



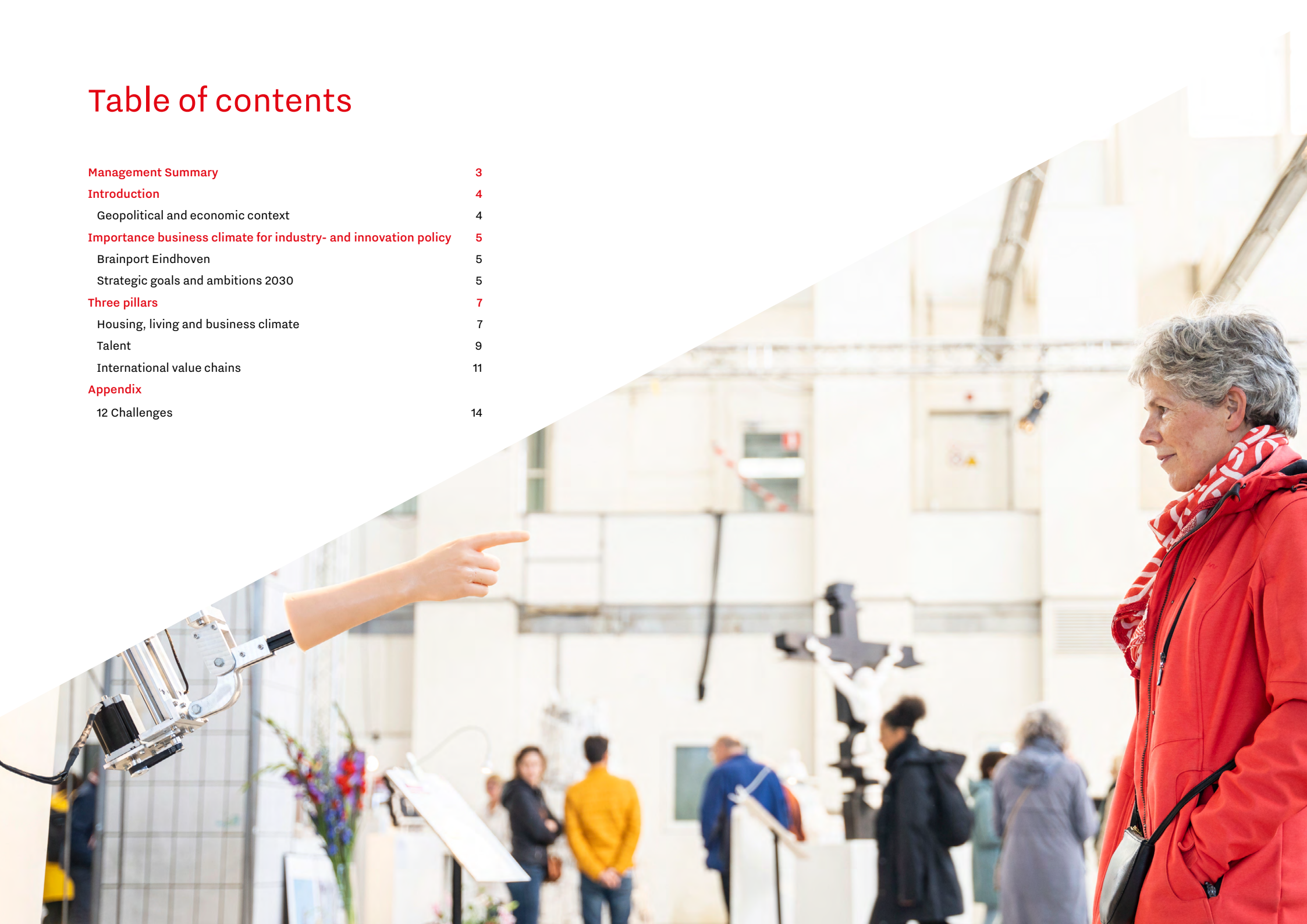
Provincie Noord-Brabant

Strategic Agenda Brainport



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Management Summary

The Brainport region strengthens the Dutch international competitive position, the European internal market, and the pursuit of a geopolitical playing field in which Europe will become less dependent on other parts of the world. Maintaining this international position is vital for the position of the Netherlands in Europe and the rest of the world, but it is certainly not self-evident.

This agenda is therefore intended as a framework for cooperation between the national government and the region until 2030, aiming for a certain and future-proof economic growth for the Netherlands based on high-quality technological production that contributes to the strategic autonomy of Europe. Being able to protect and invest in important knowledge, key technologies, vital chains, systems and networks (such as campuses and other innovation hubs) is an important part of this.

Private R&D expenditure in the Brainport region amounts to 3 billion euros a year, which is more than that of the combined urban regions of Amsterdam, Rotterdam and Utrecht. The manufacturing industry in the Brainport region accounts for 11.3% of the Dutch Gross Value Added, making it the highest value-added region in the Netherlands. The region also attracts a lot of talent, almost 20% of Dutch all R&D talents work in the Brainport region. This contributes significantly to Dutch exports, since 36% of the national high-tech exports come from the Brainport region. Due to extensive networks and supply chains, the Brainport economy also has a positive effect on other knowledge and innovation regions (synergy). The Brainport region earns money for the Netherlands.

We can therefore rightly conclude that Brainport does not represent a “regional economy” but is a powerful engine for the entire Dutch economy. Furthermore, it has enormous growth potential. The ambitions and objectives outlined in this strategic agenda are aimed at seizing the opportunities that already exist, for the benefit of all of the Netherlands.

At the same time, the region is facing significant challenges. A broad perspective is needed if we want to continue accommodating the development of companies such as ASML, DAF, VDL and Philips in the region, maintaining the supply chain behind them for the Netherlands, and sufficiently protecting the European strategic autonomy of the high-tech manufacturing industry. The region can only consolidate its growth figures if there are sufficient appealing homes, if the region is sufficiently accessible, if there is enough space for housing and scaling up new innovative companies, if there is an adequate supply of talent and if participation is open to everyone.

