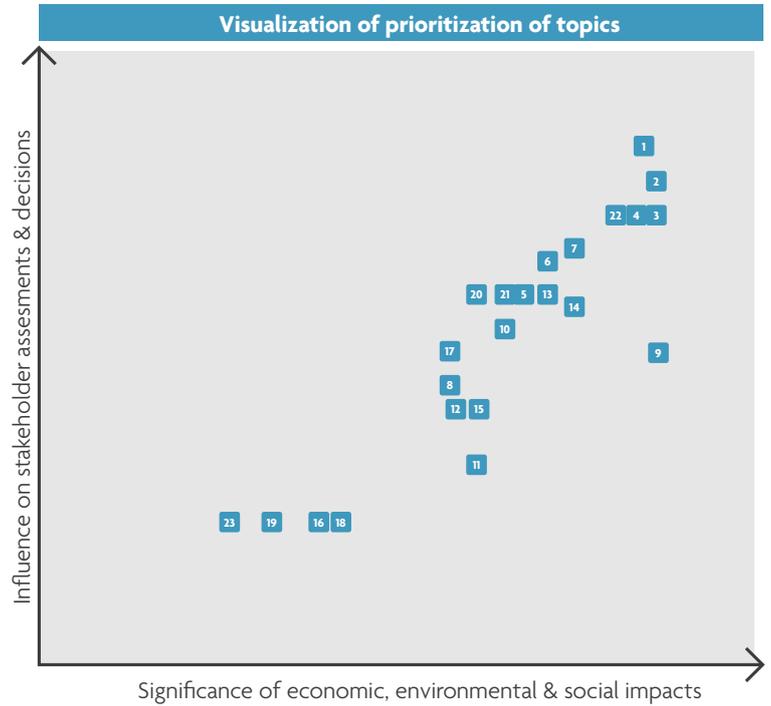


Figure 4 | imec materiality overview: material topics and priorities 2020

To make a difference, it is crucial to build the entire business strategy on sustainability. And that is exactly what imec is doing by embedding sustainability both in its research roadmap and in the way it runs its operations. In terms of research, it was decided to first focus on those areas in which imec can make the biggest difference. Imec wants to bring sustainability and social responsibility to the heart of its activities in one overarching sustainability strategy with clear focus and objectives, clear communication and new partnerships and projects, as a transition to a fully integrated sustainable strategy and business plan in the longer term.

Imec's sustainability approach is further structured in five main pillars that are linked to the United Nations Sustainable Development Goals (UNSDGs). Imec prioritizes 8 out of 17 UNSDGs, but also works on actions concerning the other UNSDGs. The five main pillars are the steering principles that help in making decisions, selecting priorities and defining actions. To each pillar, imec links the material topics and defined clear policies, qualitative or quantitative ambitions, and a short-term action plan.

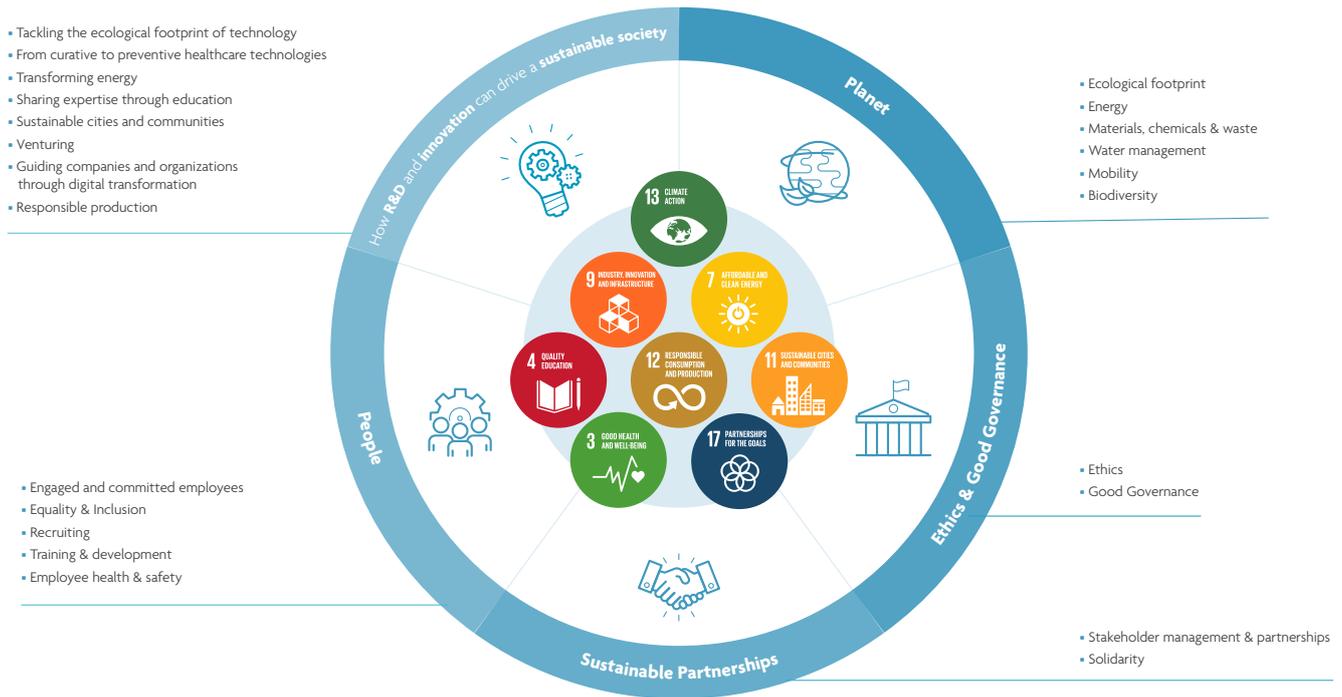


Figure 5 | Imec sustainability policy overview

By setting clear objectives and by monitoring results and progress on a yearly basis, imec can define clear actions. This information is published in a dashboard, an important instrument to drive and monitor the sustainability actions and to communicate with employees. Imec defined medium and long-term objectives associated with the SDGs. These are evaluated on an annual basis and adjusted if necessary. Subsequent to this evaluation exercise, annual action plans are drawn to achieve the objectives. In this monitoring flow, imec also subscribed the ‘Voka Charter Sustainable Entrepreneurship’ in 2019. The process runs over three years and sets the intention to cover all 17 SDG’s.

The focus on sustainability throughout all imec’s activities is essential and requires an integrated approach. In 2020, this was formalized by introducing a sustainability steerco. This board consists of representatives from R&D, operations, communications, HR (including EHS), Procurement and Brightlab. It convenes monthly, monitors the integration of the sustainability objectives into imec’s core activities, analyses the results in terms of sustainability and determines relevant internal and external communication activities. Decisions taken during the steerco are implemented and executed by the respective team members from the various departments.

Creating broad support is an important requirement to achieve the objectives. Without a supported vision and a good understanding of what the objectives entail on program and individual level, the big steps to be taken to achieve a broad transformation are not achievable. That is why imec’s head of sustainability organized 8 SSTNBLTY talks in 2020. These monthly digital sessions highlighted both the broader sustainability framework as well as specific topics from the research or other activities such as energy, water use, diversity and non-discrimination, etc. External speakers were also regularly invited to provide the broader perspective and external inspiration. In addition to these inspiring sessions, the team is also working on the creation of a sustainability community, aiming to inspire, motivate and engage imec employees.

1.3 Some 2020 highlights of our sustainability actions

Already early in 2020, the first indications emerged that 2020 would turn into a year of extraordinary challenges. Imec's innovations and research in the light of COVID-19 deserves an extra mention in the 2020 highlights, as they are a proof of imec's strong flexibility, partially switching its priorities in research activities due to pandemic:

- Imec leveraged its expertise in life sciences technologies to start developing a reliable fast and non-invasive SARS-CoV-2 test based on exhaled breath.

Minister of Innovation Hilde Crevits: "Imec's broad technological base also responds very agilely to societal challenges. The development of imec's breath test, for example, is a fine example of Flemish innovative research that no one has done before. It is not only of scientific importance, but also has a medical and social interest. Reliable self-testing is an important addition to the current vaccination campaign and will eventually allow us to ensure a quick response to the rise of virus mutations and new pandemics."

- Imec's smart education experts launched an online platform with freely available digital tools intended to support remote teaching in primary and secondary schools during the lockdown. The platform was launched in only two days. This quick reaction was possible thanks to the already ongoing i-Learn program, coordinated by imec.
- Imec's cyber security and big data experts supported the development of the Belgian Coronalert app. They provided knowledge and expertise to enable efficient data exchange while guaranteeing privacy for all subscribers.
- Also, imec supported Flemish start-ups in the development of wearables for social distancing in the workplace. These wearables guarantee privacy by measuring distance without storing data.
- Imec not only proved to be flexible in R&D and innovation, adapting its activities to the situation. It also did great efforts to enable its employees and partners to continue their research and operations in a safe manner and thus guaranteeing the groundbreaking work of imec during this period.

Imec made a particularly great effort to continue the operations in its fabs and labs, all the while respecting the health and safety of its employees and the restrictions as defined in the respective countries. The operational teams at imec not only managed to keep the fabs running throughout, but even realized record outputs. Also outside of the cleanrooms, imec remained fully operational thanks to a rapid transition to remote working and meeting. The entire imec team proved to be a resilient group of colleagues showing a lot of flexibility and inventiveness to continue working together.

2. How R&D and innovation can drive a sustainable society

Across imec's research domains, imec's research portfolio is focused on a strong, positive impact by enabling building blocks of a better world in a more sustainable society, whether it is in reducing power consumption of datacenters through developing technologies for more energy-efficient high-performance chips, developing photovoltaic technologies, new software for adaptive and personalized learning, or new genome sequencing technologies for a better healthcare.

2.1 Developing technologies for a sustainable future

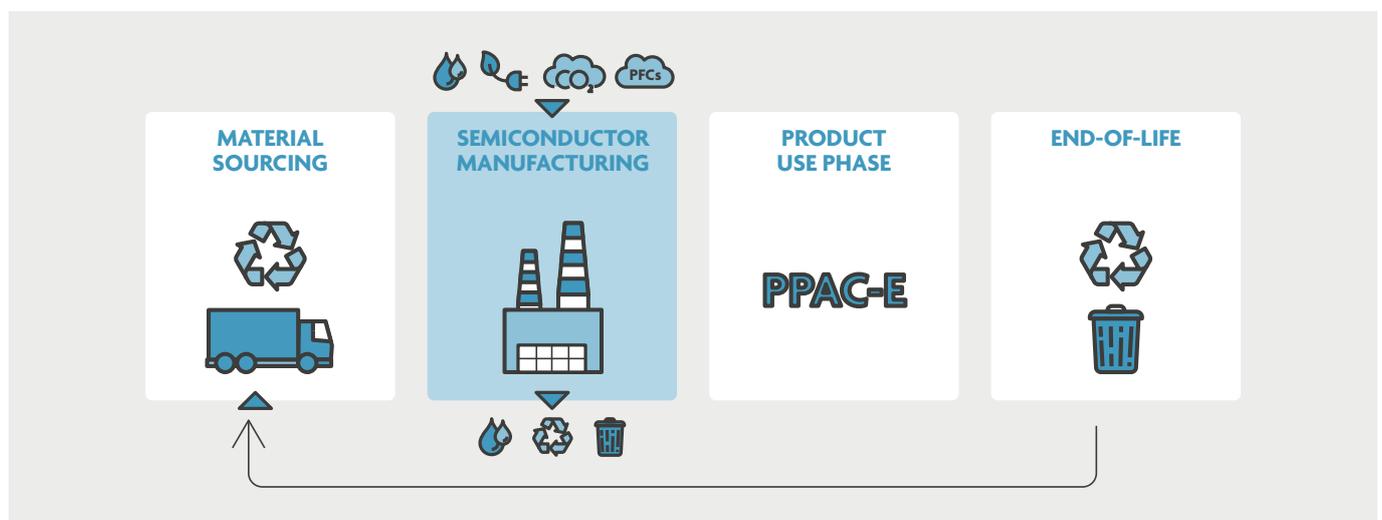


The semiconductor industry and the production of microchips are resource-intensive with regards to energy, water, chemicals, and raw materials. During manufacturing, various classes of emissions are generated including greenhouse gases such as CO₂ and fluorinated compounds.

Electronics companies want to know and reduce the ecological footprint of their product. A reduced footprint might guarantee business continuity – for example if scarce materials are involved in the production process – or might give a company a competitive advantage. Today, companies rely on methods such as Life Cycle Assessment (LCA) to evaluate the environmental impact of their product from material sourcing to end-of-life.

PPAC-E: Research with potential major impact

Imec is currently conducting research which may have a major impact on the semiconductor industry and the production of microchips and electronic devices. It used to apply a PPAC (Power-Performance-Area-Cost) model to make technological choices in the initial phase of its research. To also include the environmental cost and sustainability of upcoming technologies, it has now extended this PPAC model to a PPAC-E (Power-Performance-Area-Cost-Environment) model by extending the design-technology co-optimization (DTCO) framework with a module that estimates energy consumption, water usage, and greenhouse gas emissions of present and future microchips. Imec's PPAC-E framework is available for companies to make more sustainable manufacturing choices – far ahead of high-volume production.

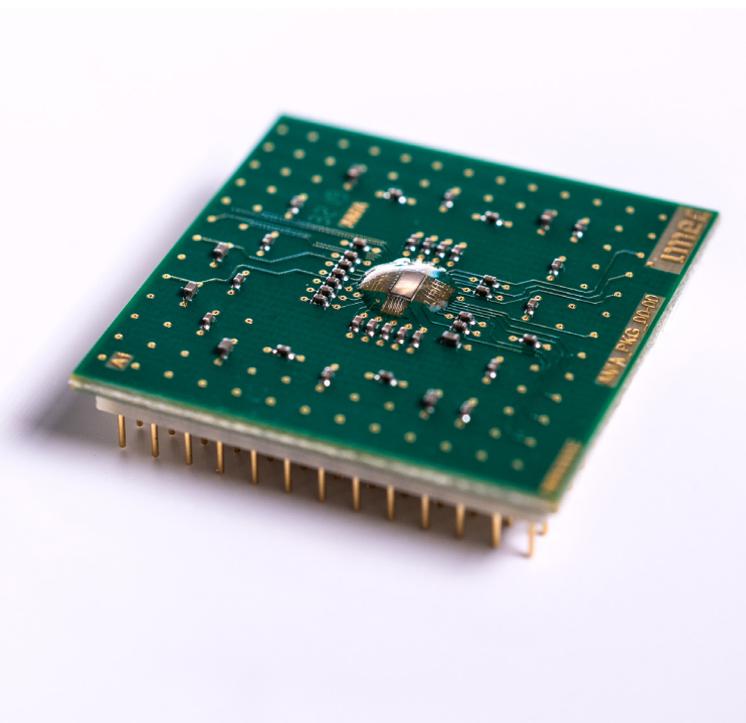


To realize this, imec developed a national and international network in which methodologies and knowledge related to the life cycle assessment of electronics are exchanged. It concerns a collaboration with imec partners, suppliers, academia and public institutions.

Imec's PPAC-E model was presented at the renowned International Electron Devices meeting (IEDM) conference 2020, to great acclaim. Today, the research continues, involving more elements and technologies. To get the full 'environmental picture', the impact of raw materials extraction and refinement should be included as well. In this context, the team will study the impact of adopting new materials in the process flows, especially when they are listed as critical. For these materials, options of using recycled materials or improving process tools for minimal material usage can be taken into consideration.

The team also plans to use its extended DTCO framework to evaluate the PPAC-E metrics for other technologies, including non-volatile and volatile memories. In addition, the framework will gradually be extended towards the system level – including metrics related to packaging, 3D integrated circuits, printed circuit boards and overall systems.

“A solution that estimates energy consumption, water usage, and greenhouse gas emissions of present and future microchips.”



Reducing the energy footprint of data consumption

As a consequence of the quarantine measures in 2020, the global web traffic volume suddenly grew with 40% in just a few weeks, both for professional and private use. It is to be expected that the data use will keep on growing exponentially, a trend that will be accelerated by the rollout of 5G networks. This exponential increase of data consumption will require a massive increase of data center capacity. Subsequently, to accommodate this growing demand for storage and computation, the semiconductor industry will need to come up with more advanced semiconductor processes. If not, the world will see a dramatic increase of energy consumption, as these data centers consume enormous amounts of electricity.

If we want to adhere to our commitment of a green future, we will need smarter, more energy-efficient ways to compute, store and connect. New computing paradigms/architectures with a radically new computing trajectory demonstrating over 1,000,000 times improvement in energy efficiency become indispensable.

Imec researchers and cleanroom staff succeeded in presenting multiple 'world's first' results in the past year. For example, at the renowned IEDM conference on the verge of the new year, imec presented a novel dynamic random-access memory (DRAM) cell architecture that implements two indium-gallium-zinc-oxide thin-film transistors (IGZO-TFTs) and no storage capacitor. This architecture shows a significantly reduced memory refresh rate and power consumption. Also, imec demonstrated the first functional Si qubit integration on 300mm wafers. Together with novel ways to operate arrays of qubits and to combine classical electronics with quantum circuits at low temperatures. These are important steps forward in the development of quantum processors.

Related to artificial intelligence and neural networks, two achievements stand out in 2020. In April, imec presented the world's first chip that processes radar signals using a spiking recurrent neural network. Imec's chip consumes 100 times less power than traditional implementations while featuring a tenfold reduction in latency – enabling almost instantaneous decision-making. Although versatile towards numerous applications, the chip's first use-case will encompass the creation of a low-power, highly intelligent anti-collision radar system for drones that can react much more effectively to approaching objects.

