North Brabant case study: Developing regional industrial policy capacity

Developing regional industrial policy capacity

Future of Manufacturing in Europe

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Preface

The objective of this case study is to map and assess the industrial policy capacity in the North Brabant region and to analyse the processes of the overall regional policy design and implementation by identifying good practices.

This work is prepared in the framework of the Pilot Project 'The Future of Manufacturing', proposed by the European Parliament and delegated to Eurofound by the European Commission (DG Internal Market, Industry, Entrepreneurship and SMEs). The European Foundation for the Improvement of Living and Working Conditions (Eurofound) is a tripartite European Union Agency, whose role is to provide knowledge in the area of social and work-related policies. The study on 'Developing Regional Industrial Policy Capacity', of which this case study is part, is one of several studies being conducted as part of the Future of Manufacturing Project.

The specific research questions addressed by the study include:

- What is the existing industrial policy capacity in EU regions? Among the EU regions, what is the existing industrial policy capacity of the EU regions managing industrial restructuring processes related to manufacturing?
- For identified regions, what are the industrial policy capacity key components (involved actors, policy areas and instruments)?
- What are the good practices in regional industrial policies, with focus on a future-oriented manufacturing eco system, including (if applicable) reconversion and structural change towards new (potentially more service oriented) regional economic structures?
- What are the success factors in regional industrial policy (capacity) and factors that facilitate/hinder regional industrial policy success and capacity building?
- How to further develop the current industrial policy capacity to match the identified good practices?

In the context of this study, industrial policy is defined as 'the set of strategic measures targeted at improving the competitiveness of the regional economy, taking into consideration the specific characteristics of the region' (Warwick, 2013). Policy capacity is defined as the 'capacity of government and other public actors to plan, develop, implement, and evaluate purposeful solutions to collective problems' (Denis et al, 2014).

The study team has conducted eight regional case studies across selected EU Member States. Case studies are meant to illustrate how regional industrial policy is interpreted in different regional settings, how it is governed, implemented and evaluated. Case study regions have been selected on the basis of an extensive literature review and indicator analysis, expert interviews and the use of a number of selection criteria (such as geographic, economic, demographic) in order to ensure a good balance of the sample. An open definition of 'regions' has been adopted for this study, with most of the selected regions corresponding to NUTS II regions.

This case study is based on half-standardised qualitative interviews with 7 representatives of institutions involved in the regional policy process from both the public and private sector.

Executive Summary

The manufacturing hub for the Netherlands

North Brabant is located in the Southern part of the Netherlands and is the second largest province with a land area of 4,913 km2 and approximately 2.5 million inhabitants. The province makes up 14.7% of the total country's size (CBS, 2015). The capital city of North Brabant is 's-Hertogenbosch. The province is one of the 13 provinces in the Netherlands, the region employed 1,212 million people in 2015, with an unemployment rate of 6.5 %, just four base points from the national average of 6.9 %.

Despite its relative size compared to other, more-populous provinces in the country, North Brabant is the manufacturing hub for the Netherlands and employs the highest number of people in the sector. The importance of manufacturing is reflected in the R&D spending in the region, with North Brabant spending the most as a percentage of GDP – 2.61% in 2014. The city of Eindhoven is the most important anchor in the region and is home to world-class manufacturers. Within one single innovation park in Eindhoven almost 80 % of all patents from the region were granted in 2013. In total, more than 50% of all patents in the Netherlands are being submitted by and approved for companies in North Brabant.

North Brabant has traditionally been strong in the field of polymers and one of the two universities in the region, the Technical University in Eindhoven, has been particularly strong in the field. Major polymer producers and manufacturers continue to operate in the province, such as leading companies like GE-Plastics, Philips and Océ and ties between companies and knowledge institutes, such as those developed on the High Tech Campus Eindhoven, are close. In the 1990s, the government implemented the 'leading technology institutes' strategy, which encouraged building these relationships between the knowledge institutes and companies. During this period, the government invited public and private actors to submit applications as consortia for funding to form institutes that would further research and development in a number of fields related to manufacturing.