The joint ambitions, leading up to 2030, that form the substance of policy dialogue between the national government and the region are, that:

- a. The region can take a spatial leap.
- b. Sufficient talent is available.
- c. Technological competitiveness is strengthened.
- d. Resilient supply chains are in place.



Introduction

Geopolitical and economic context

In a context of changing geopolitical relations, increasing international competition in technology and talent, and tensions in trade relationships, control over strategic value chains is of great importance¹. The preservation of such an international position is vital for the position of the Netherlands in Europe and the rest of the world but it does not happen automatically². The Brainport region can play a key role in the European internal market by contributing to a clean, sustainable, and safe future in which everyone can participate. The Dutch and European economies benefit from an adaptive Brainport region. The strategic goal is a sure and future-proof economic growth for the Netherlands based on high-quality technological production that contributes to the strategic autonomy of Europe, including the Dutch contribution to the European ambition of bringing at least 20% of global chip production to Europe by 2030.

Competitive business climate and talent competition

A favourable business climate is therefore crucial. Industrial and innovation policies help to continue contributing to secure economic growth in the future. This requires sufficient affordable housing, good accessibility, liveability and enough capacity on the electricity grid. In addition to a spatial leap, the availability of talent is crucial, and investments in excellent research and education at all levels (practical, theoretical, and scientific) are important³. The extremely tight labour market has long made it a challenge to find technically skilled personnel in the Netherlands. Compared to other countries abroad (including several competitive European countries), the Netherlands has relatively few technically skilled individuals in proportion to the total workforce⁴.

Projections show that under unchanged policies, the outflow in technical professions will exceed the inflow. At the same time, there are still too many people who are unable to participate, remaining on the side-lines. A smart combination of efforts by the national government and the region is needed to guide people into work and ensure a consistently good alignment of education with the regional and international labour markets⁵, such as in a European context.

Global technology competition and raw materials

In addition to changing geopolitical relations, we see an increase in global competition regarding the development and export of strategic technologies. For example, the semiconductor industry worldwide is witnessing record levels of investments in research and development, and raw materials such as lithium for the automotive industry are essential to contribute to the digital, green, and circular transition. There is an urgent need to mitigate strategic dependencies and prevent the establishment of new strategic dependencies in critical raw materials⁶. The high-tech manufacturing industry in the Brainport region and the associated supply chains in other regions such as Twente, Wageningen and Delft can play a key role in this. The technological manufacturing industry is the engine of our innovative economy through the development and application of digital and other key technologies⁷.

¹ Top Sectors (2021). 'From government as market master to entrepreneur and director'.

² National government (2022). Strategic agenda for the business climate in the Netherlands.

³ National Government, 2022. Letter to Parliament on Open Strategic Autonomy.

⁴ National government, 2022. Making a difference with strategic and green industrial policy.

⁵ Central government, 2022. Policy letter for higher education and science.

⁶ Central government, 2022. National Raw Materials Strategy.

⁷ National government, 2022. The importance of the Dutch business and business climate.

Importance of business climate for industrial and innovation policy

The region is where it happens: it is where companies, scientists, talent and societal organisations come together, where new initiatives occur and opportunities for renewal and innovation⁸ are found. For the future earning capacity of the Netherlands, having sufficient talent remains a crucial requirement on which the engines of the knowledge economy rely. This talent can only be retained if there is an attractive living and working environment for them. This requires sustainably accessible residential and work locations, affordable housing and additional amenities to strengthen cohesion in neighbourhoods and districts and cultural facilities and special education and childcare, for example.

Brainport Eindhoven

Global players

The international success of Brainport is based on proximity, close ties between industrial global players and high-quality knowledge and educational institutions, combined with a focus on deep-tech entrepreneurship. The knowledge base of global players such as ASML, DAF, VDL, Philips, Thermo Fisher Scientific, Signify, and NXP forms an innovative ecosystem with over 7,000 companies, knowledge institutions, and governments in the High-Tech Systems & Materials (HTSM) sector working together on new technologies, future earning capacity and international value chains. Over 22,600 private R&D employees (nearly 20% of the total number in the Netherlands) work in regional high-end campuses and for companies. Almost 5% of the region's workforce is classified as R&D personnel. These employees collaborate with researchers and academics at knowledge and educational institutions such as vocational schools, Fontys University of Applied Sciences, Avans University of Applied Sciences, Eindhoven University of Technology, Tilburg University, TNO(-ESI), Holst Centre, DIFFER, and hospitals. As an illustration: 16% of the TU/e (Eindhoven University of Technology) publications between 2017-2020 were produced in collaboration with industry⁹.

Mass in research and development (patents and R&D)

Collectively, companies and knowledge and educational institutions in Brainport account for over 25% of the Netherlands' private R&D investments¹⁰. Private R&D expenditure in Brainport Eindhoven amounts to 7.1% of the regional GDP (2019). So Brainport Eindhoven and its high-tech ecosystem are excellently positioned to contribute to the strategic ambitions of the EU.

Brainport is also among the top 5 regions in terms of patent applications filed at the European Patent Office (EPO) and per capita, it ranks first. The regional patent applications, more than 3,300, represent over 50% of the total number of Dutch patent applications. With approximately 6,500 applications in 2021, the Netherlands ranks 8th worldwide.

Region as a development platform

Brainport collaborates in long-term programmatic partnerships to develop and scale up new technologies in a public-private setting. For example, PhotonDelta serves as a national platform to become a frontrunner in the global photonics chip industry. Another example is the Battery Competence Cluster-NL, which focuses on battery technology for the energy transition, and its acceleration. This cluster started regionally in 2019 and has now become a national platform where companies, knowledge institutions and organisations join forces to build knowledge and competences in battery technology. Such platforms enable a large number of smaller companies to collaborate as a virtual company. Resources are allocated for business intelligence, business development, high-risk investments in R&D and general organising capabilities, enabling parties to jointly formulate their strategies and advance towards Europe.