In July, imec together with GlobalFoundries, announced a hardware demonstration of a new artificial intelligence chip, called AnIA (Analog Inference Accelerator). Based on imec's Analog in Memory Computing architecture, the chip achieves a record-high energy efficiency up to 2,900 TOPS/W. These promising results are encouraging to further evolve towards 10,000 TOPS/W, which is a key metric to enable edge-AI on IoT devices. The privacy, security and latency benefits of this new technology will have an impact on AI applications in a wide range of edge devices, from smart speakers to self-driving vehicles.

2.2 From curative to preventive healthcare technologies



2020 is the year in which COVID-19 turned the world upside down. COVID-19 is a health crisis, but also a tipping point that led to an unprecedented digital transformation in healthcare. Unlocking COVID-19-related data to healthcare providers, citizens

and policy makers has resulted in a positive evolution. Data-based correct and relevant insights enabled governments to make more informed policy decisions, and showing the consequences of each of those decisions clearly. It immediately showed the impact of prevention measures and motivated citizens to take responsibility for their own health.

This digital transformation supports the transition from reactive healthcare towards a more preventive system and towards Smart Health. Imec is ideally placed to contribute to this transition to better and more affordable healthcare for everyone. Imec's Life Science Technologies program leverages imec's unique state-of-the-art chip processing infrastructure, advanced design tools, and life sciences labs to build the next generation of smart chip-enabled sensors for the medical and life science sector.

“Imec is ideally placed to contribute to the transition to better and more affordable healthcare for everyone.”

A new SARS-CoV-2 test

Imec and UZ Leuven are jointly developing a super-fast, clinically validated SARS-CoV-2 test. In contrast to the existing test methods, the new test will work on the basis of exhaled breath. The solution aims to give a reliable answer about how contagious someone is within five to ten minutes and will thus allow to test much faster and more extensively. The project started in 2020 and is supported by the Flemish government. Clinical validation will be upscaled by summer 2021.

Extremely miniaturized biosensor for high-sensitivity molecule detection

End 2020, imec presented an extremely miniaturized biosensor for high-sensitivity molecule detection (e.g. single-molecule DNA). The result is very promising for further development into life-science applications thanks to the high integration and low-cost potential of silicon FinFETs that are at the base of the novel device concept.

Whole Genome Data Analysis Available in Just a Few Hours

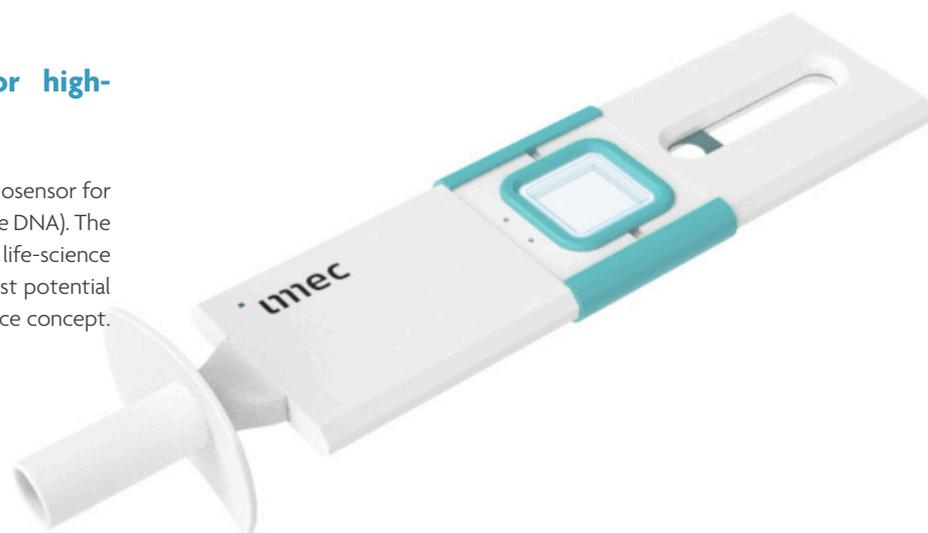
In 2020, imec announced a new version of its ElPrep software platform that performs DNA analyses in just a few hours, up to 16 times faster than previous options.

EHealthMonitor

The eHealth monitor measures the availability and use of eHealth applications in the Belgian healthcare sector. In 2020, the data from the eHealthMonitor was enriched with in-depth interviews to take into account the COVID-19 situation. The eHealth monitor looks into the future: it conveys the expectations of patients and healthcare providers around eHealth. More info on www.ehealthmonitor.be

Energy-efficient and high-capacity wireless network for data transfer of brain-wide neural recordings

An important recognition came from the prestigious European Research Council (ERC) Consolidator Grant that was awarded to imec's researcher Yao-Hong Liu for his project Intranet of Neurons. Within this project, he aims to revolutionize the way neuroscientists collect and process neural data. More specifically, he will develop miniature, energy-efficient and high-capacity wireless networks for data transfer of brain-wide neural recordings.



The world's first millimeter-scale wireless transceiver for electronic pills

At the ISSCC conference in February, imec presented the world's first millimeter-scale wireless transceiver for electronic pills. The whole transceiver module including antenna occupies a volume of less than 55mm³, which is up to 30 times smaller than state-of-the-art devices. It is a first breakthrough in imec's aspiration to realize autonomous ingestible sensors that can measure health parameters such as gut health and transmit the data in real time outside the body.

A smart contact lens that mimics the human iris to combat eye deficiencies

In September, the Scientific Reports from Nature featured the research on a smart contact lens that mimics the human iris to combat eye deficiencies. The smart contact lens has an iris aperture that can be tuned through concentric rings on an integrated liquid crystal display (LCD) and is designed to operate for an entire day thanks to an ultra-low power design. It results from imec's collaboration with CMST (an imec research group at Ghent University), Holst Centre (an open innovation initiative from imec and TNO, the Netherlands) and the Instituto de Investigación Sanitaria Fundación Jiménez Díaz (Madrid, Spain).

Support of medical start-ups

Imec supports many medical start-ups. Some examples:

- With Evonetix, imec collaborated to enable the commercial-scale production of their proprietary micro-electromechanical systems (MEMS)-based silicon chips. The novel silicon chip is a key component of Evonetix's desktop DNA platform which, once fully developed, will facilitate and enable the rapidly growing field of synthetic

biology.

- With Roswell Biotechnologies, imec announced a partnership to develop the first commercially available molecular electronics biosensor chips. These chips are the brains behind Roswell Technologies' powerful new platform for DNA sequencing, to support precision medicine, molecular diagnostics, rapid infectious disease testing, and DNA data storage.

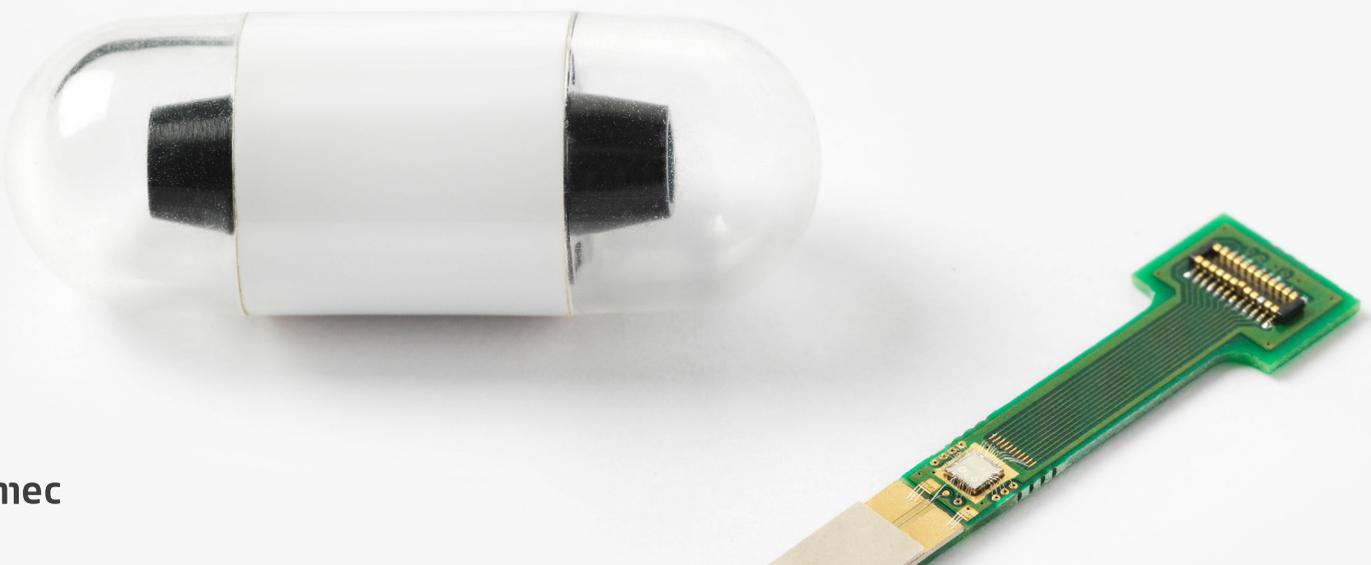
Through the imec.istart program, imec provides additional funding and support, in collaboration with various partners such as the BlueHealth Innovation Center, Pfizer, IQVIA, UCB and Roche Diagnostics. Some of the new imec.istart companies in the field of Smart Health supported in 2020:

- Saana is a personalized nutritional platform that works on the basis of scientific insights and AI.
- Hippocreates developed an automated test that detects allergies using robotics and artificial intelligence and which will assist doctors in analysis and diagnosis.

Joining forces with pharmaceutical companies

Imec combines extensive chip production facilities and bio-lab infrastructure with renowned expertise in nano-electronics, bio-electronics, sensors, photonics, microfluidics, life sciences and artificial intelligence. By combining this with the expertise and network of life sciences companies, imec can develop new solutions to prevent diseases, or discover them before they manifest themselves, enabling treatment at a much earlier stage, which in turn should lead to higher chances of recovery.

For example, in 2020, imec entered into a three-year strategic framework agreement with Janssen Pharmaceutica NV, one of the pharmaceutical companies of Johnson & Johnson, to jointly investigate how nanoelectronics can promote the development of medical solutions for disease prevention and interception, for personalized diagnosis and for patient-centered therapy.



2.3 Energy solutions for a carbon neutral society



If dreams (and policies) become reality, the world will be on an accelerated path to reduce greenhouse gas emissions and eventually become carbon neutral by 2050. By then, electricity from renewable sources will become a major source of energy for power generation and transport in many parts of the

world. For this ambition to have any chance of being realized, it will call for a sustained technology improvement and a much-accelerated deployment from where we are today. It is imec's ambition to make a significant contribution.

EnergyVille

Imec's energy activities are embedded in the EnergyVille collaboration. In EnergyVille, the KU Leuven, the Flemish Institute for Technological Research (VITO), imec and the University of Hasselt have joined forces to create a joint vision and coordinated laboratory infrastructure to address the challenges of the energy transition. Imec's research within EnergyVille focuses on the following elements:

Energy generation

- Imec develops new solar cell technology (PV, photovoltaics) with a focus on the next generation of solar cell modules, such as tandem solar cells that combine different types of solar cells to increase efficiencies. Tandem solar cells can potentially achieve an efficiency of 30 percent in the future (current commercial solar cells achieve approx. 22 percent efficiencies). These technologies are developed in collaboration with industrial partners.
- Imec develops new solar cell and module interconnection technologies with a focus on techniques that enhance the integration of PV in buildings, infrastructure and vehicles and that offer more possibilities to adjust the dimensions.
- Imec develops new simulation techniques to improve and to predict the energy production of solar panels and PV systems.

In 2020, a series of new research projects were launched, and ongoing projects were continued or finished. For example, the TWILL-BIPV project was completed in 2020. In this project, imec and its partners developed technology, materials and equipment for new PV roof elements based on imec's multi-wire interconnection technology. Project partners were Soltech, VdS Weaving and IPTE. In the Analyst PV project, imec is currently working with 3E, Engie-Laborelec, Sitemark and AllThingsTalk on a method to analyze and

predict the condition and maintenance needs of PV installations based on the analysis of images of PV installations made with drones. Furthermore, imec has projects in progress on the development and implementation of different silicon and silicon/perovskite tandem cells technologies and modules integrated in a wall, and on the cogeneration of electrical energy and heat in a concentrated solar system.

Another important aspect in the energy sector is circularity. In 2020, imec and PVCycle Belgium wrote an overview report on integrated PV and the reuse of PV in buildings. Also, imec's expertise in energy technology and its high-quality measurement and analysis equipment at imec's EnergyVille lab were leveraged to carry out a wide range of service assignments for companies such as Rexel, Borealis, and Aton Solar.

“It is imec's ambition to make a significant contribution to the technology improvement for renewable energy.”

Energy management

Imec is working on improved energy management systems:

- At the level of buildings, these systems can take into account all kinds of parameters (available green energy, price, consumption, comfort...) and control the energy flows to achieve certain predefined settings in a building.
- At energy distribution level, an energy management system can be used to determine whether the generated green energy should be used immediately or stored, and whether other energy generation systems must be enabled.

Energy storage and energy conversion

- Imec develops technology and materials for new solid-state lithium-ion batteries. The aim is to make batteries that are safer, charge faster and that have a longer lifetime, enabling for example a longer range for electrical vehicles.
- Based on imec's knowledge and expertise in electrochemistry and nanomaterials, imec develops technology to increase the efficiency of electrolysis-based green hydrogen production.



Green H2 production

Imec joins forces with the Flemish Institute for Technological Research (VITO), and with industrial pioneers Bekaert, Colruyt Group, DEME and John Cockerill to invest in the production of green hydrogen. Under the flag of Hyve, the consortium aims at a cost-efficient and sustainable production of hydrogen at gigawatt level. Hyve will put the Flemish region in the driver seat for the deployment of a hydrogen economy and the transition towards a carbon neutral industry in Europe.

The EU's commitment to reaching climate neutrality by 2050 will only be reached when we drastically transform our energy system. Within the EU Green Deal, hydrogen technology is considered essential in the energy transition towards a carbon neutral society. Especially in the chemical industry, the steel and cement industry, and in heavy duty transport, green hydrogen is considered key in decarbonisation. Today, the chemical industry depends on grey hydrogen, produced by reforming natural gas. Unfortunately, this process involves the emission of large quantities of CO₂. Green hydrogen, on the other hand, is produced through the electrolysis of water using renewable energy. To make green hydrogen competitive, the price of green electricity should further decrease, electrolyzers should be made more cost-efficient and the economy of scale should do its trick lowering the production costs.

The Hyve consortium brings together players across the value chain to achieve this ambitious goal, merging expertise in developing new components for electrolysis, with material suppliers, integration companies that will integrate the new components into their electrolyzers, and companies that will use this innovative infrastructure to generate green hydrogen..

“As a world-renowned research center in nanoelectronics and digital technology, we believe that technology is key in realizing a sustainable society and we are committed to leverage our expertise to enable this. Our ‘power-to-molecules’ program, investigating how CO₂ can be converted into valuable molecules for industry, points the way towards a carbon-neutral society.”

2.4 Enabling the digital transformation of education



Via its interuniversity and strategic research program Smart Education, imec focuses on the sustainable development and deployment of new educational technologies (EdTech).

This is not just about the digitization of our education, but mainly about the digital transformation of education towards an integrated balance between the physical and the digital. In addition, it is important to make education more interactive and personalized, also to give a clearer place to collaborative learning as well as multi-location learning, and to aim for progressively more complex learning tasks that bring knowledge and skills into a renewed balance.

The imec smart education program aims to provide the most modern and effective technologies for education and training. The

focus is on the development and testing of smart technologies (sensors, algorithms, adaptive learning platforms, etc.) that are necessary to facilitate interaction and collaboration during the learning process and for the introduction of tailor-made learning solutions.

To achieve this, imec has extensive research expertise, realized together with KU Leuven (ITEC), UGent (IDLab) and VUB (SMIT), whereby the KU Leuven research group ITEC is responsible for academic coordination. With 45 researchers dedicated to the use and effectiveness of technology in education, this imec research group from KU Leuven is the driving force behind imec's smart education activities.

To realize these ambitions, the imec smart education program is made up of four closely interacting layers, namely:

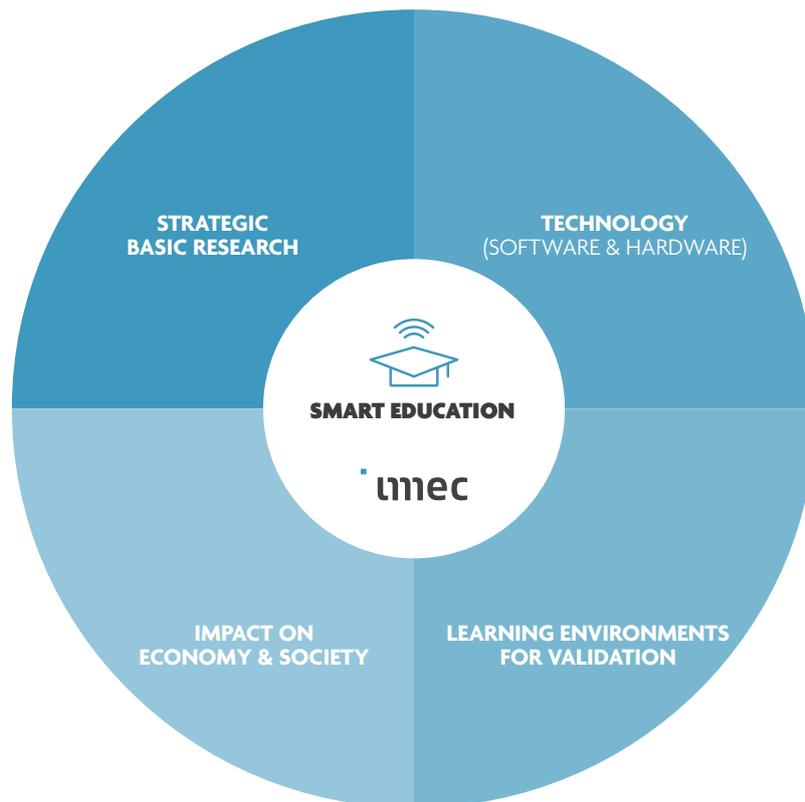


Figure 6 | imec smart education program layers

Some of the most important Smart Education realizations of 2020:

I-learn program for personalized education

Imec's i-learn program wants to boost the use of digital technologies for personalized learning in primary and secondary schools in Flanders. Personalized learning also fits perfectly into distance learning, which took off last year due to the COVID-19 pandemic. The construction of the i-Learn prototype followed a broad technical and didactic needs analysis of the Flemish education field and an analysis of 500 digital educational tools, which resulted in a collaboration with commercial EdTech companies and non-commercial organizations. 18 tools were made available through these partnerships. The i-Learn prototype and more than 500 learning activities for different learning needs were offered through so-called learning tracks (learning paths) designed by the didactic experts of i-Learn in co-creation with 12 pilot schools. i-Learn also worked on a Flemish solution for metadata with a number of public partners, including the Department of Education & Training. In this way, the initiatives can reinforce each other and there is a cross-fertilization between the public and private sector.