While North Brabant serves as an effective hub and attractor of talent and investment, there are several challenges for the future. The province does well in growing companies into major international players, but history has shown that these players remain vulnerable to external shocks and potential buy-outs. Furthermore, like other European industry-oriented regions, there is a high demand for a skilled and well-educated workforce. The Randstad region in the Netherlands currently pulls a lot of qualified personnel away from the province, which is a particular concern for SMEs that are less capable of tapping into foreign talent.

Nonetheless, North Brabant has shown to be well positioned to take advantage of many trends in advanced manufacturing, such as additive manufacturing, smart manufacturing, the Internet of Things (in a B2B context), and other areas..

From catching-up to building on strength

Before 2004, policies to support regional economic development were led by the national government with a philosophy of redistribution, helping poorer performing regions to 'catch up' to other areas of the country. In 2004, the national government changed focus and moved towards a philosophy of building on the existing strengths of the regions. This transformation of regional development continued in 2010, when the Top Sector policy was introduced. The focus continued to be on sectors and regions where the Netherlands excelled, with more attention for sector-specific issues and infrastructure and more engagement and responsibility of stakeholders for bringing forward action plans.

The change in national policy also resulted in more responsibilities being devolved to the regions, since they would be better situated to understand the context. In North Brabant, the regional policy is steered by the regional government and driven by the regional development agency, the Brabantse

Ontwikkelings Maatschappij (BOM). Several sub-regional agencies covering smaller sub units or even cities also try to exert some influence, most importantly Brainport that is located in the centre of Eindhoven.

Innovation policy in the region is guided by the Economic Programme Brabant 2020 plan, in effect since 2016. The main goal of the plan is to make the region of North Brabant one of the five most innovative regions in Europe as the 'heart of smart solutions'. The plan pays attention to growing economic clusters already developed in the area and in areas such as chemicals, High-Tech Systems and Materials (HTSM) and agrifood, to promoting entrepreneurship, pro-active labour market policies, space for innovative activities and transport accessibility. Finally, the plan aims to make connections between the economy and broader social priorities.

Governance characterised by public-private cooperation

The general approach in the Netherlands in terms of industrial and economic development policies has come from both bottom-up and top-down, and might best be characterised as a form of network governance in which the government bureaucracies relinquish some control over policy-making to private and non-governmental organisations. This should lead to more efficient and effective decisions.

The national top sector approach, first introduced in 2010, has resulted in policy coordination taking place within the triple helix of businesses, educational institutions and governments. The core of the governance model is characterised by public-private cooperation in nine top sectors (such as HTSM, agrifood, chemicals, and other sectors identified by the government). Each of the nine top sectors has developed a social network and has unique organisational structures with their own rules, agreements and arrangements to drive innovation within their respective sectors. Initiatives to strengthen public policy have therefore also largely focused on developing public-private partnerships rather than governmental restructuring.

Policy implementation that reacts to the needs of businesses

While industrial policy has seen a resurgence of interest in some jurisdictions, the Netherlands still rarely discusses 'industrial policy' in its modern incarnation. Rather, innovation policy is still the *modus operandi* of policy-makers.

Regional innovation policy fits within the national framework by implementing national programmes regionally and filling the gaps with available funding. There is no formal science or public R&D policy at regional level, however the national government provides the R&D policy tools that can be implemented and complemented with regional innovation strategies.

Since the region is responsible for coordinating stakeholders for the top sectors programme, much of the policy focus is on spatial planning at various levels, such as support for innovation parks and the overall attractiveness of the region to talent.

Policy implementation varies per support mechanism that has been put in place. Generally speaking, there is an open application process where those that meet the requirements of the programme will receive support. Instead of collecting applications for a specific deadline and then distributing resources and support, the process is much more fluid and reacts to the needs of businesses rather than the bureaucratic policy cycles.

Furthermore, while regional innovation policies focus their attention on a particular political geography, in reality borders do little to demarcate how business and academics cooperate and participate in various value chains. Given the natural links between major centres in the area, it seems like a natural step to leverage European funds to foster cooperation. In 2010, the Top Technological Region/Eindhoven-Leuven-Aachen (TTR-ELAt) was formed and is one of the largest cross-border collaborations supported by various levels of government in the region.