Strategic goals and ambitions for 2030

Through national networks with other (technological) regions, companies and knowledge and educational institutions in the Netherlands, investments in technology developed in Brainport Eindhoven lead to new startups and growth of the manufacturing industry far beyond the region thanks to chain collaboration between large companies and SMEs. These technologies underlie innovative contributions to sustainability, mobility, health and food. This offers further development opportunities to build new and robust employment opportunities and to safeguard economic growth and sustainable earning capacity through exports. The strategic goal is to achieve this secure and future-proof economic growth for the Netherlands based on high-quality technological production and which contributes to the strategic autonomy of Europe. This includes the Dutch contribution to the European ambition to bring at least 20% of global chip production to Europe by 2030. Underlying ambitions to achieve this are:

⁸ AWTI (2021). 'Advice: Setting the bar high together - Region and state joining forces for innovation'.

⁹ CWTS Leiden, Ranking 2022.

¹⁰ Refer to the Brainport Monitor for the most up-to-date figures on Brainport Eindhoven.

<https://brainporteindhoven.com/en/discover/strategy/monitor>

Living, quality of life and business climate

By 2030, there will be sufficient available housing, infrastructure, amenities, greenery, work locations and network infrastructure to accommodate the region's growth (in a climate-friendly manner) while maintaining broad prosperity for all residents. This includes:

- More space for people and the economy (construction): at least 62,000 homes have been built, and there is ongoing planning for housing and accessibility in the broader region until 2040 (including student housing)¹¹.
- Improving the national and international accessibility of the region.
- Ensuring the growth of the provision of services (both qualitatively and quantitatively), such as basic education, sports, culture, healthcare and childcare, to promote broad prosperity.
- Accommodating the qualitative and quantitative demand for business space in the region and beyond so as to retain vulnerable knowledge and innovation for the Netherlands.
- Ensuring that there is sufficient capacity on the energy network and enough nitrogen capacity in conjunction with the housing and accessibility ambitions and economic functions, such as business parks.

Talent

By 2032, 50,000 tech and IT jobs in the region will be filled by training, retraining, attracting and retaining additional talent. This includes:

- Increasing the inflow of students and producing an additional 12,000 graduates from technical programmes.
- Increasing participation through a public-private approach and adding 8,000 additional career-switchers in tech and IT.
- Retaining an additional 9,000 talents for the technology sector.
- Increasing the stay rate to 65% and actively attracting international workers.
- Increasing labour productivity in the Brainport industry by 10% (from €138,000 in 2019 to €151,800), positioning the Netherlands back in the top 6 countries (as it was in 2017¹²) with the highest labour productivity (ranked #10 in 2021). This will reduce the need for an additional 5,000 jobs. See also International Value Chains.

International value chains

By 2030, the Netherlands' strategic positions in existing international value chains will be strengthened, and new key technologies and international value chains will be developed in which the Netherlands has a strong and strategic position. This will include:

- Increasing total national R&D expenditure to 3% of gross domestic product (GDP) without a decrease in the private sector's contribution¹³, while Brainport Eindhoven's private R&D investments continue to account for 25% of the national private total.
- Ensuring that North Brabant remains among the top 5 European regions with the highest number of patent applications.
- Positioning Eindhoven among the top 10 globally in terms of deep tech development, talent and patents¹⁴.
- Increasing labour productivity in the Brainport industry by 10% (from €138,000 in 2019 to €151,800), once again placing the Netherlands among the top 6 countries (as in 2017¹⁵) with the highest labour productivity (ranked #10 in 2021). See also Talent.
- Increasing the gross value added of the industry in Brainport by 20% (€9.9 billion in 2019) and accounting for 15% of the national industry's gross value added (11.3% in 2019).

¹¹ The minimum housing construction programme for up till 2030 will be established in the Zuidoost-Brabant housing deal, which is currently being prepared.

¹² Ministry of Economic Affairs and Climate Policy. Business Policy Snapshot: How is the Netherlands doing?

¹³ In line with the "Kamerbrief met Actieplan innovatie en valorisatie" (2022).

¹⁴ Dealroom: the next generation of tech ecosystems (2022).

¹⁵ Ministry of Economic Affairs and Climate Policy. Business Policy Snapshot: How is the Netherlands doing?



Three pillars

Housing, living and business climate

A spatial leap is essential if we are to accommodate the growth of the manufacturing industry. This is a significant challenge, as the region is currently facing increasing traffic congestion, a strain on the electricity network, housing market shortages, pressure on neighbourhood cohesion and a provision of amenities that is lagging behind. Traffic and network congestion already have a direct impact on the quality of life and business climate. To take the leap, it is necessary to balance steps in all aspects of broad prosperity. In the contexts of housing, living and business climate, the following actions are needed:

- Realising homes and improving accessibility.
- Accommodating the growth of student housing.
- Ensuring the basics are in order: preserving, accommodating and strengthening liveability and amenities.
- Continuously planning for economic work locations.
- Accelerating solutions for the energy network and nitrogen capacity.

Realising homes and improving accessibility

Spatial Leap until 2030

In the BO MIRT (Governance Consultation on Multiannual Infrastructure, Spatial Planning, and Transport Programme) of 9 November 2022, agreements were made regarding the spatial leap in Brainport until 2030. It will consist of the following five priority tasks, with the possibility of increasing the estimates for the Multimodal Public Transport Hub Eindhoven Central by a maximum of €48 million if funding is found¹⁶:

- Acceleration agreements for Fellenoord/Knoop XL Eindhoven.
- Short-term mobility transition measures package.
- Multimodal Hub Eindhoven.
- HOV 4 / De Run / High Tech Campus Eindhoven.
- Main and underlying road network.