“Personalized learning fits perfectly into distance learning, which took off last year due to the COVID-19 pandemic.”

DataBuzz project to enforce data literacy

DataBuzz currently has 9 detailed interactive workshops to improve data and AI literacy (www.databuzz.be). The focus in 2020 was on Dutch-language schools and playgrounds in Brussels and CVOs / CBEs in Flanders:

- The DataBuzz visited 17 schools and 13 playgrounds in Brussels (target group: Dutch-speaking young people between 10 and 18 years old).
- The DataBuzz visited 8 CVOs / CBEs in Flanders (adult learners) and organized 5 demo days to train teachers about the DataBuzz.

Hybrid digital class room EduLab

The hybrid virtual classroom in the EduLab of imec and the KU Leuven won the 'EUNIS Award for best overall AV-enabled Education Space 2020'. This hybrid virtual classroom was designed as part of the KU Leuven-TECOL project in collaboration with Barco and acts as a research facility within imec's Smart Education program, in which the edutech is being developed and its effectiveness is being investigated. EUNIS (European University Information Systems) is a European network that aims at the innovative and high-quality use of audiovisual improvement technology in higher education.

2.5 Smart cities and smart mobility to improve quality of life



As urbanization will very likely progress, more and more people will go and live in cities. This means that the effort of building robust societies will increasingly be a challenge that must be tackled at the city level. Shocks as produced by climate change, demographic displacement or pandemics such as

the COVID-19 crisis are showing regularly that cities and societies as a whole have varying degrees of fragility. Imec researches how technology can help to make our cities more resilient.

Instruments for this are internet-of-things sensors for measuring air and water quality, technology for 5G networks and studies on the effects of 5G, low-power radar sensor systems, digital twin visualizations and predictions. With projects towards a sustainable automotive industry, City of Things, MobiliData, Indimo, Token, the urban digital twin and Internet of Water Flanders, imec contributed in various ways to improving the quality of life in 2020 as well.

“Technology can help to make our future cities more resilient.”

Towards a sustainable automotive industry

The automotive industry shaped the economic and urban landscape of the 20th century. Today, it needs to reinvent itself to rise to 21st century challenges, such as the decarbonization of our energy system and the creation of smart, connected cities. This requires car manufacturers and their suppliers to venture into new territory, and to integrate automotive nanotechnology and digital technologies to make their products greener, safer and more adapted to the sharing economy. Imec is the trusted copilot for this ride into the unknown.

When will we see the first autonomous cars on our roads? Nobody in the automotive industry can say for sure. But progress is continuously being made through the implementation of advanced driver-assistance systems (ADAS) that increase road safety and enhance driver comfort. Through features such as automatic lane

keeping or adaptive cruise control, ADAS relieves the driver of some tasks – reducing the risk of human errors. Another function of ADAS can be to monitor a driver's health to sound the alarm when he or she becomes distracted or unwell. As an R&D hub that combines hardware and software capabilities, imec is in a perfect position to assist companies.

To bring down energy consumption and increase the driving range of electric vehicles, we need ultra-efficient power electronic circuits – both in the car and the charging infrastructure. By constructing switches and converters with wide-bandgap materials such as GaN, they can operate at higher switching frequencies and at higher temperatures, leading to higher efficiency. Imec explores next-generation GaN technology that yields a higher level of integration and higher performances.

City of Things

Imec's City of Things program is looking for answers to the complex problems or needs that arise in our ever-growing and changing cities. In particular, City of Things is examining the role technology can play in these solutions. How can we move more safely? How do we limit traffic congestion? How do we make life in the city healthier? And how do we make maximum use of the disseminated knowledge and information for the benefit of everyone who lives and works in our cities? Find out more on www.imeccityofthings.be

MobiliData

Imec wants to tackle traffic challenges by making existing roads, traffic lights, intersections, etc., smarter through technology. A smart infrastructure can communicate in real time with road users and as such respond to their mobility needs. In addition, imec conducts intensive research into new technological solutions that stimulate behavioral change, both in the field of passenger transport and goods transport.

With the MobiliData program, innovative mobility solutions are realized in a partnership between the Flemish government and imec. This is done by collecting mobility information from road users, infrastructure, vehicles, applications and government systems at one point and by making this data available in real time. The goal is to facilitate innovative solutions that make Flemish mobility safer, smoother, more sustainable and more comfortable for every road user.

MobiliData also conducts innovative research to make container transport via trucks in ports more transparent, to an efficient and comfortable design of bicycle parking facilities at railway stations, to applications in traffic for people with a visual impairment, or to how drivers of motorized traffic can be notified when cyclists approach.

Indimo

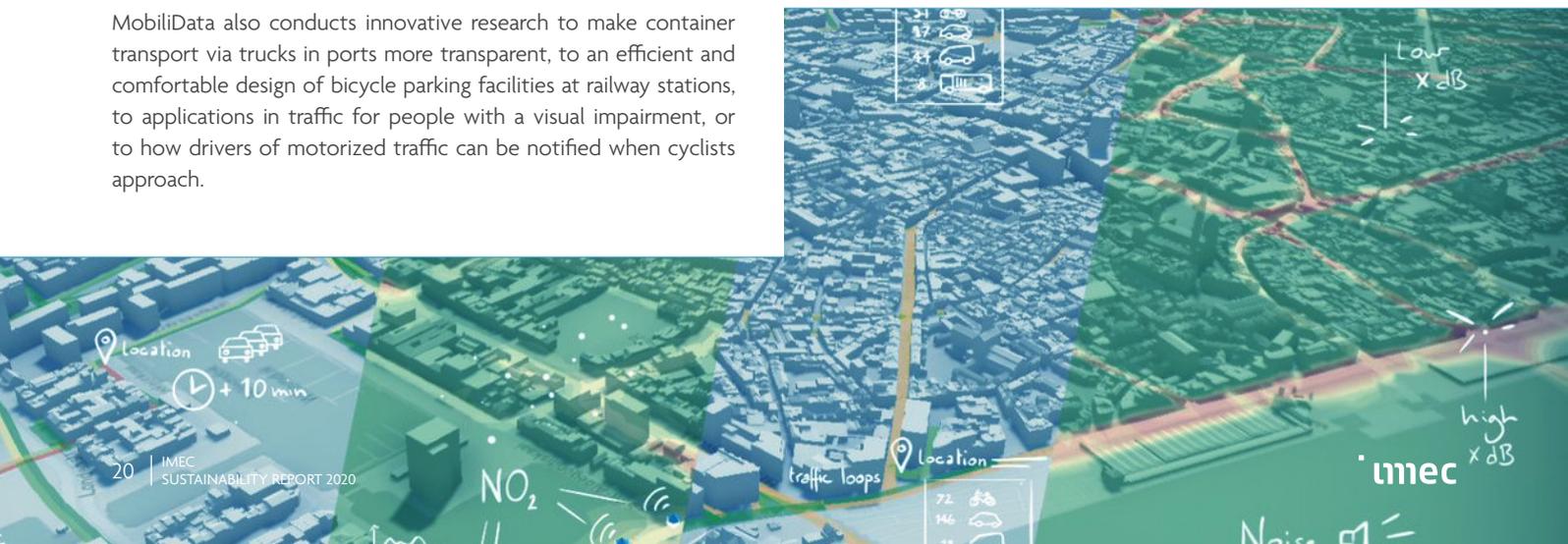
Indimo is a European Horizon2020 project whose objective is to develop mobility solutions within Europe, which focus on inclusion of all road users. Special attention is paid to projects that can provide a solution to the needs of people with disabilities, elderly, people with limited digital skills, and so on. Indimo writes a toolbox for innovation teams to find specific guidelines when devising and testing their concept. Applications are tested at various locations, namely in Spain, Italy, Germany, Israel and Belgium. In Belgium, Antwerp is the chosen location and the research carried out by imec has the ambition to make smart intersections with smart traffic lights accessible to people with a limitation.

Token

Token is also a European Horizon2020 project with the aim of conducting research into the added value of distributed ledger technology in public services. This project is part of the European Blockchain Partnership. Within Token, research takes place in Poland, Spain, Greece and Belgium. Within this project, imec is investigating 'Dynamic access to the city and the last mile in the (food) logistics' in Flanders. This research starts with building a working prototype in the city of Leuven, followed by the evaluation and large-scale rollout of the prototype to other cities in Flanders.

The urban digital twin

This 3D replica of an urban environment reflects the different dynamics of the real city and is an embodiment of it inter- and multidisciplinary urban development and operational follow-up. What is the effect on the air pollution in surrounding streets if you make a certain street car-free? And what about the noise nuisance in the park nearby? On such complex issues, an urban digital twin aims to provide answers. The urban digital twin is continuously fed with data from sensors that measure environmental factors such as air quality, noise level and traffic flows. In addition, it contains models that predict what will happen to those environmental factors as a result of policy interventions. That is why an urban digital twin is such an interesting tool for policy makers. The urban digital twin bridges the gap between the digital and the physical world and aims to support policymakers in complex decisions about urban livability. In 2020, imec enrolled in a cooperation with the cities of Bruges and Antwerp to develop a digital twin.



Internet of Water Flanders

In 2019, the Flemish Government, through its Agency for Innovation and Entrepreneurship (VLAIO), provided 9.7 million euro for Internet of Water (IoW) Flanders project, a collaboration between imec, Flemish Institute for Technological Research (VITO), Flemish Water Knowledge Center (Vlakwa), VMM, De Watergroep and Aquafin. The aim of the internet of water research project is to roll out a fine-meshed and high-frequency sensor network across Flanders supplementing the existing VMM measurement network. Where current methods use manual scoop samples and expensive multi-parameter probes, the IoW Flanders project aims to provide and develop the most recent sensor, data and network technology enabling continuous real-time monitoring.

Innovative algorithms and hydrological models will process the large amount of data to monitor salinization problems and other challenges in our water system in real time. At the same time, future evolutions will become more predictable. This provides useful policy information for a more sustainable water policy.

2.6 Venturing to support sustainable innovation



All sustainable innovations start with a bright idea. But not all bright ideas become successful innovations. To achieve its commercial potential, innovation needs nurturing and entrepreneurial drive. Imec offers an ecosystem of tailored venturing

support to give new start-ups and entrepreneurs a head start on their road to market.

“Sustainable innovation needs nurturing and entrepreneurial drive.”

Imec.istart

Imec.istart - imec's business accelerator - supports young tech start-ups. The imec.istart program offers a wide range of services, professional and sector-specific coaching and mentoring, access to technology and office facilities, access to a wide national and international network of partners and investors, an initial financial injection (50,000 euros in seed capital investment, up to a maximum of 150,000 euros per start-up) and much more. Since its launch in 2011, imec.istart has supported more than 220 tech start-ups and spin-offs in different domains, to develop into sustainable companies.

In 2020: 179 projects were submitted in the several imec.istart calls (compared to 146 in 2019), of which 33 were selected. In the calendar year 2020 27 new start-ups signed their imec.istart contract. The imec.istart portfolio currently consists of 220 companies. Of these companies, almost 83% are still active today (181 of the 220). Together, they already created more than 1,900 full-time jobs, and generated more than 140 million euro in turnover. These young companies are achieving a growth rate of about 30% per year.

Imec.xpand

Imec.xpand is an independent incubation fund for young companies in which imec's technology, expertise and infrastructure are distinctive factors. Imec.xpand is committed to supporting these companies from the early stages of their development, thanks to, among others, IP developed at imec. In addition to the fund's initial focus on digital technology, special attention will now also be paid to sustainability and solutions with a hardware component.

The imec.xpand fund is supported by several Flemish partners (such as PMV and KU Leuven) and also managed to attract substantial foreign capital. It has been proven that the presence of large investment funds (imec.xpand currently has € 117 million under management) in a region has a positive effect on the success of local start-up creation and scale-ups. Since its start in 2018, the fund has invested in 12 companies, including 7 imec spin-offs. In total, imec.xpand has already invested more than 20 million euro. More importantly, the imec.xpand investment has often been a catalyst for startups to raise additional funding from local and international investors, generating 83 million euro extra capital up till now.

Imec.xpand recently led an investment round of 5.4 million euros in Pulsify Medical. This spin-off from imec and KU Leuven is developing a smart patch that can monitor the functioning of the heart based on ultrasonic waves. The unique sensor expertise of imec and the advanced software knowledge of KU Leuven form the building blocks of a unique innovation that will greatly improve the treatment and follow-up of heart patients worldwide. Last year, imec.xpand also invested in Indigo Diabetes, a spin-off of imec and Ghent University that is developing a small, implantable sensor. This revolutionary sensor will allow diabetic patients to continuously and accurately measure blood sugar levels, significantly improving their quality of life and peace of mind.

2.7 Guiding companies and organizations through digital transformation



An important part of imec's role is to share its technology leadership with companies to strengthen their own digital innovations. Because not all companies are at an R&D maturity level to be able to engage directly in bilateral research collaborations, imec

is continuously investing in low-barrier-to-entry models which facilitate collaboration, especially with SMEs.

Imec.icon - demand-based collaborative projects

ICON (Interdisciplinary Cooperative Research) is a unique demand-driven applied research model. Imec.icon projects start from a technology need of Flemish companies. The innovation challenges fit within imec's smart application sectors and are tackled in cooperative research projects, by researchers from imec, Flemish universities and the companies.

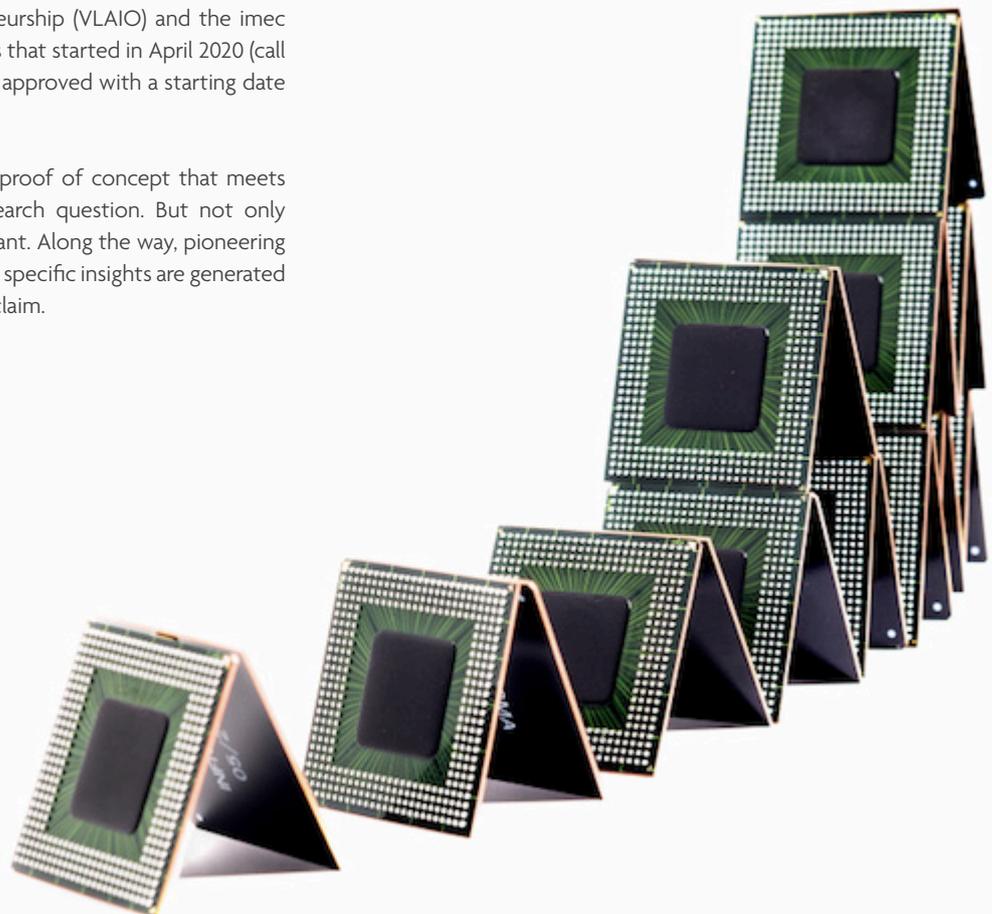
The imec.icon program is positioned as a low-barrier access program for regional industry to collaborate with imec in applied research. The low-barrier character of the program is demonstrated by the high proportion of first-timers (i.e., companies that participated for the first time in imec.icon) and the high proportion of SMEs in the projects.