Monitoring takes place at the national level

The main line of monitoring and evaluation of the implementation of policy comes from the Ministry of Economic Affairs, which conducts evaluations of the regional economic development agencies and

the progress of the top sectors. In addition to the formal evaluation processes, data on progress for the top sectors are collected by Statistics Netherlands (CBS) in a scoreboard exercise which is publicly available. In addition to these two sources of monitoring, the Netherlands has a further accountability mechanism in a series of advisory councils and planning bureaus that provide advice and report directly to parliament.

The agency most relevant to industrial policy in the Netherlands is the Advisory Council for Science, Technology and Innovation (AWTI). It produces advice based on either a parliamentary request or its own judgement as to what is important. Once a report has been produced, the responsible minister is legally obliged to respond to any recommendations that may come out of this report.

Overlapping jurisdictions do not hinder effective cooperation

Given that policy initiatives are generally developed at the national level though executed and steered at the regional level, there are few public policy initiatives that are truly developed at the regional level.

The theoretical basis for focussing efforts on sectors where the Dutch have performed the best matches the Smart Specialisations strategy of the European Union. However, the geographical concentration of industry does not tend to overlap with the various national and regional administrative jurisdictions in the Netherlands. In North Brabant, the regional development agency seems the most natural executive body for innovation policy in the region. However, various small economic development agencies have been created to develop parts of the province outside the heart of Eindhoven, creating an extra layer of policy effort.

Nonetheless, North Brabant and the Netherlands as a whole are able, because of the political and social culture, to support open innovation, public-private partnerships and network governance and overlapping jurisdictions have not stopped effective cross-border cooperation.

Industrial profile

Key economic, social and geographic specificities of the region

The province of North Brabant, one of 13 provinces in the Netherlands, lies outside the population-rich Randstad area between Amsterdam, Rotterdam, and Utrecht. Almost a half of the population of the Netherlands lives in the Randstad area even though it comprises only one-fourth of the surface area of the country. Major city centres include Tilburg, Breda, and — perhaps most important to the economic health of the region — Eindhoven. Eindhoven is an important anchor in the region as the home to world-class manufacturers, most notably ASML (the largest supplier of photolithography systems for the semiconductor industry), NXP (a global semiconductor manufacturer), and Philips.[1]

The province is the second largest of the Netherlands (4,913 km^2, which is 14.6 % of country's size). Approximately 2.5 million people live in the region, which is approximately 14.7 % of the total for the country (CBS, 2015). According to the Dutch Statistics Office, the region employed 1.212 million people in 2015, with an unemployment rate of 6.5 %, just four base points from the national average of 6.9 %. Of the 13 provinces, it ranks fourth behind Zeeland, Utrecht, and Gelderland in terms of unemployment. While statistics for 2016 are not yet complete, unemployment has been trending downward sharply, with the rate measured at 4.9 % in the third quarter of the year.

At the beginning of 2016, 264,843 businesses were in operation, with 66,601 small and medium-sized enterprises, 132,374 freelancers (*zelfstandigen zonder personeel*), and 65,661 'part-time' freelancers (people who may work part-time for an employer, and part-time for themselves). This represented a 3.1 % increase from the year before, though is one of the poorest performers compared to other provinces, where the largest growth in the number of companies was in the population-rich North Holland (which achieved a 5.2 % year-on-year increase).