Investments in the Multimodal Public Transport Hub Eindhoven Central will accommodate the expected growth in public transport and enable the development of a new, highly urban residential and work environment in the heart of the Brainport region.

This will involve the realisation of nearly 5,000 homes by 2030 and an additional almost 5,000 homes after 2030. The investment in the HOV4 connection directly contributes to the realisation of approximately 11,400 new homes, with over 6,500 homes by 2030 (and nearly 5,000 homes in the subsequent period) and strengthens the connection between the city centre and top economic locations.

In the BO MIRT of November 9, 2022, additional investments were made in the A58 Eindhoven-Tilburg, and the first of three steps were taken in the Future-Proof Rail Programme for South Netherlands, creating the connection to the other public transport challenges in the Multimodal Hub Eindhoven. The total package of investments in the Brainport Deal 2030, A58 Eindhoven-Tilburg, and the Future-Proof Rail Programme for South Netherlands, agreed upon in the BO MIRT 2022 and previous BO MIRTs, amounts to over €1.5 billion.

For the main and underlying road network, it was agreed that the 2020 MIRT Study on Urbanisation and Accessibility, along with other relevant documents such as those approved at the BO Environment 2022, supplemented with the most recent insights, such as mobility growth, mobility transition effects, economic development, and the pace of housing construction, will serve as the basis for an updated proposal, which will be scheduled for decision-making at the BO MIRT in 2024.

Living and accessibility programming up till 2040

The Brainport region consists of 21 municipalities. As stipulated in the Metropoolregio Eindhoven Cooperation Agreement, they jointly bear the responsibility for the spatial leap. In line with this, a regional development perspective is being developed by the State and Province in the context of the NOVEX area Stedelijk Brabant, with a focus on housing, amenities, and accessibility, with adaptive programming. A Woondeal Zuidoost-Brabant 2023 (Housing Deal Southeast Brabant 2023) for all 21 municipalities of the Metropoolregio Eindhoven (Eindhoven Urban Area, De Kempen, De Peel, and the A2 municipalities) is being prepared, which will define the minimum housing programme up till 2030.

¹⁶ Central Government, List of Agreements for Administrative Consultations MIRT 9, 10 and 11 November 2022.

<https://www.rijksoverheid.nl/documenten/rapporten/2022/11/14/afsprakenlijst-bo-s-mirt-2022>

For the heart of the area - the Eindhoven Urban Area - a Verstedelijingsakkoord¹⁷ (Urbanisation Agreement) was reached in 2022. The State, Province, water authority, and municipalities involved have closely collaborated in this agreement. All parties concerned are collaborating on the steady implementation of the agreements outlined by the State and the region, based on the principles agreed upon. The other three regions - De Kempen, De Peel, and the A2 municipalities - are working on a concrete elaboration of their plans, with the aim of achieving an integrated development strategy for the entire Southeast Brabant region that will ensure both its distinctive qualities and the value of the region as a whole in the future.

Within the framework of the spatial leap (Schaalsprong), the State and the Region will continue to collaborate on a strategic agenda towards 2040 for the Brainport region¹⁸ of Eindhoven. The 2020 MIRT study and the urbanisation agreement for the Eindhoven Urban Area show that additional investments will be required after 2030 for mobility transition, including improvements in public transportation at both the national level (Future-Proof Rail South-East Netherlands: Eindhoven Central as a hub for South Netherlands) and regional level (e.g., strengthening the HOV radials from Eindhoven and Helmond to the region), as well as measures for the main and underlying road network in and around Eindhoven and Helmond.

Accommodating the growth of student housing

A significant increase in the number of student units will be necessary to implement the measures outlined in the “talent” pillar. This will entail a minimum of 10,000 units by 2030 (in addition to the current shortage of 1,500 units). It is important to collaborate on solutions and instruments to realise student housing within the region itself, as well as in the surrounding cities and municipalities.

Getting the basics in order: preserving, accommodating and strengthening liveability and amenities

Of all amenities, prosperity and well-being overlap the most directly. Regional basic amenities are crucial to the well-being of residents and consequently instrumental to sustainable growth. To maintain the liveability of the region, efforts are being made to provide additional amenities, such as basic education, sports, culture, healthcare and childcare. The region can only make a future-proof spatial leap if its residents in both urban and rural areas continue to support it and see that they can also benefit from it, bridging the different worlds that come together in Brainport Eindhoven.

Inspired by the “barcode¹⁹” developed in Utrecht, the development and growth plans are being made for the Metropolitan regio Eindhoven. The theme of liveability also includes regional goals and collaboration regarding Climate-Neutral Cities in the Netherlands²⁰.

Programming economic work locations

Space in the Netherlands is scarce, and there is increasing pressure on space. Various societal issues, such as housing, energy transition, restoration of nature, and the economy, all compete for space, including in Brainport Eindhoven²¹. Projections show that the development and growth of certain industrial sectors and sub-sectors in the region will continue unabated in the coming years. It is necessary to explore how growth and the integration with supply chains in the Brainport region and other regions can be accommodated, if we are to preserve vulnerable knowledge and innovation for the Netherlands.

Accelerating solutions for energy networks and nitrogen capacity

In conjunction with the urbanisation agreement and economic growth, the energy network and nitrogen deposition present obstacles that require attention in implementing the plans. The energy transition places accelerated demands on the existing electricity network. To achieve ambitions in terms of housing, mobility, business expansions and production process sustainability, the current network needs significant reinforcement and expansion, along with accelerated flexibility in usage. Expanding the network has long lead times, similar to building highways, and requires substantial operational capacity. Personnel is needed, to expedite the strengthening/expansion of the regional network up till 2030, promote local sustainable generation, and employ innovative solutions to minimise the energy network’s load and make it more flexible. Differing ambitions and locations compete with each other for the existing capacity on the network.