In 2020, a total of 12 projects were approved. In March, the Flemish Agency for Innovation & Entrepreneurship (VLAIO) and the imec Executive Board approved 5 projects that started in April 2020 (call 2019-2). In July 2020, 7 projects were approved with a starting date of 1 October 2020 (call 2020-1).

Imec.icon projects work towards a proof of concept that meets the concrete, market-oriented research question. But not only this final proof of concept is important. Along the way, pioneering technologies are often developed or specific insights are generated that attract a lot of international acclaim.

Imec.IC-link – access to IC design and low-volume manufacturing

For companies and universities that do not (yet) need a high-volume production of their microchips (ICs), it is nearly impossible to get direct access to leading foundries and thus the latest semiconductor technologies. This is where imec.IC-link comes in by offering direct access to prototyping new chips, and offering a flexible production capacity. Imec.IC-link complements its service with support, design services and packaging & test services for companies that would otherwise not have access to these leading technologies and expertise. As such, imec.IC-link offers an optimal solution for universities and smaller companies to enable them to realize their ideas in application-specific integrated circuits. Imec realizes this access to leading technologies through its partner ecosystem, working with IC-design companies and aggregating multiple smaller projects in multi-project-wafer (MPW) setups. Imec.IC-link's core customer base is represented by start-ups/scale-ups, SMEs and universities, but also by larger companies who do not have the in-house design and manufacturing competencies for their niche products.



Artificial intelligence (AI)

Artificial intelligence (AI) has made a tremendous leap forward in recent years. The influence of AI will be felt in all sectors and sections of society in the coming years.

On 23 January 2020, imec, Voka, Agoria and VLAIO brought together all stakeholders in Flanders within the framework of the Flemish impulse program for artificial intelligence for the business world. More than four hundred companies, academics and other stakeholders attended the Flanders AI Forum.

On 22 March 2019, the Flemish Government approved the Artificial Intelligence Policy Plan. Imec coordinates the Flemish Research Program on Artificial Intelligence. This research program brings together all AI research groups of the Flemish universities and research centers. Companies, government institutions and non-profit organizations are the users of AI in Flanders. Synergy with them and thorough knowledge and technology diffusion to them are therefore central. Generic AI methodologies are researched and developed and can be used for countless applications in healthcare, industry and government. For example, powerful smartphones, cars and robots can take over tasks from the cloud (edge computing), leading to faster decisions, lower energy consumption and better privacy protection. This opens new possibilities for AI applications based on intelligent systems and components with low power, often on batteries.

In 2020, imec, together with KU Leuven, UZ Brussel and VUB, jointly conducted research into AI-based analysis of CT images of lungs. The research was part of the iCovid project that focuses on the detection of lung damage by COVID-19, and is now being continued with European subsidies. Professor Jef Vandemeulebroucke of ETRO (an imec research group of VUB): "What started as a local project is now being rolled out in 800 hospitals in Europe and supported by excellent research centres all over Europe. With icolung, we can detect COVID-19 patients at an early stage and quantify the extent of lung lesions. Meanwhile, we are further improving the AI software to identify lung damage from COVID-19 even more quickly, and to determine the further care path of the patient faster and better through prognostic models."

"The influence of AI will be felt in all sectors and sections of society in the coming years. AI methodologies can be used for countless applications in healthcare, industry and government."

Cyber security

On March 22, 2019, the Flemish Government approved the Flemish policy plan for Cyber Security (CS). In the context of this plan, a policy agenda was proposed that consists of three complementary parts: the performance of top strategic basic research, the implementation of cybersecurity applications in the business world and a strong supporting policy to meet the significant training needs in the labor market.

Imec is part of the consortium responsible for developing the research program for strategic basic research. The program is built around four Research Tracks. Imec contributes to Research Track 4 - Technology Building Blocks: Secure Hardware, Cryptography and Secure Implementations, more specifically in the research theme: Secure Hardware: Roots of Trust Anchored into Technology Foundations. In short, imec uses its expertise and knowledge in semiconductor technology to research and develop basic cybersecurity building blocks for embedded systems. This research is done in close collaboration with the Device Reliability and Electrical characterization (DRE) team and the imec research group COSIC at KU Leuven.



2.8 Innovative technologies for more responsible production



The world will need to produce ~70 percent more food in 2050 compared to 2006/2007 in order to feed the growing, wealthier population that is expected to reach 9.8 billion people. This vast amount of food needs to be produced with half the resources due

to the limited availability of key nutrients, increased water stress, and soil degradation. At the same time, additional challenges arise, like climate change, changing consumer demands, and demographics. The main challenges, both on a global as regional scale will be (1) the need to match supply with a rapidly changing demand for food from a larger and wealthier population, in ways that are environmentally and socially sustainable, and (2) to eradicate extreme hunger in the poorest areas of the world. For this to happen, fundamental changes are required in the way food is produced, stored, processed, distributed, and accessed.

Imec's OnePlanet Research

The launch in 2019 of imec's new OnePlanet partnership, a multidisciplinary collaboration agreement with imec, Wageningen University and Radboud University was an important milestone. It allows imec to develop innovative technologies such as sensors, robotics, AI, (big) data analysis and digital connectivity, and to improve production and processes in areas such as food, agriculture and health and in a precise, controlled and sustainable manner. In 2020, the research programs took further shape.

What if we lived in a world where the quality of fresh produce, and the health of plants and livestock could be autonomously and continuously monitored and adjusted when necessary, at precisely the right place and time? It would make agriculture and food processing significantly more sustainable, as it enables the production of more food of higher quality with less input of fertilizer, water, agrochemicals and human labor. It would reduce the emissions of methane, nitrous oxide and carbon dioxide, and it would boost biodiversity. Farm management would become data-driven, anticipatory, highly optimized and individualized. It would provide new opportunities for producing fresh food at locations where space is limited, such as in urban areas, and retailers would be able to substantially reduce their food miles by growing fresh produce locally indoors.

Precision Agriculture, Food & Environment focuses on the development of sensing technologies and digital applications that enable smart precision farming and food processing. Industry programs will be initiated that deliver solutions for real-time monitoring of individual plants, animals and their environments. This enables growers to farm as efficiently and circularly as possible, dosing precise nutrient volumes, whilst minimizing the use of agrochemicals and so reducing their environmental impact. Examples include sensing solutions for autonomous indoor farms, in-soil sensors that monitor the internal quality of fruits and vegetables, and sensors that measure nitrogen emissions. In food

processing, new sensing applications are envisaged for real-time monitoring of food quality and food safety. OnePlanet's smart technologies will enable circular food processing with a minimum of food waste and efficient resource (re)use.

“OnePlanet's smart technologies will enable circular food processing with a minimum of food waste and efficient resource (re)use.”

More various groundbreaking innovations are underway. Advanced (combined) sensors to non-invasively measure the ripeness of fresh fruits and vegetables will be one of the outcomes of Emerging Sensing. This innovation track will also investigate how to measure plant health. In a second innovation track, Indoor Autonomous Farming, OnePlanet is developing a sensor-based, integrated data platform that opens the way to autonomous greenhouse production and, in the longer term, fully-controlled vertical farming systems. A third innovation track, Digital Orchard is dedicated to the gathering and integrating data on – and predicting fruit-tree health and fruit harvest quality.

Smart Agrofood

Imec is exploring how nanotechnology and digital technology can contribute to support the switch to sustainable and precision agriculture. In Flanders as well as in Europe, imec is joining forces to develop technology for the food industry. The European Smart-sensor-systems-4-agrofood platform is a further extension of the local i-FAST platform (www.ifastproject.com).

Through the collaboration with Flanders' FOOD, agrofood companies are actively guided in their new developments through services, partner matching, innovation stimulation, etc. and they gain insight into their innovation potential using imec technology and services. Flanders' FOOD has also been approved an Industry 4.0-oriented living lab file: 'living-lab industry 4.0 for agrofood', which is supported by imec with hyperspectral camera technology for quality monitoring.

In 2020 the foundation was also laid for regular consultation between Flanders' FOOD and imec-OnePlanet. During the further development of the collaboration with Flanders' FOOD, the relationship with the Institute for Agricultural, Fisheries and Food Research (ILVO) was also tightened up. In collaboration with ILVO, Flanders Make and other partners, imec works on the Industry 4.0 testing ground “Smart Farming”, aimed at disease detection in potatoes and fruit trees with the help of hyperspectral cameras. ILVO has also started its own research projects using various hyperspectral camera systems from imec, which entails leverage within the agrofood sector.

3. Extraordinary people, delivering extraordinary results

Imec's world class R&D infrastructure and its extraordinary talent are two of the essential assets that make imec tick. Imec's future people strategy is entitled, extraordinary people, delivering extraordinary results. It builds on the foundations laid over the past years. Still, as the title reflects, imec is shifting focus and defining its future priorities from the perspective of its extraordinary people rather than from the standpoint of the irresistible workplace. Imec puts its people and their sense of autonomy, belonging, and competence center stage in its activities. To this end, imec elaborated key priorities on the level of the individual and her/his integrated employee experience, the level of our many teams and their leadership, and the level of the corporate mechanisms that differentiate imec as a healthy, connected, and sustainable place to work.

3.1 Engaged and committed employees

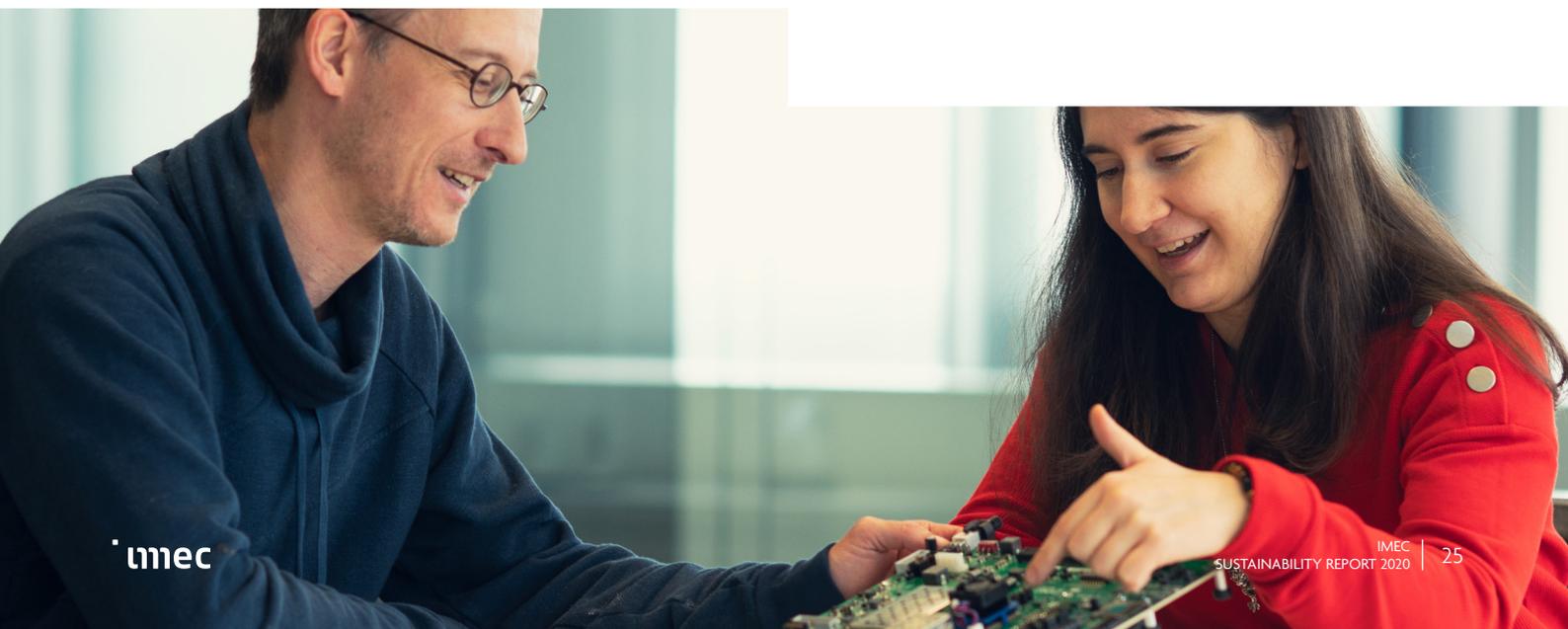
Employee expectations about how they work are not changing, they have changed. As companies adapt to the massive disruption of COVID-19, they must move quickly to redefine workforce strategies, re-engage employees, and reimagine the employee experience.

Imec puts its employees at center stage. Achieving this requires a pivot to a new, employee-centric operating model, one that re-orientes teams around what matters most to employees and delivers differentiated experiences to maximize engagement and build trust.

Standard **imec services and employee benefits** entail life insurance, health care services and insurance, short- and long-term disability insurance (invalidity), maternal and parental leave, retirement provisions and a work-related accident insurance. For all imec locations, 100 % of the workforce are covered by collective bargaining agreements and all employees are covered with a healthcare insurance.

However, this is just a glimpse of the services imec provides. For example, imec employees in Leuven can make use of the children's daycare services of imec. Since 2018, employees access all information, guidelines procedures and templates via the **employee center** platform. This platform provides information to all imec colleagues in a smart and fast way. In this way, the HR Employee Center can create more time and invest in situations where a personal contact is desired.

In an extremely competitive world with respect to high-tech talent, there is an increasing risk of finding the right talent at an affordable cost. This sector is populated with big attractive companies and with exciting start-up companies promising stellar prospects to candidates. Therefore, imec has a strategy to attract, motivate and retain the best minds around. Apart from the employee services on both career level as quality-of-life, imec set up a **remuneration policy and offers a performance bonus system** to the employees. This system enables imec to promote career development within the organization and remunerates employees for outstanding team and individual performances.



In June 2020, imec launched a new **digital workspace**, “imec Teams” including a number of imec-designed “apps”. Imec Teams is the base for employees to easily find information, share knowledge in a safe way and collaborate with colleagues and to connect with colleagues across the organization. Several initiatives were taken in 2020 to work on team cohesion across the various locations. As an organization, being and remaining effective and agile simultaneously, maximizing results today, and staying relevant in the future, is the challenge in an ever and fast-changing environment. Listening and responding fast to employee feedback is the most powerful way to do this.

In 2020, imec transformed the old process from engagement and wellbeing surveys on a two-year basis into a new way of asking for and listening to feedback from employees. The “**connected.minds**” expresses imec’s ambition of connecting by listening. It combines surveys across the whole of imec with new, frequent team pulse surveys. These include the overall employee experience of working at imec - including all aspects of engagement, commitment, vitality and leadership and are visualized in a user-friendly and easy to interpret dashboard.

In 2020, an organization-wide connected.minds survey was conducted on the topics of engagement, commitment and vitality for which an imec response rate of 77.6% was reached with results lying in line with or exceeding the results at peers. Imec reached an average eNPS score of 7.2 in 2020.

Engagement	7.4
Commitment	7.3
Vitality	6.7

“Imec puts its employees at center stage.”

Thanks to this valuable and broad feedback, imec could quickly respond with actions in the areas of respect to all employees, actions concerning diversity and inclusion and cross departmental collaboration. As part of the second lockdown in Belgium, several pulse surveys were conducted on specific topics to have a close view and clear understanding of the work pressure and social and emotional consequences of the pandemic.

For all countries where imec operates, internal employee guidelines and procedures are available in accordance with local laws and regulations such as “de Arbeidswet van 03/07/1978” for Belgium and the “Arbeidsomstandigheden wet (Arbowet)” for the Netherlands. In Belgium there are two other collective agreements being the “CAO operatoren 2015” and the “CAO maaltijdcheques”. In 2020, the personnel policy of the various international teams was further aligned and strengthened. The sales team in China underwent a small but successful reorganization to increase efficiency. Efforts were made to integrate the HR processes. This year, the sales team in the United States worked on further integration in the field of HR processes.

Imec wants to be an organization that stands for transparency and sustainability both in its business and with regard to its employees and their careers. An important choice to realize this is maintaining a good social dialogue with employee representatives, both the Work’s Council and the Committee for Prevention and Protection at Work (CPPW) play a key role to achieve that. With both representatives of management and imec employees, the Works Council’s task is twofold: informing and consulting on financial and economic themes and on topics regarding work organization and working conditions. The councils are organized on a monthly basis and elected on a 4-year basis. In November 2020, elections took place to appoint new representatives for both the Works Council as the Committee for Prevention and Protection at Work with 1130 registered votes.



3.2 Equality & Inclusion

The mission, vision and values of imec are built on the foundations of respect and diversity. Imec actively embraces diversity of all kinds, as it fuels our creativity and disruptive innovation. Imec is committed to ensuring that its people can carry out their assignments in an environment free of discrimination on the basis of gender, ethnicity, age, religion, gender identity, sexual orientation or disability, and free from harassment or any conduct that is likely to cause offence or humiliation. Imec promotes and accepts equal opportunities for all.

In 2020, imec worked on new policies and initiatives to strengthen these principles in imec's culture, leaving no room for offensive behavior or harassment.

EXPLICIT COMMUNICATION



A revised diversity and inclusion vision statement and revised imec values bring explicitness into our communication. We call everything by name and include the fundamental value of equal treatment. We make sure these topics continuously remain on the radar and we explicitly expect from all imec staff that public behavior is in line with our values.

LISTENING AND UNDERSTANDING



We build a lively diversity and inclusion community to connect top-down and bottom-up initiatives and support informal network initiatives. Imec thus wants to offer people platforms to address their concerns and dive deeper into the issue(s) of racism, harassment, and discrimination.

SKILL BUILDING & SUPPORT MECHANISMS



Imec offers expertise to the leadership and teams on all matters of "inclusion" (unconscious bias, cultural differences, psychological safety, speaking up). A clarified legal framework and enhanced online information should give self-help a boost.