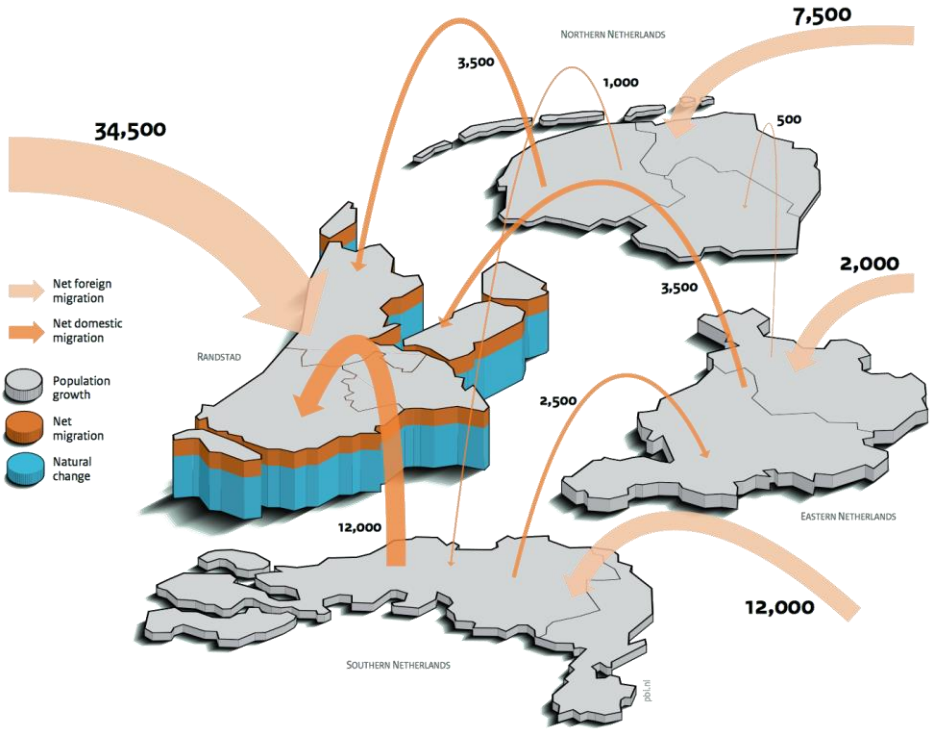
The province is physically well-connected internationally[2]. It benefits from its short distance to the German province of North Rhine-Westphalia, providing the region with access to high quality partners and suppliers. Motorway and rail connections between the two regions are good, and the open border between the two countries is essential to the free movement of people and goods. There are direct rail and motorway connections between the major cities of the region and Schiphol airport, one of the major air hubs of Europe. Eindhoven airport, while smaller and traditionally servicing tourist traffic, continues to grow, having served 10 % more passengers in 2015 than the previous year, with 4.3 million passengers passing through its gates flying to 78 destinations (by comparison, Schiphol airport serviced 58 million passengers with 295 destinations). More and more, the Managing Director for Eindhoven airport claims businesses are using the airport, as the frequency of flights to business destinations increases.

Yet, despite its geographical attractiveness within Europe, the region remains a net exporter of talent to the Randstad region. On an annual basis (at least until 2010, when the latest available regional statistics are available), an average of 12,000 workers left the region for the Randstad, with a further 2,500 departing for the east of the country. This loss of workers was generally offset by attracting workers from abroad, whether from Europe or further afield. This is one reason why the province and various other regional stakeholders place such an emphasis on making the region attractive to (foreign) workers, as both regional movements and demographics point to a potential problem for the region.

[1] https://www.asml.com/
http://www.nxp.com/
http://www.philips.com/

[2] Data on firm internationalisation is available for the national level, only; no regional statistics exist.

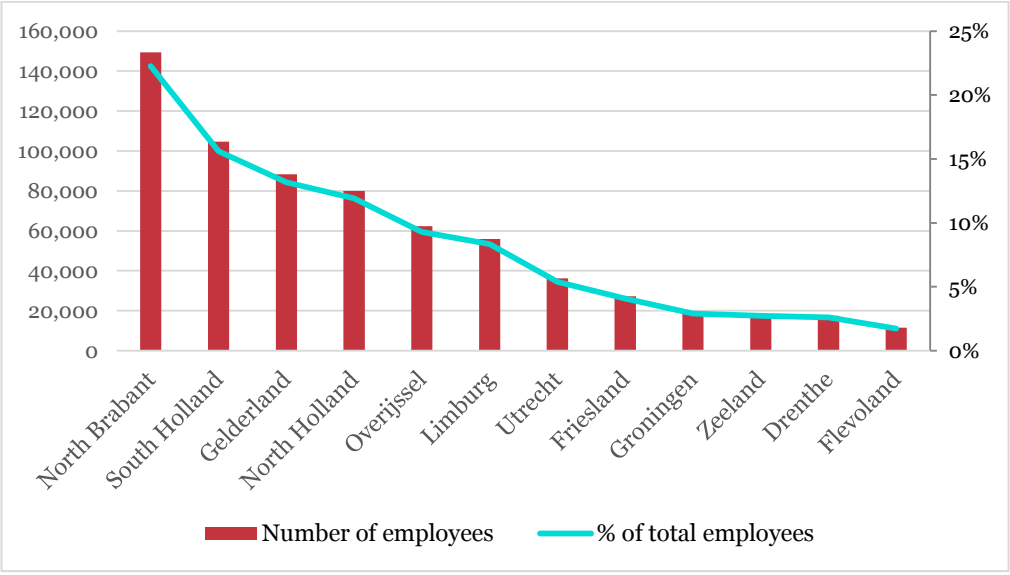
Figure 1: Population growth and migration flows per region, 2006–2010