Nitrogen is a significant point of focus for the development of business space, housing and infrastructure, especially since there is still much uncertainty, and frameworks are partly determined by recent, and possibly to be expected, court rulings. Problem-solving capacity, an integrated approach, and collective prioritisation of spatial challenges are necessary to accelerate progress in this regard. This is not only important for safeguarding economic growth but also for simultaneously enhancing the quality of the living environment, including working from the principles of “water and soil management” and regional broad prosperity.

¹⁷ Urbanization Agreement Urban Area Eindhoven, June 2022 - Agreements for a future-proof urbanization of the Eindhoven Urban Area.

<https://static.metropoolregioeindhoven.nl/downloads/Bijlage-3b-Verstedelijingsakkoord-afspraken.pdf>

¹⁸ Central Government, List of Agreements for Administrative Consultations MIRT 9, 10 and 11 November 2022.

¹⁹ Spatial Strategy Utrecht 2040 (participation version January 2021).

²⁰ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_2591

²¹ See e.g. ‘Making a difference with strategic and green industrial policy’, specifically ‘Directing physical space for industry.’

Talent

Challenge and five action lines

By 2032, approximately 71,200 jobs will be created in the broad HTSM sector in the Brainport region (43,485 at the vocational level and 27,715 at the higher vocational and university levels). This number is composed of replacement demand due to retirement (18,500) and expansion demand due to growth (52,700). With the current level of graduates (adjusted for entry into the regional labour market), 17,500 vacancies can be filled. That leaves the task of filling more than 50,000 job vacancies by 2032.

The focus is on technical talent (tech and IT) because it is crucial to the strong HTSM sector in the Brainport region, a sector that contributes the most to the earning capacity of the Netherlands and the societal transitions we need to achieve. However, the regional ecosystem can only function well if other critical sectors such as education, healthcare, childcare, construction, etc. also have an adequate supply of skilled individuals.

The labour market challenge can only be achieved by focusing on five core measures based on three principles:

- We consider the entire labour market, including the group of people who are currently unemployed.
- Where possible, we break down traditional barriers in education, for example, through continuous learning pathways from primary to secondary education and from vocational to higher education. The same applies to the distinction between public and private sectors; we need companies and educational institutions to work and invest together.
- Lastly, we carefully assess which programmes can be implemented locally and which can be realised through collaborations with institutions in other regions.

Given the current labour market shortages, we really need to examine how and where breakthroughs can be stimulated in the short term. To address the labour market challenge in the tech and IT sectors, the following is necessary:

1. Increase participation rate through a public-private approach.
2. Increase the influx of students and the number of graduates in technical education.
3. Retain talent in the field of technology.
4. Enhance growth of labour productivity.
5. Actively attract international talent and increase the stay rate.

Increasing the participation rate through a public-private approach

It is important for the entire workforce to participate as much as possible and engage in lifelong learning to remain sustainable and employable. This can be achieved, for example, through a training fund with a flexible public-private offering of education. The goal is to increase the labour force participation rate (to >73% by 2023). All talents are needed, and untapped and unrecognised potential (early school leavers, refugees, spouses) are encouraged to choose careers in tech and IT through alternative entry programmes. This requires continued and renewed efforts by labour market regions, regional mobility teams and employers, and adjustments in laws and regulations. By increasing labour force participation rate, we aim to fill 8,000 vacancies by 2032.

Increasing the influx of students and the number of graduates in technical education

One aspect of the talent puzzle lies in increasing the number of students and regional graduates in technical education. This starts in primary education. To create a sustainable solution for labour market shortages in the long term, the region proposes a phased approach to align the required number of students at all education levels and across various disciplines (humanities, sciences and social sciences) with the demand from the high-tech manufacturing industry in the Brainport region. The ambition is to achieve an additional 12,000 technical graduates by 2032. Collaboration with the industry is crucial in ensuring an optimum integration of theory and practice, through hybrid learning environments like public-private company schools of the 21st century and the Brainport Study Fund, for example. Additionally, collaboration is sought at the regional, provincial and national levels with a range of vocational, higher education and university institutions to accommodate the growth of the high-tech manufacturing industry and unlock relevant offerings and expertise. Examples include ROC-ter AA, Summa, Fontys, Tilburg University, TU/e, JADS, KMA, Avans, BUAS, and collaborative partnerships such as 4TU and EWUU (Utrecht and Wageningen). This requires a sufficient number of well-trained teachers in tech and IT at all education levels.

Retaining talent for technology

The government and the region are investing in the retention and continuous development of talent for tech and IT while minimising voluntary attrition and leakage from the sector. Within one to five years after graduation, 21% of technical graduates are already employed in non-technical professions and sectors. After fifteen years or more, this percentage increases to 34%. The leakage is even higher among female technical graduates, indicating significant room for improvement. Modern employer practices, including primary and secondary employment conditions, are necessary to make the profession and work more attractive and to retain individuals in the sector. This initiative could help retain 9,000 workers over the next 10 years. The business community in Brainport Eindhoven takes responsibility for the labour market challenge by investing both individually and collectively in attracting and retaining talent for their companies and/or the region.

Increasing growth of labour productivity and reducing capacity demand

As of 2022, the Netherlands ranks tenth on the list of countries with the highest labour productivity worldwide. However, compared to previous years, the Netherlands has dropped in the rankings. This is partly due to the fact that labour productivity has barely increased since 2008. The Dutch labour productivity growth lags behind that of the United States and other countries in the top 10. To avoid further decline, a significant labour productivity offensive is needed, aiming for a 10% acceleration in labour productivity growth by 2032 (from €138,000 in 2019 to €151,800²²). Close collaboration with partners such as those involved in the Technology Action Plan²³, is crucial. This includes broader implementation of new digital and production technologies, such as robots, autonomous vehicles, Additive Manufacturing (3D printing), Systems Engineering and AI. This offensive will reduce the additional labour capacity demand by 5,000 jobs in the Brainport region and contribute to improving the country's global position (the Netherlands ranked 6th in 2017 and 10th in 2021²⁴).