REPRESENTATION



Imec checks all internal decision-making boards on their diversity –e.g.: gender (identity), international community, locations... It "fills the pipeline" with diverse talents from all over the world, via university collaborations and by bringing diversity into the hiring or promotion processes.

An important approach to achieve a culture of openness and respect at imec is using the informal pathway. Imec does this through learning modules on the employee platform but also through daily informal communication in which it spotlights events that are important for underrepresented groups, such as spreading congratulations for various New Year celebrations (e.g. for South and Southeast Asian colleagues), national day celebrations (e.g. King's Day Netherlands) or religious events (e.g. Ramadan).

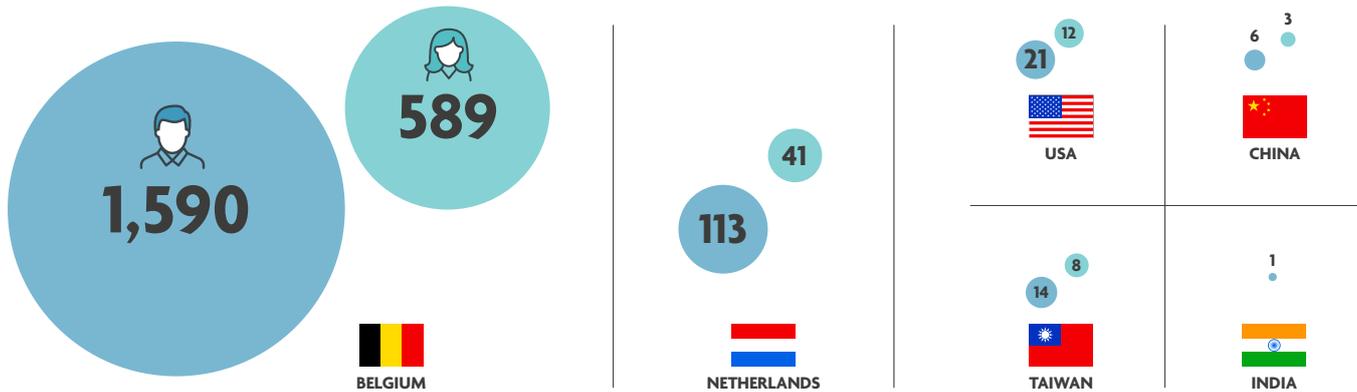
The total employment at imec has now grown to more than 4,500 employees, 51% of which are payroll and 49% are non-payroll. Non-payroll employees mainly are guest researchers and industrial residents within the framework of programs, but also PhD students. Over these 10 years, there's a steady growth in international representation within imec's workforce. One can see this growth at all target levels, even the highest. Researchers are still being recruited from all over the world. Top 5 countries after Belgium and the Netherlands are India, China, France, Italy, and Germany.

+4,500 IMEC EMPLOYEES

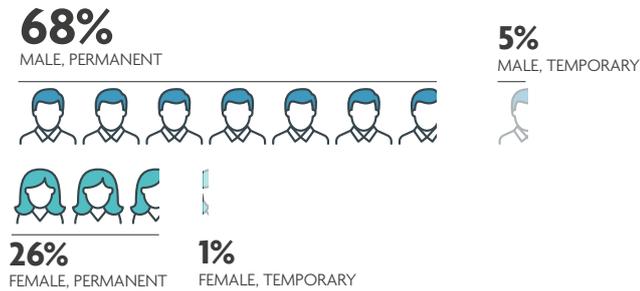
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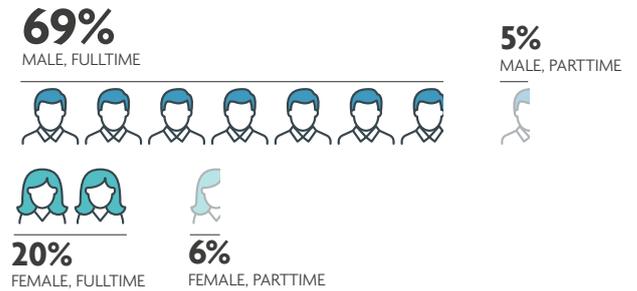
HEADCOUNT IMEC SITES
EXCLUDING NON-PAYROLL WORKERS



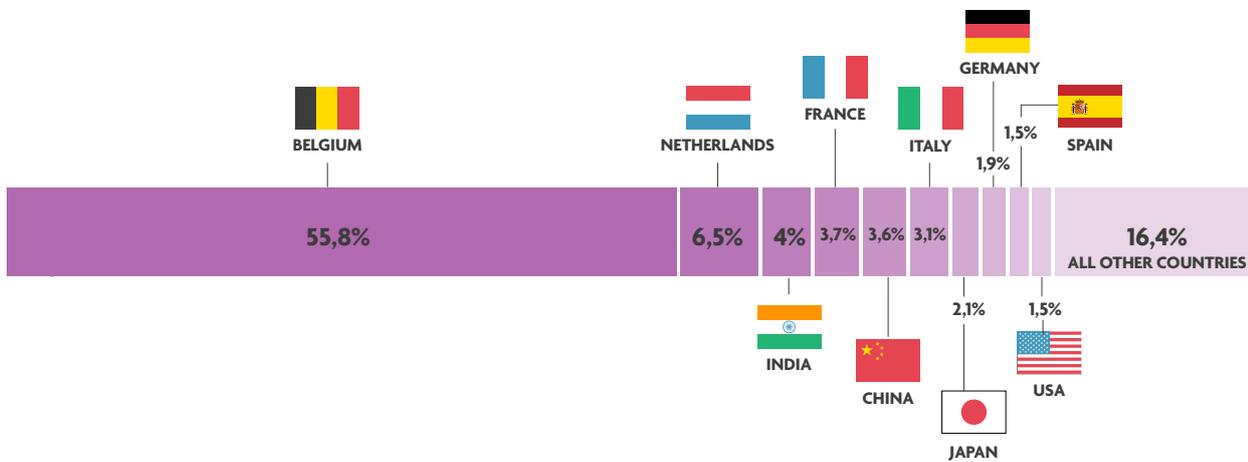
CONTRACT TYPE PER GENDER
FOR ALL IMEC EMPLOYEES ON PAYROLL



EMPLOYMENT TYPE PER GENDER
FOR ALL IMEC EMPLOYEES ON PAYROLL



COUNTRY OF ORIGIN
FOR ALL IMEC EMPLOYEES ON PAYROLL



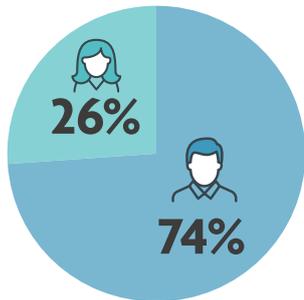
By age, imec harbors a workforce with a rather stable distribution per age group. 17% is 50 years or older, 13% is under 30 and the largest group (70 %) is between 30 and 50 years old. In this decade female representation improved to 26%. Unfortunately, at some management levels the proportion of women has stabilized or even declined. Moving forward, a better representation is part of our diversity & inclusion strategy for the next five years. Imec's inclusion and diversity policy, which was recently revised, therefore stresses the importance of improving the ratio of women in the organization, with special focus on the presence of women in leadership positions.

To highlight these challenges and raise awareness, imec participates in several initiatives like "women in tech" and organizes internal sessions. In 2020, for example, imec organized a panel discussion handling the themes of inclusive leadership and the challenge of diversity in the technology sector. In 2020, imec also invited employees to follow e-learning modules related to equality and inclusion topics and gave the opportunity to follow specific trainings.

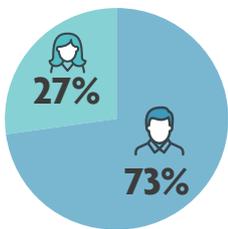
"We observe a steady growth in international representation within imec's workforce."

PERCENTAGE OF MEN AND WOMEN
FOR ALL IMEC EMPLOYEES ON PAYROLL

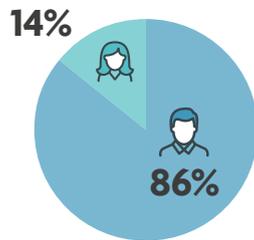
ALL FUNCTIONS & LOCATIONS



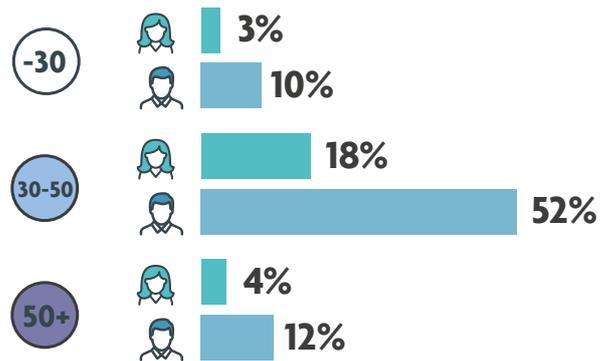
BOARD OF DIRECTORS



MANAGEMENT TEAMS

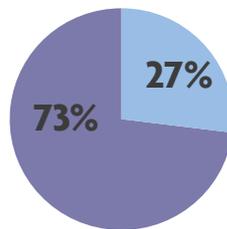


AGE GROUP DIVISION BY GENDER
FOR ALL IMEC EMPLOYEES ON PAYROLL

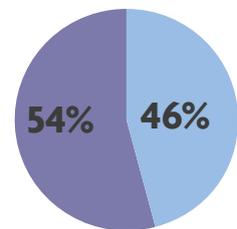


AGE GROUP DIVISION
FOR ALL IMEC EMPLOYEES ON PAYROLL

BOARD OF DIRECTORS



MANAGEMENT TEAMS



● 30-50 ● 50+

3.3 Recruiting

The founders of Google were right when stating that “hiring is the most important thing you do” ... as a manager. The imec network of talent needs to work together to fuel the need for new skills and additions to the teams. Managers play a pivotal role from the first contact through the entire employee journey of their team members. Over the past years HR has teamed up with many management teams to tackle the talent challenges together, following an integrated approach and sharing accountability for success.

Over the last 10 years, imec has grown by more than a factor 2.5. This has required an ever-growing effort from the talent acquisition team, with almost 300 new hires every year to provide in replacement and to enable further staff growth.

A good example of the entire imec network acting together in a joint effort to recruit new talent can be found in imec’s referral app to support the existing referral process. This app, launched mid-2018, makes it very easy for all imec staff to check open positions and refer friends and acquaintances. The number of referrals immediately tripled and up 10% of our vacancies can now be completed thanks to the network of imec colleagues.

Imec’s HR teams also focuses on difficult-to-fill vacancies. This approach is twofold. First, there’s a process for filling new vacancies internally through internal mobility. Today, up to 28% of vacancies are filled via internal mobility searches. Secondly, the teams also focus on innovative and tailor-made external searches. On the other hand, imec also develops its own approach to attract and guide employees in building the right skills and competences. Imec School is an important initiative in the light of these recruiting challenges.



Imec school

Filling the pipeline for technical profiles to support the cleanroom operations, has been an ongoing challenge for many years. There are, simply put, not enough skilled technicians on the labor market and demand for these skills has significantly outgrown the supply. In 2018, imec decided to apply a concept that prevails in the IT world: training or reskilling youngsters that have the right mindset and potential, but not the right qualifications. In 2019, imec School was launched with exactly this ambition: filling the pipeline by training instead of hiring only. Imec School is our first example of an extensive joint effort between fab experts and recruitment experts to define the right approach and implement the – intense training program completely in-house. Once the students are selected, they start a dual learning program. Theoretical classroom training is combined with on-the-job learning. The first imec School students graduated in June 2020 and are now working as technicians in our cleanroom. In 2020 imec added the aspect of offering opportunities to less or differently educated people to work for imec. The selection happened with the support of specialized organizations, with specific focus on the job posting and the first screening, to lower the threshold.

Not only the recruitment phase is an important step in de employee experience. Just as important are the first days of a new employee at imec. This is why imec.academy has placed great emphasis on the **onboarding process for new employees**. The WelcomeApp has been used for a while now to organize “preboarding”. It offers useful information about imec for newcomers. This information includes the imec mission, organization structure, but also practical facts that will come in handy during the first days about events or locations. Via the app, he or she can fill out administrative forms and a few short questionnaires.

To make the onboarding process even stronger, imec.academy launched an Onboarding Program in 2020 that introduces all starters quicker and more efficiently in the multiple aspects of a new professional life at imec. The first day as imec employee is followed by mandatory e-learning modules on information security, quality assurance, intellectual property and digital collaboration. Privacy and environment, health and safety were added to this list of mandatory e-learning in 2021.

Imec is also attentive to avoiding employee turnover. The emotional impact and fear for extra workload resulting from a colleague’s departure can be difficult for a team and its members. This is why imec is committed to continuously monitoring colleagues throughout the year. Managers and team leaders receive adequate trainings in people management, supported by the HR team. There are strict procedures for terminating an employment contract as these decisions cannot be taken overnight. A formal committee guards this process and specific cases. HR is monitoring the ins and outs at imec on a very regular basis and together with information they retrieve from exit conversations, they keep a close eye on the evolution of the employee base in terms of inclusion and equality.



3.4 Learning & development

Imec.academy, imec’s strategic learning framework, is an important instrument for the realization of imec’s ambitions. It encourages every employee to take ownership of their own growth and stimulates and supports everyone in their professional and personal development.

“Imec enables employees to be(come) the best version of themselves.”

In 2020, standard classroom trainings have been complemented with digital (smart) learning solutions, resulting in a blended – best of both worlds – approach. Safety training in virtual reality, the onboarding program and remote leadership offer three great examples of imec’s training approach.

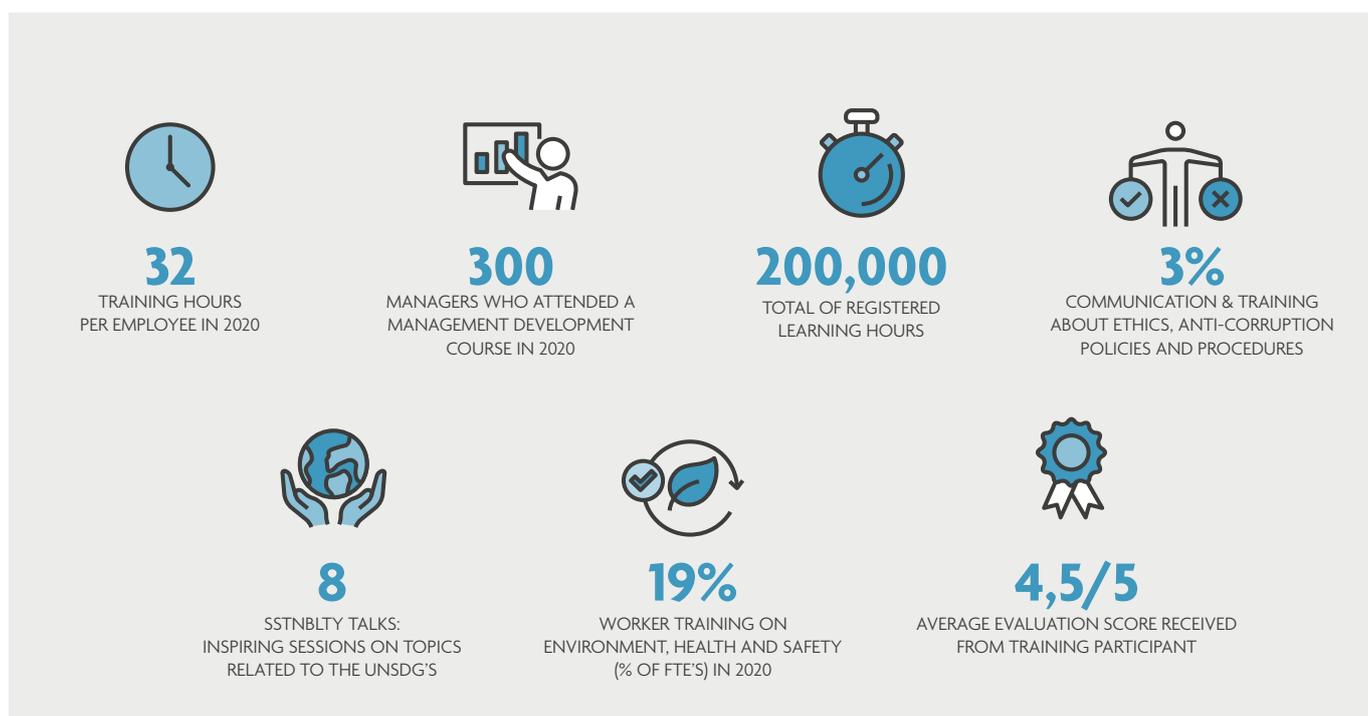
“We encourage our employees to engage in continuous learning through our imec.academy and knowledge sharing through Connect & Learn sessions.”

Only by keeping the focus on giving imec employees the best employee experience, imec can avoid the pitfall of designing and redesigning processes that serve HR but not the employee. Therefore, moving forward imec is enriching the performance management process by simplifying the evaluation, and redefining the link with pay. This will enable continuous feedback and

conversations. In 2020 the guiding principles of this vision were defined and in 2021 imec will on this path, executing some first actions as well as testing some new approaches.

A priority is to remove the barrier to internal mobility. A switch to a different job and context within imec can ensure that new behavior is developed more quickly, resulting in excellence. In other words: that talent is activated. Imec wants to offer these challenging jobs and environments to its employees.

In 2020 100% of imec employees (payroll) received a performance management review and career development review.



3.5 Employee health & safety

Imec cannot remain a top performing organization without being a healthy organization. A point proven once again by the COVID crisis.

“We secure imec’s irresistible charm as an engaging, committing, vitalizing ‘home’ for employees.”

How does imec build such a healthy imec ‘home’?