Source: Planbureau voor de Leefomgeving, 2016

Despite its population size relative to the rest of the country, North Brabant remains the manufacturing hub for the Netherlands, employing the highest number of people as well as the highest percentage of the overall population in the sector. In 2014, approximately 150,000 were employed in the manufacturing sector. Manufacturing that takes place in the region is also highly advanced, with the competitive advantage of the region heavily contingent on the innovation found within the companies and research institutes working in the region.

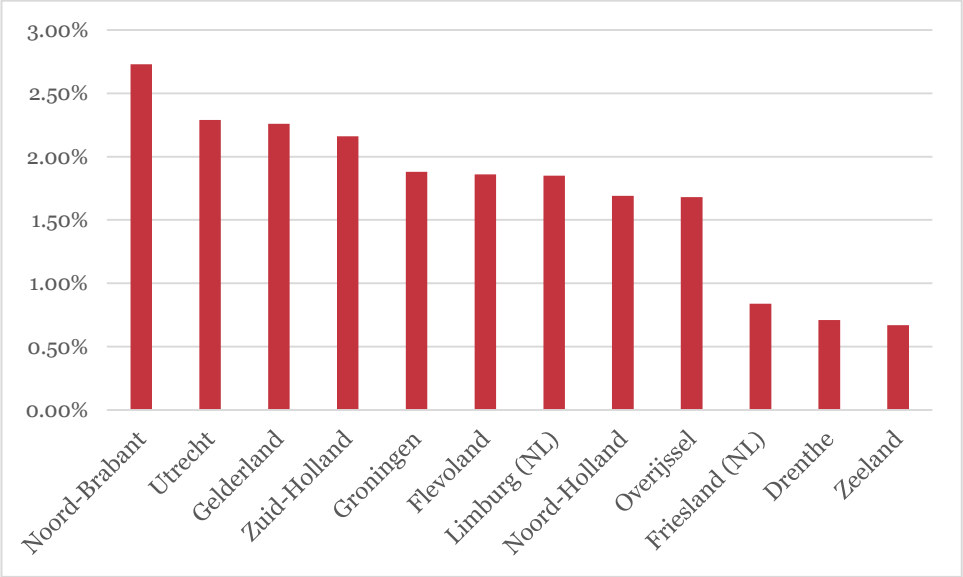
Figure 2: Number and percentage of people employed in manufacturing in 2014



Source: Eurostat, 2017

The importance of innovation in manufacturing is reflected in R&D spending in the region, with North Brabant spending 2.61 % of GDP in 2014. This figure is higher than compared to any other region in the Netherlands and well above the EU-28 average of 2.03 % achieved in 2013.

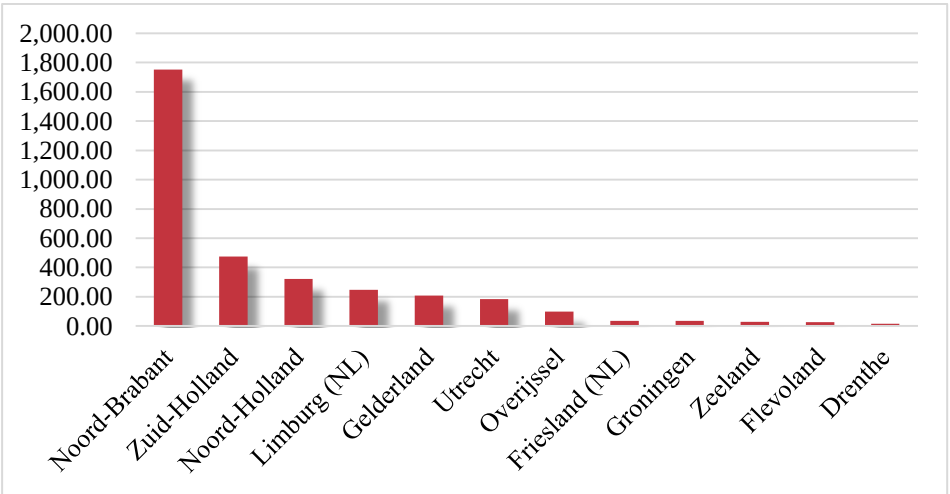
Figure 3: R&D spending as a percentage of GDP in 2014