Targeted attraction of international talent and increasing the stay rate

Brabant is an international region where multicultural talent stimulates innovation. Attracting and retaining international students, as well as knowledge workers and labour migrants, is one of the actions needed to address the labour market shortage in tech and IT in the coming years. This will be done in collaboration with educational institutions, employers and organisations such as the Holland Expat Centre South and the upcoming Brabant Migration and Information Point. The knowledge workers and labour migrants needed already possess the necessary skills and can quickly enter the job market (more quickly than new students, for example). Programmes like the

Brainport Talent Attraction Programme focus on selective attracting of international talent to strengthen and further develop the Brainport ecosystem. Europe is a logical and important market for recruiting talent that already holds a degree. This public-private programme aims to attract international tech and IT talent at the vocational, undergraduate and graduate levels for companies and organisations in Brainport Eindhoven. The programme's strength lies in the collaboration between regional employers. As part of this programme, Spanish and Italian tech and IT students and recent graduates are matched with companies in the region that offer work experience opportunities. Brainport collaborates with many universities and colleges in Spain and Italy and continually explores possibilities in other countries²⁵.

International students, with their unique knowledge, can make a significant contribution to the Dutch economy, especially after graduation. To retain this group as effectively as possible, it is important to increase the stay rate of international students, which refers to their likelihood of staying in the country. For instance, nearly a quarter of international students continue working in the Netherlands five years after graduation. Graduates from technical studies tend to stay in the country for a relatively longer period. Among all university graduates who pursued technical studies, 40% are still residing in the Netherlands five years after completion. Compared to the national average, foreign students who graduate from the Eindhoven University of Technology (TU/e) are more than twice as likely to continue living and working in the Netherlands (52% versus 25%)²⁶. Efforts are being made to increase the stay rate to 65%. The Fontys ICT programme already has a stay rate of 75%. By raising the stay rate and implementing the other four measures, the annual influx of international students can be limited to the level of early 2023 (16,000 individuals).

²² Refer to: <https://brainporteindhoven.com/nl/ontdek/strategie/monitor/economie>

²³ Technology, Construction, and Energy Labour Market Shortage Action Plan. <https://www.technieknederland.nl/stream/aanvalsplan-techniek-nov-2022>

²⁴ Ministry of Economic Affairs and Climate Policy, 2022. Business policy in focus. <https://www.bedrijvenbeleidinbeeld.nl/bedrijvenbeleid/arbeidsproductiviteit>

²⁵ Refer to: <https://brainporteindhoven.com/nl/ondernemen-en-innoveren/ondernemen/hoe-kan-ik-internationale-kenniswerkers-aantrekken>

²⁶ Nuffic, 2022. Research: Higher education is an important channel for knowledge workers.



International value chains

To achieve the strategic goals and ambitions, the government and the region collaborate by leveraging current policy frameworks, programmes and financing instruments from Europe, the government, and the region. This includes initiatives such as the National Growth Fund (NGF), Regional Deals, IPCEI, the nationwide network of Regional Development Agencies (ROMs), the PPS Surcharge, generic innovation instruments (such as WBSO, Innovation Box), and programmes in the Knowledge and Innovation Agendas (KIA) and the Knowledge and Innovation Contracts (KIC).

Efforts are being made to:

- Align with national missions and ministries.
- Develop value chains around technologies and growth markets.
- Enhance and sustain facilities.
- Utilise and solidify innovation campuses.
- Establish a future-proof high-tech manufacturing industry.
- Engage in international innovation, trade, and collaboration.

Aligning with national missions and departments

In order to capitalise on the opportunities presented by global transitions, it is important to align with national missions and departments. This includes exploring possibilities for technology applications in Defence, the economic and societal potential of medical technology (medtech) for healthcare transitions with the Ministry of Health, Welfare, and Sport (VWS), innovative forms of mobility with the Ministry of Infrastructure and Water Management (IenW) to promote sustainable mobility, or Ministry of Agriculture, Nature and Food Quality (LNV) interventions and instruments to strengthen the connection between high-tech and agrifood.

National security

Geopolitical tensions highlight the need to enhance the protection of citizens and vulnerable technologies, with an increasing focus on commercial technology and research. It is important to invest more in the development of artificial intelligence, machine learning, quantum technology, and data security (including algorithms and systems to secure and compromise communication, data transactions, and storage, including quantum-resistant encryption methods, blockchain and cybersecurity in general). Security experts consider artificial intelligence, big data, photonics, quantum technology, robotics and autonomous systems, and semiconductor lithography as the most critical emerging technologies for future defence applications. The Brainport region is home to numerous companies, educational and knowledge institutions, and security organisations that develop and offer such technologies.

Developing value chains around technologies and growth markets

It's relatively clear where our strengths and existing strategic positions lie now and in the future but less so for potential new strategic positions. Developing new strategic positions within international value chains requires a good understanding of the ecosystem's strengths, weaknesses, opportunities and threats to identify niches (business intelligence). This approach allows us to choose where to focus our capacity and collaborate with businesses, knowledge institutions and governments to explore areas of market traction.

Occupying positions in value chains and key technologies does not revolve solely around general digital technologies, manufacturing technologies or photonics. It operates at a deeper level, encompassing specific technologies combined with their possible applications (growth markets) and the strengths of Brainport and the Netherlands. Based on these combinations, public-private roadmaps are developed, involving national partners. This approach follows a model where a joint public-private innovation infrastructure is established, on which R&D projects are based, leading to proof-of-concept in products or, for example, the built environment. Subsequently, this leads to industrial scaling. In a way, we are continually building a new 'PhotonDelta' on each technology, key technology or application. Since many solutions also need to align with European policies, instruments, and bilateral technology and innovation collaborations, the government plays an important role in connecting with Europe. It is therefore necessary to strengthen control points²⁷ and establish sustainability in areas such as:

- **(Key) technologies:** micro-nano electronics, chip design, batteries, integrated photonics, quantum, artificial intelligence, molten salt, additive manufacturing, systems engineering, thin-film technology, smart biomaterials, complex molecular systems, computational science, engineering health, metal fuels, etc.
- **Growth markets:** energy transition (generation, storage, usage), medtech and healthcare transition, sustainable and smart mobility, agricultural and food processing sustainability, built environment, defence, and security.