- Design a **healthy work environment**. The continuous feedback loop imec installed between employee and manager, within teams, between teams and the organization, allows it to keep a finger-on-the-pulse regarding the health and wellbeing of its employees and inspires it to improve. Imec scored 7/10 on “dealing with stress effectively” in the last edition of its engagement and wellbeing survey, which is reassuring. This includes a healthy work-live balance.
- Promoting a healthy lifestyle and motivating employees with some locally organized actions like Move More Challenge, Yoga@ the office and Start to run.
- Providing support **channels and procedures** and make them known, internally or externally. Only with the right combination of internal and external channels, can imec provide support to as many people as possible. Internally, employees can rely on their manager, the official person of trust as well as their HR business partner. Externally they can communicate with the company doctor, prevention advisors for psychosocial matters and the employee assistance program.

2020, the COVID-19 pandemic has proven “**safety**” is a very important topic. Imec outperformed as an organization in the crisis time. Imec should bring this strength to the next challenge: moving from compliance to human-centered safety.

“We promote safety from a technical-only issue to an HR concern.”

This essentially means incident prevention, risk management and compliance – the foundation for a solid environment, health, and safety vision, is strengthened by an EHS management system driving continuous improvement, management leading by example to achieve true excellence in this domain, and a supporting culture of engagement and mutual trust.

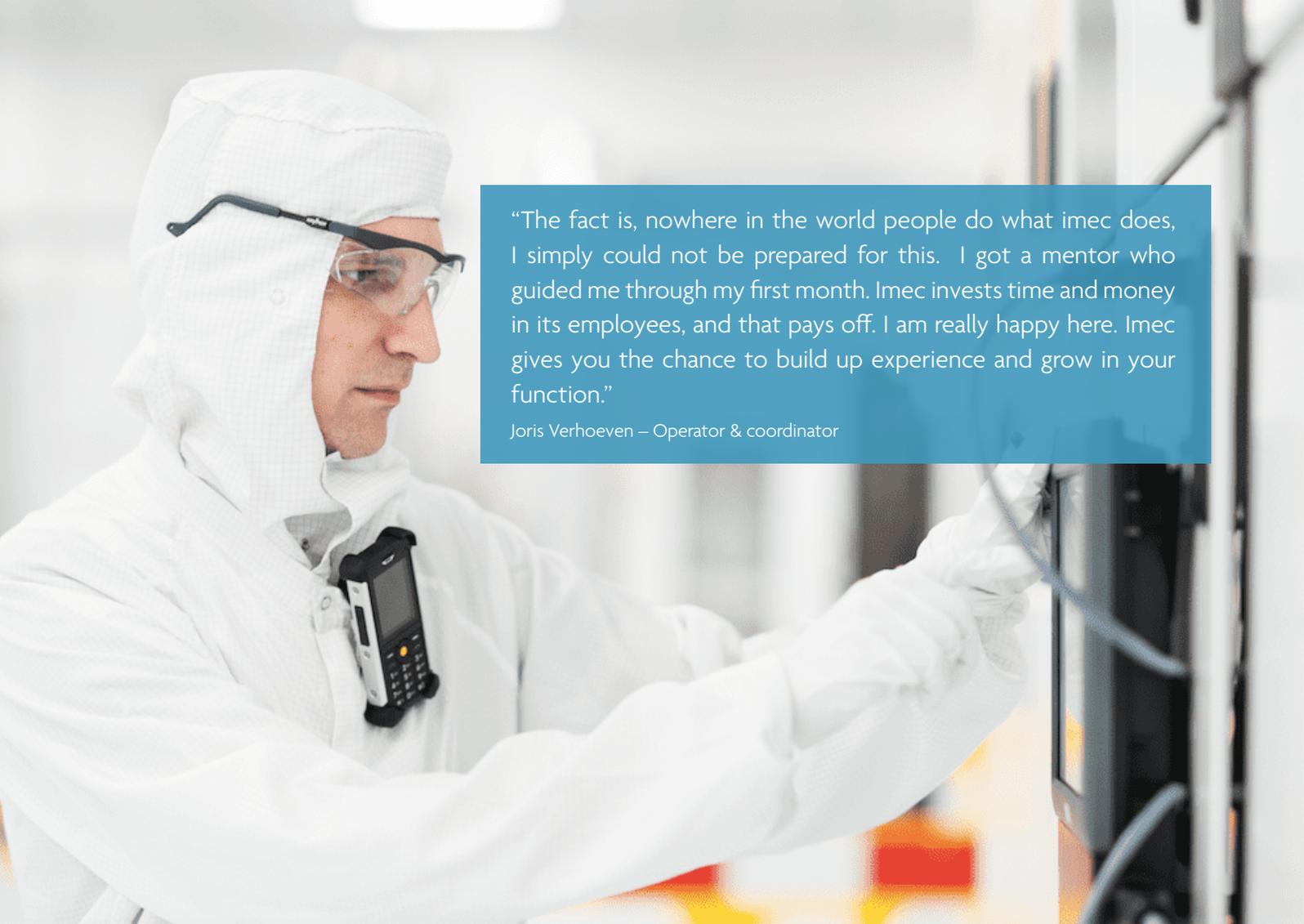
Health and safety are of paramount importance to imec, its employees, customers and the surrounding community. As a Seveso company (establishment which has an activity linked to handling, manufacturing, using or storing dangerous substances), imec must be compliant with the relevant guidelines that follow from federal regulations (in execution of the EU Seveso Directive) and that apply to imec’s activities. Therefore, imec has specific and extensive policies, procedures and control mechanisms.

Imec continuously manages the health and safety risks of its employees. Imec succeeded in achieving industry leading accident rate of 0.30 (based on 1/1,000,000 hours worked) covering both payroll and non-payroll workforce in 2020. Most of the injuries reported with medical costs as consequence are related to incidents with chemicals making body contact for which a preventive check-up was advised and other minor injuries. No high-consequence work-related injuries occurred.

Imec uses an Environmental, Health & Safety Manual. The purpose of the safety manual is to define imec’s policy, core principles and activities with regard to controlling risks and preventing losses. These principles apply to the technological research groups, the supporting logistics groups and to third parties carrying out assignments at imec’s sites, and more specifically the sites in Leuven, Genk, Eindhoven and Wageningen. This safety manual is kept up to date by the Prevention Adviser and Quality Manager each time new risks are identified with the imec Dynamic Risk Management System. There’s a hierarchical structure defined, compliant with regulations to monitor, analyze and modify policies and procedures. Risks must be reported following the existing procedures and guidelines to team or room responsables.

This care system is kept up to date in accordance with the Belgian Welfare Law and the KB regarding the Dynamic Risk Management System as well as the Dutch Arbo law as well as the Working Conditions Law. The care system has been created in accordance with OHSAS 18001 and thus wishes to effect continuous improvement. In addition, this document sets forth the prevention policy for the prevention of severe accidents as defined in article 9 of the Cooperation Agreement (Seveso).

In order to ensure the good knowledge of rules and procedures, an electronic version of the policy statement and care system is available to all imec employees. Every new employee (payroll, contract research, scholarship, student, contractor) is assigned to a personal supervisor who will inform the new employee from the first day of employment of the evacuation instructions, the use of personal protective equipment and all other procedures that are needed to work safely. For each employee working for more than three months at imec, a mandatory training on EHS must be completed and renewed every three years. If an employee doesn’t comply with this rule, access passes are blocked.



“The fact is, nowhere in the world people do what imec does, I simply could not be prepared for this. I got a mentor who guided me through my first month. Imec invests time and money in its employees, and that pays off. I am really happy here. Imec gives you the chance to build up experience and grow in your function.”

Joris Verhoeven – Operator & coordinator

The production process of semiconductors and related technologies implies the use of a number of potentially hazardous chemical compounds in all possible states. The Prevention Department keeps an overview of all known EHS risks associated with the processing of semiconductors and related technologies. Before the introduction of any new materials, or hazardous substances, the project will be evaluated in the Material Introduction Board where among other topics, an analysis of EHS risks is made, resulting in a project approval or refusal.

In order to protect employees with regard to certain workstations and tasks, the responsible departments perform systematic analysis of health and safety risks are carried out systematically. These focus on maternity protection, ergonomics – screen work, ergonomics – handling loads, appliances and chemicals with SHE code.

There are also thorough procedures and standards for the personal protection material of the employees and all site, lab or room entries have a visual indication of which protective equipment is mandatory before entering. Finally, risk analyses regarding EHS are also carried out when introducing new devices or equipment and introduction of new processes.

The risk of fire is extremely high in the production of semiconductors and related technologies because of the raw materials, manufacturing techniques and construction materials used. This is clearly shown by the statistics regarding fire in our industry. That is why imec is investing significant means and people for prevention in the field of technical installations and organization.

4. Reducing our environmental impact

Besides being a key driver in imec's research roadmaps, imec has also adopted sustainability as a driver in the operational departments. Imec is aware of the fact that our operations in itself also have a significant environmental footprint. It has the clear ambition to reduce its carbon footprint and its water footprint. Imec has a remove – reduce – compensate strategy with specific ambitions on its carbon footprint, water usage and mobility.

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 incoming water
- Maximize water re-use

MOBILITY

- Travel policy
- Company car
- Work-home travel

4.1 Carbon footprint

In 2015, imec Leuven drew up a carbon footprint for the first time for scope 1 & 2 (reference year 2014). In 2019, the footprint was calculated on the basis of the Bilan Carbone method and the Greenhouse Gas Protocol, for scope 1, 2 and 3 (reference year 2018). In 2020 an update of the carbon footprint was made using the same calculation method and assumptions. For the imec scope 1 – 2 – 3 carbon footprint, the following groups were identified and calculated:

 <p>SCOPE 1</p>	 <p>SCOPE 2</p>	 <p>SCOPE 3</p>
<p>DIRECT CO₂ EMISSIONS</p> <ul style="list-style-type: none"> ▪ NATURAL GAS ▪ FUEL OIL ▪ FUEL CONSUMPTION OF LEASING CARS ▪ FUEL CONSUMPTION OF SERVICE CARS ▪ COOLING LIQUID ▪ PROCESS EMISSIONS 	<p>INDIRECT CO₂ EMISSIONS</p> <ul style="list-style-type: none"> ▪ ELECTRICITY CONSUMPTION 	<p>OTHER INDIRECT CO₂ EMISSIONS</p> <ul style="list-style-type: none"> ▪ FREIGHT TRAFFIC FROM WAREHOUSES & WASTE COLLECTION ▪ PACKAGES SHIPPED ▪ TRAVEL CAR, TRAIN & AIR ▪ VISITORS EVENTS ▪ PURCHASED CHEMICALS AND GASES ▪ CATERING ▪ USED CITY WATER ▪ WASTE MANAGEMENT ▪ COMMUTING NON-LEASING CARS

Imec has the ambition to reduce its carbon footprint with 65% by 2030, versus reference year 2014, scope 1 and 2 and worked out an action plan to realize this goal.

Since 2015, imec transitioned completely to green electricity, which resulted already in a reduction of 23,000 ton/CO₂e between 2015 and 2016. In the cleanrooms, natural gas will gradually be replaced by installations with heat pumps and heat recovery, which should result in a reduction of at least 3,500 ton CO₂, of which 1,300 is realized by the installation of a heat pump on FAB1 in 2019. In 2020, a scope 1 & 2 reduction of 2,864 ton CO₂ was reached versus 2019 for which gas counts for 66% of the reduction.

IMEC CO₂ EVOLUTION/AMBITION

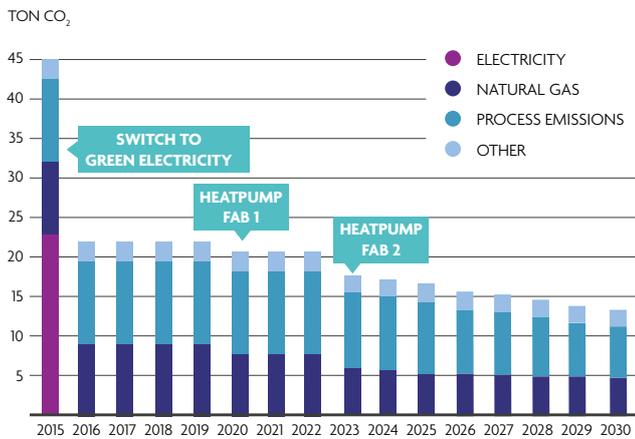


Figure 7 | imec CO₂ emission reduction plan for scope 1 & 2

The process emissions of today 9.8K ton CO₂/year should be reduced to < 7.5K ton CO₂ by 2025. Since the carbon footprint calculation showed that the process emissions coming from GWP gases provide the largest CO₂ contribution, imec wanted to investigate what is possible to better map the process emissions and reduce the emissions. A feasibility study was launched in 2020. For example, all major consumers were identified (SF₆, C₄F₈, CF₄ and NF₃), the effective consumption was checked, leakage tests were introduced during shutdowns and losses were checked during bottle changes and rinses. A plan has been worked out with the ambition to halve the CO₂ contribution from process emissions by 2030 at the latest compared to the values in 2018. From 2021, possible solutions will be implemented and evaluated.

In 2020 Imec knew a large scope 3 decrease, mainly as a result of the strongly reduced business travel. Although new mobility procedures have been worked out, imec expects that scope 3 business travel will raise again throughout the years 2021 - 2022.

Reducing process emissions, the use of gas and electricity, and also the impact of mobility and travel, encourages imec to review policies, procedures and practices towards more climate neutral options. This is already yielding promising first results.

In 2021 an energy balance for the Imec Leuven site will be made including evaluation of the options of a heat/cold grid in order to further reduce the need for energy/natural gas.

“Imec has the clear ambition to reduce its carbon footprint by 65% by 2030.”

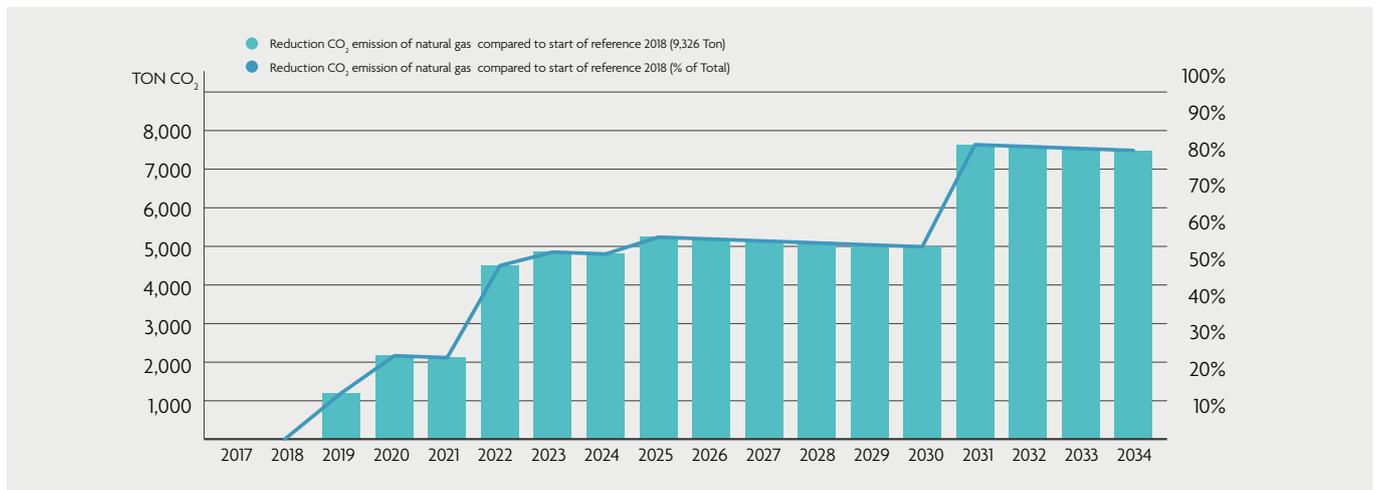
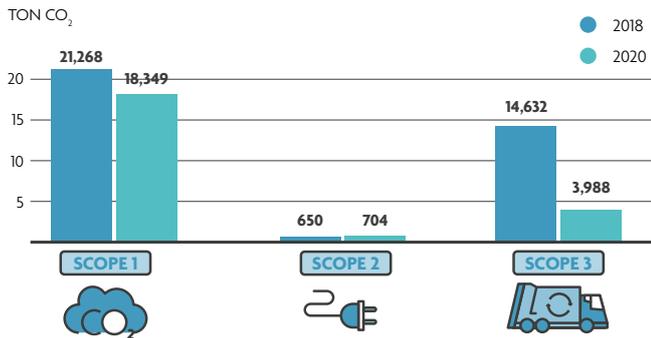
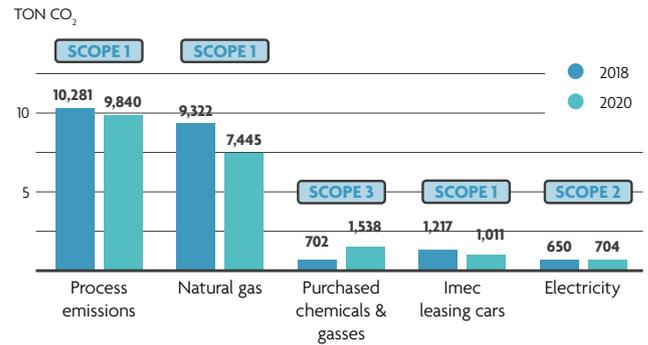


Figure 8 | CO₂ natural gas reduction program

EVOLUTION OF TON CO₂ 2018-2020



TOP 5 EMISSION CONTRIBUTORS' SCOPE 1-2-3



4.2 Energy

Every year, imec selects investments that lead to a reduction in energy consumption. Measures arise on the one hand from an energy scan (4-yearly) and on the other hand by a "green team" energy.