It is important to note that the technologies and applications we select are based on the strengths of the Brainport region (substantial private R&D budgets, industries, knowledge positions of universities and research institutions) but are by no means exclusive to Brainport. Development does not stop at regional borders. Here, too, the comparison with PhotonDelta is inspiring; based on content, we seek collaborations with other parts of the Netherlands and the world.

²⁷ Top Sectors (2021). From government as market manager to entrepreneur and director.

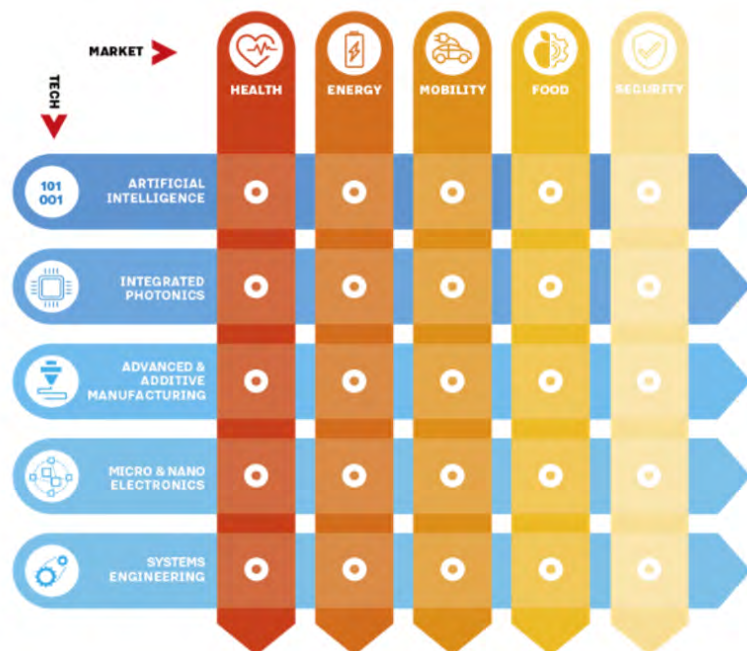


Figure 1: Some of the tech-market combinations that Brainport is developing

Generic and specific agility

It is often not so clear which strategic positions can be occupied for potential new value chains, and it is not uncommon to see that there are no players already acting as frontrunners to establish a position or build an ecosystem²⁸. To gain insight into this, there is a need for generic agility between knowledge institutions and companies to collectively identify opportunities and, ultimately, value chains based on key technologies and business intelligence.

When markets or technologies are already in a more advanced stage of technological maturity (such as chip design, advanced manufacturing, and medical technology), with potential producers and/or consumers, specific agility is required to test and demonstrate prototypes and subsequently connect financial instruments and funds.

Developing and sustaining shared facilities

To ensure the emergence of innovation, also ongoing, regional research and innovation ecosystems need to strengthen themselves. They know what is required but cannot achieve it alone. There are **generic** facilities that support the regional innovation ecosystem, such as The Gate, serving as a one-stop-shop for start-up entrepreneurs, the Cyber Resilience Center Brainport, which assists SMEs in the OEMs' digital resilience chain, or small exploratory public-private partnership (PPP) innovation projects (such as in Eindhoven Engine). Other examples include a Natlab-like institute to accelerate innovation, an innovation programme like the 'Factory of the Future' and a shared clean room for startups.

In addition, **specific** facilities are needed to test, measure, develop, and experiment with new applications. These include laboratory facilities, pilot production lines, tools and equipment, and other infrastructure (pilot). Examples of such facilities could be an additive manufacturing pilot production line for industrial applications, testing and lab facilities for chip design or batteries, or an MT (Medical Technology) Centre infrastructure for a medical wearables value chain. While the importance of this type of pilot infrastructure is recognised, private parties are often reluctant to invest due to the high level of uncertainty and risks associated with pilot infrastructure and the fact that the ultimate market demand and application of key technologies may not immediately be clear. In addition, for some new applications of key and other technologies, the existing ecosystem consists solely of SMEs, startups, and scale-ups that do not have sufficient resources to invest in this infrastructure. The government and the region will jointly finance and sustain R&D and other facilities.

Startup and scale-up climate: the region as an incubator

Startups and scale-ups play a crucial role in finding innovative solutions to societal challenges. Early-stage financing is vital for many key and other technologies and startups because they are often far from the market with their product and application. The Brainport ecosystem is characterised by a substantial need for capital, long development time and high risks, and it requires specific investment knowledge. It is therefore necessary to make good use of existing financing instruments and funds from organisations such as BOM, Invest-NL, the province, RVO, the government, and European programmes.

In collaboration with a wide range of partners from the Brainport ecosystem, The Gate provides start-up entrepreneurs with advice on housing, financing, training, coaching and collaboration. This support covers various themes and application areas. Startups are connected to existing opportunities through The Gate, which serves as a one-stop shop, linking them to resources such as Braventure, Brabant Startup Fund, Brabant Development Agency (BOM), and InvestNL.

²⁸ See 'Letter to Parliament with Action Plan for Innovation and Valorisation', page 24 (of the Action Plan)

Leveraging and sustaining innovation campuses

Innovation campuses serve as physical meeting places for (regional) innovation ecosystems and are essential for promoting and accelerating innovation, facilitating collaboration, knowledge exchange, and generating new ideas. They are equipped for valorisation, finding solutions to societal problems, attracting international talent and strengthening our earning capacity.