A plan has been developed to nearly halve energy consumption by 2030. The most important action here is to install heat pumps in FAB1, FAB2 and FAB3. The heat pump in FAB 1 was commissioned in 2019. The further roll-out of the initial plan will be continued in 2021 with the installation of a heat pump in CUB/FAB 2.

For the year 2020, imec realized an **estimated energy reduction of 32 865 GJ**. The main reductions could be realized by replacing lighting in the offices by LED lighting, replacement of ventilation filters by more efficient types, etc.

		Unit	
ENERGY CONSUMPTION (owned and leased facilities)	Total energy consumption within the organization from renewable sources.	Gjp	1.056.609,50
	Total energy consumption within the organization from non-renewable sources.	Gjp	144.268,42
	i. Electricity consumption	Gjp	14.869,59
	ii. Heating consumption - Gas	Gjp	99.233,81
	iii. Cooling consumption	Gjp	0,02
	v. Gasoil	Gjp	165,00
	Total energy consumption within the organization.	Gjp	1.170.877,92
	Standards, methodologies, assumptions, and/or calculation tools used.	Internal imec calculations based on data delivered from suppliers.	
REDUCTION OF ENERGY CONSUMPTION	The amount of reductions in energy consumption achieved as a direct result of conservation and efficiency initiatives.	Gjp	32.865,00
	Basis for calculations: Every 4 years an energy plan must be submitted based on an energy audit. In 2017, imec defined that energy consumption should be reduced with almost 100.000 Gjp		

Figure 9 | Overview of imec's energy consumption in 2020 for the main consumption locations (Leuven – Genk – Eindhoven)

4.3 Waste

Imec has 3 fabs on the Leuven campus, FAB1, FAB2 and FAB3. In the past the majority of the liquid was collected and processed externally for all 3 fabs. In recent years Imec invested in on site waste treatment for FAB2 and FAB3 and realised a substantial reduction of externally processed liquid waste. In order to facilitate this, imec separated the different waste systems (type of chemical) at the source. In FAB2 and FAB3 imec has more than 10 different drain types. FAB1, the oldest fab doesn't have such a detailed drain separation system. A study was performed to see till what extent the learning from FAB2&3 could be copied for FAB1 but that seemed much more technically complicated and costly than original anticipated.

As there is a much bigger gain in reduction and reuse of city water, the decision was taken in 2020 not to focus for the time being on liquid waste handling but instead on no more effective water useage.

“It is our objective in imec Leuven to strive for 100% on-site processing of these bulk waste flows in FAB1.”



Figure 10 | Overview of imec's waste groups in 2020, location Leuven

		2020 (Ton)
WASTE GENERATED	Total weight of waste generated (effluents excluded): hazardous waste	254,9
	Total weight of waste generated (effluents excluded): non-hazardous waste	434,6
	Total weight of waste generated	689,6
WASTE DIVERTED FROM DISPOSAL	Total weight of waste diverted from disposal (effluents excluded): hazardous waste - prepared for reuse	0,0
	Total weight of waste diverted from disposal (effluents excluded): hazardous waste – Recycled*	0,0
	Total weight of waste diverted from disposal (effluents excluded): hazardous waste - other recovery operations	144,9
	Total weight of waste diverted from disposal (effluents excluded): non-hazardous waste - prepared for reuse	0,0
	Total weight of waste diverted from disposal (effluents excluded): non-hazardous waste – Recycled*	0,0
	Total weight of waste diverted from disposal (effluents excluded): non-hazardous waste - other recovery operations	246,3
	Total weight of waste diverted from disposal	391,2
WASTE DIRECTED TO DISPOSAL	Total weight of hazardous waste disposed for incineration (with energy recovery)	0,0
	Total weight of hazardous waste disposed for incineration (without energy recovery)	7,5
	Total weight of hazardous waste disposed for landfilling	52,9
	Total weight of hazardous waste disposed via other operations	49,5
	Total weight of hazardous waste disposed	109,9
	Total weight of non-hazardous waste disposed for incineration (with energy recovery)	187,9
	Total weight of non-hazardous waste disposed for incineration (without energy recovery)	0,0
	Total weight of non-hazardous waste disposed for landfilling	0,0
	Total weight of non-hazardous waste disposed via other operations	0,0
	Total weight of non - hazardous waste disposed	187,9
Total weight of waste directed to disposal	297,9	

Scope: All waste from imec's main waste generating locations (Leuven & Genk) for 2020 excluding effluents. Calculations are based on formal data collected and reported compliant with Belgian regulations

*Data for recycled waste is included in the total of waste diverted from disposal – other recovery operations.

Detail on treatment (recycling or other) per waste group:



HAZARDOUS WASTE GROUPS FOR RECYCLING OR OTHER DISPOSAL TREATMENT (EFFLUENTS EXCLUDED)

Glass recycling	3%
Sulphuric acid conversion to ammonium sulphate	11%
Waste oil and photo lacquers (fuel reuse)	54%
Wafer waste (silicon recovery)	3%
Used plastics (plastic recovery)	8%
Sludge from electrocoagulation plant (reuse in cement industry)	8%
Electronic waste	2%
Batteries	0%
Other	9%



NON-HAZARDOUS WASTE AND RECYCLING OR OTHER DISPOSAL TREATMENT (EFFLUENTS EXCLUDED)

Metal	3%
Plastics & glass	11%
Paper/Cardboard	54%
Construction waste	3%
Wood	8%
Isomo	8%
Kitchen waste	2%

“City water reduction, water recovery and reuse of wastewater have seen crucial improvements and remain essential goals for imec.”

4.4 Water management

Responsible water use is a topic that has been receiving a strong increase in attention as more and more regions around the globe as also in Europe become water stressed through global warming. Imec’s cleanrooms consume a considerable amount of water. City water reduction, water recovery and reuse of wastewater have seen crucial improvements and remain essential goals for imec to continuously improve on.

In combination with the reduction of wastewater flows, imec wants to invest in the proactive reduction of the need to use High Purified Water, for which imec today uses city water as source.. Imec started recycling wastewater in 2018, with an investment of €300k. First a pilot installation was built to check the best alternative solution to reuse wastewater. Thereafter a new filter installation was installed as a definitive implementation. Imec now wants to go further by reviewing the need for High Purified Water in the first place and by investigating options to regenerate High Purified Water from waste water streams.

Water withdrawal by source	Total third-party water used (city water)	m³	746.933,75
	Total water withdrawal	m³	746.933,75
Water discharge	Total surface water discharged	m³	614.640,00
	Total water discharged (sewer)	m³	18.767,00
	Total water discharged (external treatment, effluents included)	m³	1.321,40
	Total water discharge	m³	634.726,00
	Evaporation	Evaporation	m³

Figure 11 | Overview of water usage and discharge in 2020 for the main consumption and discharge locations (Leuven – Genk – Eindhoven – Nijmegen)

Imec currently consumes approximately 2000 m³ of water per day for its operations, or more than 746,622 m³ per year in its highest water consuming locations in Belgium.

In 2020, more than 230,000 m³ of water was reused, or 100 m³/day reuse of wastewater. As a result, imec has less intake of city water and less discharge of wastewater. In 2019 imec had an intake of city water of +/- 800.000 m³, in 2020 this was 746.622 m³, which means > 50.000 m³/year savings on city water in 2020. Water usage is one of the main focus areas within the sustainable use of resources for the process departments and therefore ambitious targets were defined. Together with an engineering advisory firm, imec is currently investigating the possibilities of increasing water reuse to 80% in the long term.

4.5 Mobility

HR not only wants to manage the imec colleagues sustainably but wants to extend this intention to our planet as well. In May 2020, a new fleet & mobility officer joined the HR department. A mobility survey has been conducted to learn how employees commute to and travel for work, and what they think is important for their choice of transport mode. Imec wants to learn what employees expect, what win-win actions could be taken, and how to gain support for these actions, to reach the higher objectives. In 2020, a mobility website and community were launched, and 'a mobility month' was organized. In September, staff was challenged to question their travel behaviour and improve it in the long term.

Imec's mobility strategy is based on the 'avoid – shift – clean' principle. In 2020 some important milestones in mobility were reached:



AVOID: Decrease commuting altogether

The link with "hybrid" working is obvious, and also why imec wants to facilitate this in tools and allowances. Already before the COVID 19 pandemic, +10% in the share of people working from home on average 1 day per week or more, was well within reach. This policy will be further implemented on a structural basis.

SHIFT: Increase sustainable transport to commute, decrease car use

In 2019, imec launched a so far very successful bike lease policy. In December 2020, imec counted 281 bicycles in its fleet, 67% electric bicycles or speed pedelecs. Imec receives an average of 10 lease bike orders per month.



Furthermore, imec reformed the bicycle allowance. Each bike commute now generates a compensation. The target of 30% cyclists for employees who live close to imec and 15% cyclists for those who live further away from imec, respectively, is mostly "on track".

CLEAN: Decrease car emissions to commute

In 2020 imec launched a new car policy passing the cost of CO₂ emissions to the end user and allotting an extra budget to those who choose a more ecological car. The past years, imec has invested to foresee loading infrastructure for electric cars on imec sites. Imec employees could take electric cars for a test ride as well. Total emissions and the average emissions per car (catalog value) are monitored and expected to decrease.

At the end of 2020, imec had 453 cars in its fleet, of which 17% are more sustainable cars (hybrid, plug-in hybrid and electric). Imec's average fleet emissions were 111g of CO₂ per km. 80% of the cars, ordered in 2020 were green. The average emissions of these are 52g of CO₂ per km.

CARS IN USE			CARS ORDERED		
Diesel	250	55%	Diesel	6	11%
Gasoline	127	28%	Gasoline	5	9%
Gas	1	0%	Gas	0	0%
(plug in) Hybrid	70	15%	(plug in) Hybrid	38	72%
Electric	5	1%	Electric	4	8%
TOTAL	453		TOTAL	53	
Average CO ₂	111		Average CO ₂	52	

Imec's ambition by 2023:

- Mean fleet CO₂ emissions (g/km) – target max. 100 gr
- 50 % green cars in total fleet – target 50%
- 50 % electric vs 50 % fuel for hybrid cars

Imec's plans for the near future are stimulating employees to think about which mode of transport best suits their needs by offering flexible combination of multiple transport options. This includes car and bike sharing into the offering, introducing a mobility app to enable imec in realizing this ambition and implementing more charging infrastructure.

Travel policy

Because imec is internationally oriented, business trips are frequent. In 2020, the travel policy was thoroughly reviewed to reduce the impact of business travelling. The new policy includes clear guidelines for intra-EU travel and binding advice for international travel. For destinations that take between 5–7 hours traveling by train from Brussels, people are advised to use an alternative transport option like train, coach, or carpooling.

The Travel request contains 4 criteria, to evaluate the necessity of the travel request: Does the travel plan concerns more than one meeting or business activity? Does it concern external meetings with non-imec partners? Does it concern activities that cannot take place virtually, per tele- or videoconference? Is the minimal necessary number of imec employees represented at the activity verified?

A group of 'Frequent Travelers' was gathered to provide the new sustainable travel policy with support within imec, and to provide concrete implementation tips.

4.6 Biodiversity

More food, energy and materials are supplied to humankind than ever before, but this is achieved by an unbalanced withdrawal of natural resources. It is also imec's responsibility to look at nature management and biodiversity. In general, imec avoids any release through liquids or exhaust air of any pollution into the local environment. Liquids are locally collected and treated internally or externally before being drained in the nearby river or sewer. Exhaust air is treated in abatement systems that facilitate exhaust washing, prior to release in the air.

Furthermore, in 2020 imec concluded an agreement with Natuurpunt in 2020 and the ByeBye-Grass charter was signed.

Collaboration with Natuurpunt

Thanks to financial support from imec, Natuurpunt has been able to purchase 3 hectares of nature in the Molenbeek valley (Leuven area) to create a new nature reserve: Dalemhof. The haylands of Dalemhof had been out of use for a while, but remained well preserved and with high potential for nature restoration. This also applies to the entire Molenbeek valley: a complex of nature reserves that reinforce each other. With imec's support, Natuurpunt can now further work on the development of the rich biodiversity, which can on its turn contribute to cope with climate change.

Natuurpunt also provides professional advice to improve biodiversity in the outdoor space of the imec campus in Leuven. Furthermore, Natuurpunt helped to place a nesting box for peregrine falcons on the roof of the imec tower.

Imec also wants to focus on involving imec employees in conservation activities and guided walks. Such initiatives help imec to increase the mindset for biodiversity among employees and create a larger, stronger support for nature conservation and biodiversity.

Byebye-Grass- Charter

Together with other Leuven companies and organizations, imec signed the 'ByeBye Grass Charter' of the City of Leuven and Leuven 2030. Imec is committed to increase biodiversity on its sites. Experts will provide tailor-made advice for this.



5. Ethics & Good Governance

5.1 Ethics & Governance

All entities within imec adhere to the corporate guidelines regarding business development, finance, human resources and operations. Imec's **Good Governance Charter** prescribes a reasoned system of good governance, taking into account the specific mission and status of imec as a non-profit organization. An **audit committee** and an **appointment and remuneration committee** are part of imec's governance structure.

The boards of directors of all entities belonging to imec have taken note of the Charter and have accepted that they will comply with the principles set out therein. They conscientiously follow and monitor the guidelines and generally accepted principles in this context. In particular, the various deliberations within the respective management boards are closely monitored in order to avoid any conflict of interest.

Like any company, imec is also exposed to various internal and external risks, which, if they occur, could have serious consequences for its stakeholders, activities, environment and financial situation. Therefore, the management of these risks is of key importance. An Enterprise Risk Officer was appointed in 2018 and reports directly to the chairman of the audit committee. In addition, imec implemented an **Enterprise Risk Management** approach, resulting in a risk register in 2019. This is now complemented with specific risk – and control frameworks.

Ethics Code of Conduct

Imec's **Ethics Code of Conduct**, updated in 2020 and published in 2021 completes the strategic framework of imec's vision, mission and values. It is a guide that helps to manage ethical dilemmas and take the right steps in problem situations. Compliance with the Code of Conduct is followed by an **ethics committee**. Imec has also a **Code of Conduct for imec's partners**, as imec believes that mutual respect for this Code of Conduct is a guarantee for building a trustworthy, fruitful, sustainable and professional collaboration between imec and its partners. The Code of Conduct for partners was also updated in 2020 for use in 2021. Through its research and associated efforts, imec aims for the long-term perspective of a better life in a better society. To this end, imec works closely with partners such as suppliers, research partners and customers.

In imec's Code of Conduct, the R&D center defines its **policy on fraud, anti-corruption, bribery, corruption and conflict of interest**. In addition, another set of policies have been adopted and specific contractual clauses are used related to contract

management, privacy and data protection, information security, animal welfare and biosafety, export controls, etc. Concerning compliance with export control regulations, there's a systemic screening of partners and potential partners (employees, customers and suppliers) against 350+ global lists for restricted persons, embargoed countries, and companies that are owned by these denied entities. In addition, it enables imec to identify risks on fraud and corruption. Therefore, imec uses an external tool. In 2020, 1 potential partner was flagged and further investigated following imec's internal procedures. No R&D collaboration was set up.

In order to assure the good follow-up of these policies as well as to protect persons who communicate risks, breaches or violations of the policies, whistle-blower's procedures and protection measures are in place or being drafted, according to country specific rules of law. Imec provides regular training on these topics for imec employees. All new employees receive a general introduction training on data and information security and related elements of the imec Code of Conduct.

Scientific integrity is an integral part of imec's organisational culture. Imec's policy in the field of scientific integrity focuses on promoting good research practices. As a reference framework, imec uses the codes of conduct at Belgian (www.belspo.be) and at European level (www.allea.org). Imec has a Commission for Scientific Integrity (CSI), which is responsible for imec's integrity policy. This committee also deals with possible breaches against scientific integrity, such as plagiarism, falsification or manipulation of data.

An internal Research Integrity Officer is responsible for coordinating the integrity policy. Imec is also a member of the Flemish Committee on Scientific Integrity (VCWI). The entire imec group has a transparent internal and external communication policy, both from a management perspective, as well as from an operational and logistical perspective, with attention to the timing of the communication and its serenity and objectivity.

5.2 Procurement

Imec firmly believes that suppliers are key providers of innovative, qualitative, sustainable and cost-effective solutions. Imec's operations involve certain risks regarding the supply chain. Therefore, the supply chain requires attention both from the business and the purchasing department. Imec also attaches great importance to complying with the principles of good governance and ESG. When concluding a contract, all suppliers must sign the negotiated agreements. The concerned supplier hereby endorses the imec Code of Conduct for partners. This way, 100% of the contracts are followed up. In 2020, new steps were taken in the further development of the purchasing policy and the associated processes and support tools, with core focus on the qualification and selection of new suppliers and the control of existing suppliers. A key principle in these processes is risk-based assessment, for which objectives have been defined.

Another significant modification to the former procurement policy, is the integration of specific sustainability topics as part of the Supplier Management Process. In 2021 new and existing suppliers will be evaluated on several additional criteria such as use of materials from conflict zones and child labour. Suppliers are also questioned about their sustainability policies and available certifications.

Imec is also paying attention to local purchasing. It is within imec's policy to contribute to the sustainable economic growth of the communities where imec is located. When defining Belgium as region for calculating the spent on local suppliers, imec reached 57,7% of local suppliers for those goods and services sourced via imec's procurement department at HQ Leuven.

5.3 Information and data security & GDPR

R&D information and information in general are one of imec's key assets. They represent great value and should therefore be adequately protected from many risks including information security and compliance risks. Information security is defined as the process of protecting information and associated assets from accidental or intentional breaches in order to ensure the confidentiality, integrity, availability and traceability of information. Information security at imec is achieved by implementing an adequate set of technical control measures as well as non-technical measures like policies, processes, procedures and guidelines.