From the perspective of national and international value chains and control points, the various innovation campuses in Brainport Eindhoven are extremely important. Each campus in the region has its own specialisation, such as the Automotive Campus, Brainport Industries Campus, Strijp-S/T, TU/e Campus, ASML Campus, Philips Health Campus, and High Tech Campus Eindhoven.

While campuses are often privately owned, this also presents opportunities to facilitate collaboration between companies in the same R&D chains. However, it is important to ensure that centrally organised countries do not gain access to vulnerable knowledge and interests concerning national security. This calls for a critical application of the ViFo Act, ensuring that companies have good cyber resilience, and give careful consideration to providing valorisation funds or venture capital to prevent unwanted access to technology lines. The region values the safeguarding of vulnerable technologies developed on campuses and explores new public-private forms of campus development to protect the open innovation concept.

A future-proof high-tech manufacturing industry

The digitalisation of the economy and the further integration of data into production processes are important focal points for ensuring the future-proof condition of the high-tech manufacturing industry and increasing labour productivity. This is crucial to remaining globally competitive. Additionally, the data generated by machines is of great importance for future competitiveness and economic resilience. The high-tech SMEs in Brainport represent over 31,000 jobs in the supply chain of large OEMs and contribute to embedding these companies in the region. Keeping up with developments in new production and digital technologies such as robots, autonomous vehicles, additive manufacturing (AM), Systems Engineering, and artificial intelligence (AI) is crucial to maintaining the competitiveness and future-proof state of the high-tech manufacturing industry.

Enhancing digital resilience

To protect our technology, it is important for companies to safeguard themselves against cybercrime. This includes securing information and office automation digitally, as well as machines, processes, and products. The high-tech manufacturing industry is characterised by close chain collaboration between companies that work together and supply each other. A successful hack costs an affected company an average of €67,000, and 2 out of 5 enterprises experience such attacks²⁹. Due to the close collaboration in the supply chain, one hack can quickly spread to other companies in the chain, in the way a fire does, as cybercriminals seek vulnerability in the chain's "weakest link" to gain access to other companies.

The Cyber Resilience Center Brainport (CWB) was established to support the national high tech manufacturing industry. At the centre, companies can connect to a collective, professional system against digital espionage and cyber-attacks. Threat information is monitored and shared (through NCSC), and participants can exchange knowledge and experiences on a confidential basis through meetings and a secure, private platform. The CWB, together with TÜV and ASML, developed CYRA® (Cyber Rating) for the high-tech manufacturing industry. CYRA® is a tool with which companies can enhance their cyber resilience with the possibility of certification. In collaboration with Stichting FERM - Rotterdam, Stichting Cyber Safety Noord Nederland, TÜV Nederland, and CWB, efforts are being made to establish a common standard for maturity/certification schemes for cybersecurity across various sectors and regulators in the Netherlands.

International innovation, trade, and collaboration

The importance of internationalisation for the Netherlands is evident: we earn one-third of the GDP from abroad. In addition to the existing relationships for exports and imports, companies and knowledge institutions in Brainport Eindhoven have a long-standing reputation for cross-border, international innovation collaboration. As a partner in Trade and Innovate NL (TINL), Brainport Eindhoven has joined forces with other regions (such as ROM Netherlands which includes BOM) to provide optimal support to companies in their international ambitions. International collaboration on innovation is the way to establish long-lasting, high-quality, strategic partnerships.

Development and production of high-tech products and services are becoming more complex and expensive. Companies are making decisions at an earlier stage about who they will collaborate with for R&D, how the supply chain will be organised, and in which countries they will establish themselves. In the research phase (lower TRL levels, higher risk), the emphasis is often on technological collaboration where risks are shared. It is important to establish multi-year innovation programmes with international partners.

²⁹ Sources: KVK (2021); ABN-AMRO (2022)

Appendix: 12 Challenges

Summary of the challenges being addressed:

Pillar 1: International value chains

- Challenge 1: In the context of international developments, ensure more intensive collaboration on technologies in which the Netherlands wants, and can play, a global role, driven by the need for strategic autonomy of the Netherlands and Europe.
- Challenge 2: A well-functioning innovation ecosystem as the foundation for new and existing technologies and companies.
- Challenge 3: Participating in international programmes, including mission-driven innovation policies, substantive research agendas, and projects of common European interest, with a focus on the contribution the regional high-tech manufacturing industry can make.
- Challenge 4: Upgrading and linking innovations and key and other technologies to major societal challenges.
- Challenge 5: Protecting vulnerable knowledge and technology.

Pillar 2: Talent

- Challenge 6: Educating more people for the professions of tomorrow.
- Challenge 7: All talent is needed: from untapped labour potential to international knowledge workers.
- Challenge 8: Innovative concepts in education and the labour market to achieve breakthroughs: crossing borders.

Pillar 3: Housing and Accessibility

- Challenge 9: Ensuring an adequate supply of affordable housing (for all income categories) as well as sufficient qualitative business space to meet the region's demand.
- Challenge 10: Accelerating investment in mobility and new connections to improve the accessibility of the regional daily urban system within, from, and to other regions in the Netherlands and beyond, particularly Belgium/Germany.
- Challenge 11: Making sure that new and existing spatial and infrastructural developments comply with existing laws and regulations regarding nitrogen and emissions and that these developments are sustainable; considering all energy and nature-inclusive requirements and promoting climate-adaptive construction, without imposing restrictions on regional energy supply.
- Challenge 12: Ensuring that the region's growth contributes to Broad Well-being and is accompanied by the expansion of a robust, appropriate, and competitive range of amenities that contributes to liveability, particularly the preservation of social cohesion in the highly internationalised region.

Contact

Brainport Development NV

Achtseweg Zuid 159H

Postbus 2181

5600 CD Eindhoven

040 751 24 4

info@brainporteindhoven.nl

www.brainporteindhoven.com

Provincie Noord-Brabant



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