Imec has a decentralized risk management organization, overseen by imec's Risk Officer and an Enterprise Risk Management approach supports the achievement of imec's objectives by addressing the full spectrum of risks.

Building an efficient and effective Information Security Framework (ISMF) involves the understanding and influencing of human behavior, such as attitudes, as well as implementing the necessary contractual, organizational, process and technical controls. Imec uses a structured and documented ISMF to improve the maturity of its information security risk management and control environment, based on industry good practices such as ISO 27001, CSF (Cyber Security Framework) and CIS (Center for Internet Security).

Imec's Information Security Management Framework is applicable for all imec entities and imec provides the necessary education and training to ensure that employees are familiar with and understand the information security policies and endeavor to comply with it. All new employees receive a training explaining what information and data security rules entail and how to involve them in their daily operations. In 2020 the information security department launched the creation of an ambassador community. This community helps to raise awareness around these topics and also contributes in developing tailor-made trainings for imec employees. In 2021 further focus will be given to this awareness creation.

In 2020 the Information Security team reported 154 security incidents. For none of these, there was an impact on imec business, or impact on partner related information. The main group of reported incidents are related to phishing attempts.

In addition to information and data security, the protection of privacy is also an important pillar. Imec is compliant with applicable privacy legislation including the GDPR. Imec has appointed a DPO (Data Protection Officer) and has the necessary policy guidelines and procedures in place. These procedures have been proven effective. When (preventively) reporting data breaches to the regulatory authority, imec received the feedback that the correct procedures were followed and correct measures were taken.

	2019	2020
Number of personal data breaches reported to the authorities	2	0

In 2020, further information and awareness raising activities were organized and this will remain an important focus point in 2021, more specifically within the research departments.

6. Sustainable partnerships



Imec is convinced that joint research and collaboration can lead to groundbreaking achievements that contribute to sustainable development, both internationally and regionally with companies, organizations and governments. No single organization can tackle the challenges the world is facing today on its own. It is necessary to join forces. And this was exactly the purpose when imec started in 1984: concentrate resources and people as a unique, powerful way to create disruption. Come up with groundbreaking research and innovation through state-of-the-art infrastructure, brilliant minds and an open and multidisciplinary ecosystem to provide the building blocks for a more sustainable world.

Sharing costs, talent, risks and benefits. As an independent research center, imec, headquartered in a small region in Europe and helped by the continued support from the Flemish government since its start, managed to realize this.

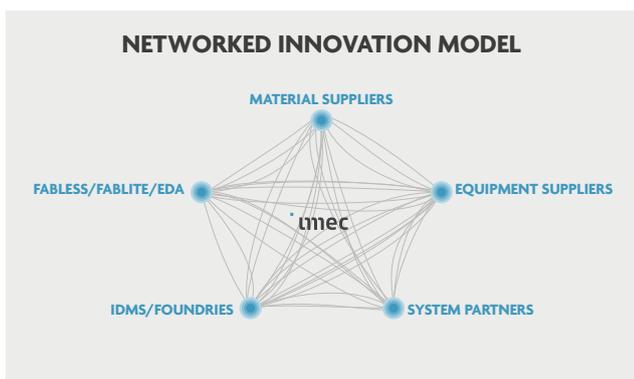
Unique global ecosystem across the value chain

Imec has set up the world's most advanced infrastructure for semiconductor research in which it brings together all the key players along the value chain. In our cleanroom more than 500 professionals work 24/7, so in a through continuous mode, with the goal to reduce cycle time and to optimize learning cycles. In its cleanroom imec is working with all the advanced equipment suppliers. More than ever, equipment & material suppliers are playing a key role in collectively tackling the scaling challenges posed by today's fast-evolving, equipment-intensive, semiconductor landscape. Strong R&D interactions between manufacturers and suppliers at an early stage of development accelerate technology advancements and optimize the return on investment for all partners involved. Imec performs cutting edge research on materials, device concepts and process steps. And it makes these innovations industry-ready.

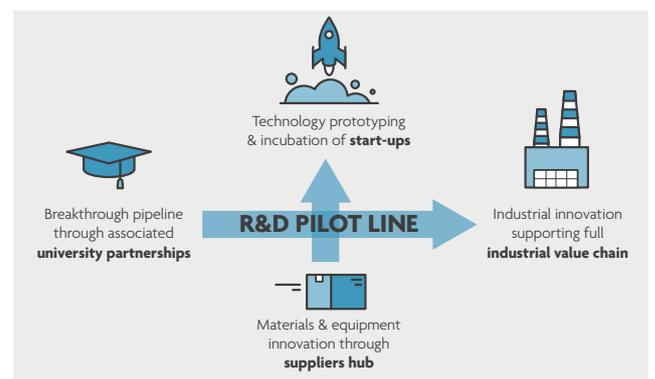
requirements at a system level, it tries to identify how innovative processes and materials need to be developed.

Imec has developed a unique partnership model. It offers a unique neutral environment where the entire chip creation process can be designed and tested. Imec has built up a relationship of trust with the various players over more than 30 years. It is, as it were, the Switzerland of the chip sector. The neutral crucial link in the research and development process.

“Imec is the Switzerland of the chip sector. The neutral crucial link in the research and development process.”



Imec's R&D programs unite all key players from the global semiconductor industry: leading equipment and material suppliers, IDMs (integrated device manufacturers), foundries, fabless and fablites companies, and application partners, as well as leading academia and knowledge centers, for groundbreaking R&D. By bringing together all these leading companies the R&D center is changing the innovation model from a sequential innovation model, where innovation is brought from one layer of the value chain to the next one into a networked innovation model. This allows it to basically short circuit the ecosystem. Starting from



Imec collaborates with more than 200 universities from all over the world. These academic partnerships fuel its long-term pipeline and bring fundamental understanding. With the R&D pilot line, imec transforms academic innovations into industrial innovations. This is enabled through a major participation from all leading equipment and material suppliers in imec's supplier hub. Together, we develop new concepts and leading-edge technology platforms. With these technology platforms, we are also supporting many startups, which often lack access to high-end technology.

The Flemish ecosystem

The interaction between academic research at universities, strategic research centers and industry, makes a substantial contribution to the innovation and the economic development in a region. The overview below shows the channels through which imec shares its expertise with the Flemish ecosystem. A key success factor to support Flemish companies is imec's local network of research oriented/supporting organizations that together form our Flemish innovation ecosystem, supporting their member companies to come to new collaborations. The ongoing cooperation between imec and these key organizations in the Flemish innovation ecosystem leverages imec technology and expertise, transferring these technologies and know-how to industry and non-profit organizations to increase the common impact to society.

These collaborations span a broad range of organizations as illustrated by the following non-exhaustive overview of partners imec is working with:

- Strategic Research Centers: Flanders Make, VITO, VIB
- Spearhead clusters: Flanders's Food, VIL, Catalisti, SIM, Flux50, De Blauwe Cluster
- Innovative business networks: Smart Digital Farming SDF, EUKA, smart buildings in use, Flanders Health, Space4.0...

- Collective centers: Sirris, WTCB, Centexbel, OCW, CRM...
- Other research centers and network organizations: ILVO, VLIZ, Sciensano, Pack4Food, DSP Valley, Flanders Bio, Health House, Medtech Flanders, MedTeG, the Beacon, VRI...
- Academic partners: Flemish universities, university hospitals and colleges
- The public and non-profit sector: Flemish & federal government administrations and agencies, small and large cities, elderly care centers, RVO society, ESA, EARTO...
- Sector and employer federations, regional development companies: Voka, Unizo, Fevia, BeMedTech, Agoria, Sirris, PMV, FPIM, LRM...

Imec is also active in the local community as a founding member of Leuven Climate Neutral (Leuven 2030), a group of citizens, companies and organizations who aim to make Leuven climate neutral by 2050.



Imec stakeholder dialogue

GROUP	DESCRIPTION	RELATIONSHIP	KEY TOPICS 2020
01 INDUSTRIAL PARTNERS	Long-term partnerships with top semiconductor (IDM's, Foundries, Fabless&Fablite companies, Equipment suppliers, Material suppliers, EDA companies) and system companies,	Joint research in nanoelectronics on the long term, in shared research roadmaps. Relationships based on trust and excellence.	Creation of added value by world-class infrastructure, brilliant minds (people) and a local and global ecosystem of diverse partners across a multitude of industries.
02 CUSTOMERS	From large, worldwide accounts to SME's (bilateral, development on demand, low-volume manufacturing)	Bilateral R&D collaboration, innovation services and solutions.	Ensure fluent transition from imec R&D (building blocks) into impactful products & services. Define the potential of relevant nano- and digital technologies within the roadmap of the companies.
03 EMPLOYEES	Payroll and non payroll. Non payroll workers are guest researchers, industrial residents, PhD's, assignees, students, contractors, flex forces.	Attracting, nurturing and growing world leading talent. Ensuring a safe, healthy and inclusive workplace with equal opportunities to grow. Imec wants to be a place where extraordinary people deliver extraordinary results.	"1) Introduction of the Connected.minds surveys 2) Cross-team collaboration 3) Respect for each contributor 4) Diversity & inclusion focus"
	Employee representatives selected through social elections.	Represent the employees interests in the works council	Social dialogue: 2020 representation elections
	Board/AC imec VZW and Board of Directors of imec international.	Assess the overall direction and strategy of the business and appoint the CEO	Good governance, based on a Good Governance Charter. Selection of board members based on expertise and competences.
04 GOVERNMENTS	Flemish government	This collaboration is regulated through a covenant. The objective is to bring new developments to the market through partnerships or startups and to help businesses and universities gain access to new technologies.	Support to industry and startups in their digital transformation and innovation efforts through bilateral and joint collaborations with many partners ranging from research centers, clusters and federations. Imec support Flanders to become a top EU smart region.
	Federal government	Advising in imec domains of expertise in a neutral independent way, based on technological and scientific evidence.	Support to the Belgian government in their key priorities: 5G, health, digitization... Provide open innovation and platforms for optimal compatibility.
	Cities of Leuven, Genk, Antwerpen, Gent, Hasselt.	Support each others objectives through initiatives, projects and open innovation to realize positive impact for citizens and local government.	Proactive regular communication and collaboration on diverse topics: expats community, mobility, climate goals, biodiversity, ... Join forces on the specifics per city; Leuven Mindgate and Leuven 2030 in Leuven, EnergyVille in Genk, Smart City, Mobility & Logistics research in Antwerp city and port and Ghent.
	European Commission	Joint research to support the EU Commission's objectives.	Collaboration in joint research programs.
05 GOVERNMENTAL INSTITUTIONS	Belgian Science Policy Office - Belspo, Vlaio, FWO, DPA, Flemish audit authorities, etc.	Bringing R&D to the industry.	Focus on future strategies for innovation. Participate in projects making use of the available instruments of these organisations.
	Environment inspection	Supervisory authority charged with enforcing environmental policy.	Annual external environmental and safety controls in addition to self-monitoring program.
06 UNIVERSITIES	KU Leuven, VUB, UGent, UAntwerpen, UHasselt, Wageningen University, Radboud University, etc.	Ensure that imec's lines of research keep in touch with breakthroughs emerging in academic research.	See detailed ecosystem description.
	Universities in Europe, the United States & Asia.	Develop strong international network of universities including PhD agreements, exchange of samples, student exchange and internships, access to equipment, promotorship of imec doctorates, strategic collaboration projects, etc.	See detailed ecosystem description.
07 SUPPLIERS	Set of preferred partners for procurement of supplies and services at the imec locations	Follow up of service and supply quality according to agreed contractual terms in respect with the Imec CoC for partners and general imec Terms & conditions.	Review of the CoC for partners, review of the procurement policy & targets setting, introduction of a supplier questionnaire on sustainability related topics.
08 VENTURING PARTNERS	imec.xpand, imec.istart, spinoffs.	Business accelerator (imec.istart) or Incubator (imec.xpand).	Coaching and mentoring, access to technology, to network, to investors, to facilities (istart). Derisk, accelerate and find funding (xpand).
09 TRADE AND PROFESSIONAL ORGANIZATIONS INTEREST GROUPS	Scientific Community & Scientific Advisory Board.	Exchange of strategic viewpoints and positioning, performing events together to support each other role.	Regular advisory board meetings and follow up of given advise.
	VOKA Unizo Agoria Beltug etc.	Bridge between imec and the individual organizations.	Support the industry in their digital transformation by knowledge transformation, joint research projects, open innovation.
	Environmental interest groups and organizations.	Protect the planet for current and future generations. Research and innovation. Responsible production and consumption and circular economy.	Collaboration with Natuurpunt, Bye bye Grass project, etc.
10 FINANCIAL INSTITUTIONS	National and international financial institutions.	Partners for financial products.	Financial management
11 POPULATION SOCIETY	Large (non-technical) audience, teachers, youngsters.	Inform, educate, interact.	Knowledge transfer, stimulate to go for STEM education, increase digital and scientific literacy, DataBuzz, EDUbox programs.
12 PRESS MEDIA	Global specialized media, local media.	Press relations and collaboration with PR agencies.	Press releases & publication of articles, opinion pieces and interviews.
13 COMPETITORS	Other R&D entities.	How to collaborate with trust.	Exploration of ways to work together. Participating and collaboration in common interest projects.

Solidarity

2020 was a very special year in terms of Social Responsibility, precisely because of the Corona crisis that hit everyone. Imec quickly decided to deploy its expertise, available material and knowledge where the need was high.

Actions were set up to support companies and education in setting up digital solutions, for example by offering free training modules. Imec helped to develop the coronalert app to inform people when they came into contact with an infected person, while respecting the privacy of the individual. Imec also collected and donated PCs for underprivileged young people in various cities where imec has a branch: Leuven, Antwerp, Ghent, Brussels. Protective equipment and masks were donated to centers in Leuven, Ghent and Genk (ZOL Hospital East Limburg via EnergyVille). In addition, there were also spontaneous actions by employees with 3D printers, for printing parts of face masks, or with sewing machines for making mouth masks.

Imec's internal focus on social responsibility is driven by belonging, diversity and solidarity in the workplace, in local communities and around the world. Health issues are also present close to home. Everyone has friends, family and colleagues who are affected by diseases such as cancer and Alzheimer's. That is why a large imec team actively participates every year in Levensloop, an event that raises money for cancer research and pays tribute to the daily struggle of patients with the disease. The fundraising campaigns that imec employees organized for the 2020 edition of Relay for Life were carried over to the 2021 edition.

In addition, Knitting for Alzheimer brought together a group of creative imec employees who sold more than 350 homemade face masks, some of which were sent to the Visa Academy, a school in Kenya with which imec has a partnership (see below). This action raised money for Alzheimer's research.

The imec employees support 30 Kenyan girls in their fight against poverty and female genital mutilation by giving them the opportunity to study and thus break the cycle of poverty. The Empowering Girls Through Education project has now been running for 6 years and imec also installed a computer class in the Visa Academy, the primary school of the girls in the program.

Through the imec Sinterklaas Fund, imec annually donates to organizations where employees work as volunteers. This year Casa Magnolia (care for seriously ill children), May I ask something (help children with questions about homework) and Awel (listening to children and young people with a story, a question or a problem) each received a donation.

With employees from more than 100 different countries, imec is a melting pot of cultures and nationalities. This means that in every (natural) disaster worldwide, friends or family of employees are involved. At such times, solidarity on the work floor is very high and actions are invariably organized. In 2020, a benefit collection was organized to benefit the victims of the explosions in Beirut and the victims of the natural disaster in Izmir.



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7. About this sustainability report

This sustainability report gives a true picture of imec's social, environmental and ethical performances relevant for imec stakeholders and for imec itself.

2020 was a special year in many ways. There was not just the pandemic which forced everyone to respond in a very flexible and humane way, rethinking priorities and acting upon. It was also the year where imec prepared its business plan for the coming years. The perfect opportunity to fully anchor and integrate its purpose, "Embracing a better life", in the long-term strategy, from the start - by design. And at the same time the opportunity to take stock and readjust ambitions and objectives.

Reporting period

Publication date: 16 June 2021

Reporting period: 1 January 2020 – 31 December 2020, this is also the imec fiscal year for all entities under the imec umbrella. The sustainability report is accessible online at www.imec-int.com/sustainabilityreport.

It is imec's first and voluntary edition. Imec will continue to publish sustainability reports on an annual basis as it is a transparent and public statement about ambitions and progress towards the goals.

Reporting standard & approach

Imec has reported according to the GRI guidelines. This report has been prepared in accordance with GRI Standards, Core option. The GRI content index can be found on pages 50-53. Scope coverage for KPIs and omissions are explained in the relevant chapter. The report structure and content have been set up with imec's sustainability policy and the materials topics as a baseline. The management approach is integrated in the sections associated with 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. Imec will seek further external feedback from its stakeholders to deepen its understanding of all sustainability related impacts.

In 2021, imec will continue working on its long-term goals. Being a global leader in nanoelectronics research, it implies the ambition of developing sustainable technologies and processes for the next generations of chips. Paving the way and setting an example for a more sustainable semiconductor business globally. Adding environment as additional criterium is one of the focus points of imec's research, next to work on reducing the CO₂ footprint in the own operations by focusing on process emissions and water use reduction. And paying attention to create a vital, diverse and inclusive working environment. It's our ambition to create

disruptive digital system innovation in domains as healthcare, industry4.0, energy, mobility etc. taking sustainability as a key driver.

Contact details

For questions regarding this report: contact Tru Lefevere, Director stakeholder relations, sustainability@imec.be

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8. GRI index

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103-49	Changes in reporting	not applicable	This sustainability report is imec's first public sustainability report describing material topics, related policies, goals and progress,
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103-51	Date of most recent report	not applicable	This sustainability report is imec's first public sustainability report describing material topics, related policies, goals and progress

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401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	p. 25	
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