Source: Eurostat, 2016

According to OECD statistics, R&D expenditures also reveal themselves in the number of patents granted in the region, with more than 50 % of all patents in the Netherlands being submitted by and approved for companies in North Brabant. Much of this activity takes place within a single innovation park in Eindhoven, the High Tech Campus, where almost 80 % of all patents from the region were granted in 2013.[3]

Figure 4: Number of patents per region of the Netherlands in 2013

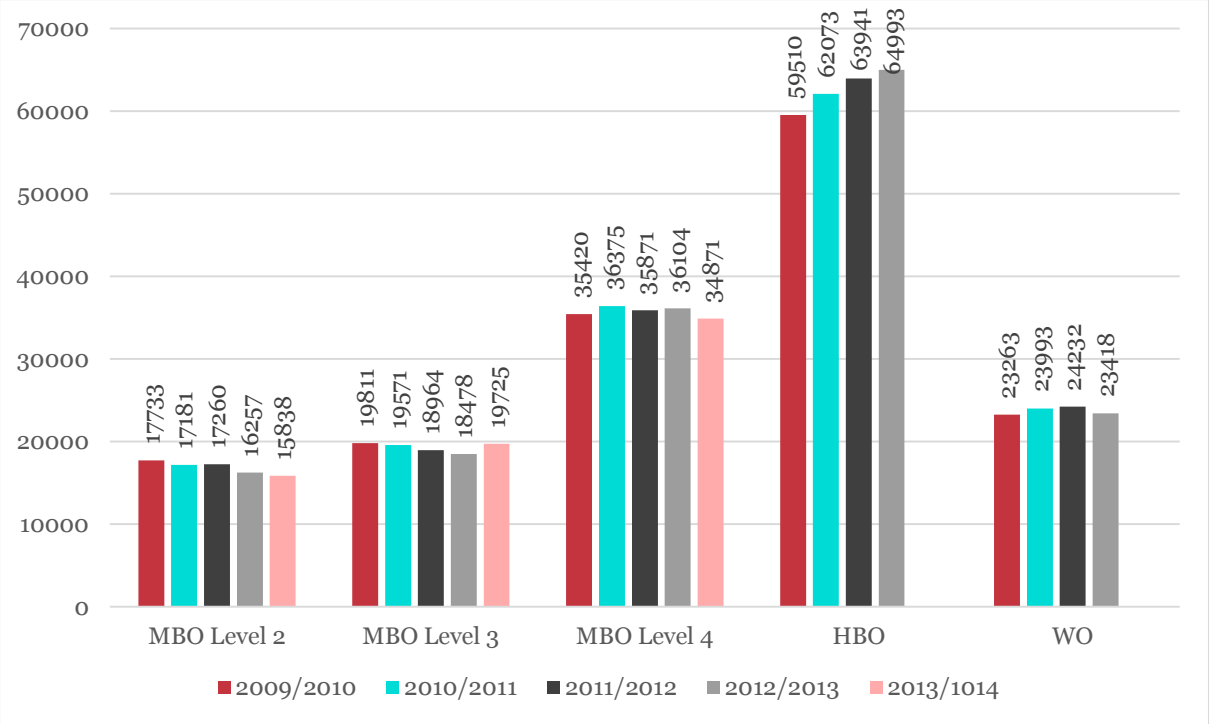


Source: OECD

[3] *Facts & Figures: High Tech Campus.*

In terms of skilled labour, while migration patterns are important in supplying the labour market, the education system provides an important inflow. According to figures reported in the Labour Market Monitor for North Brabant (*Arbeidsmarktmonitor Noord-Brabant*) for 2014, less advanced vocational training has seen decreasing numbers while 'level 4' degrees designed for middle managers have been increasing. Enrolments at university level have been relatively stable.

Figure 5: Enrolment by level of education, 2009/2010 to 2013/2014, in North Brabant

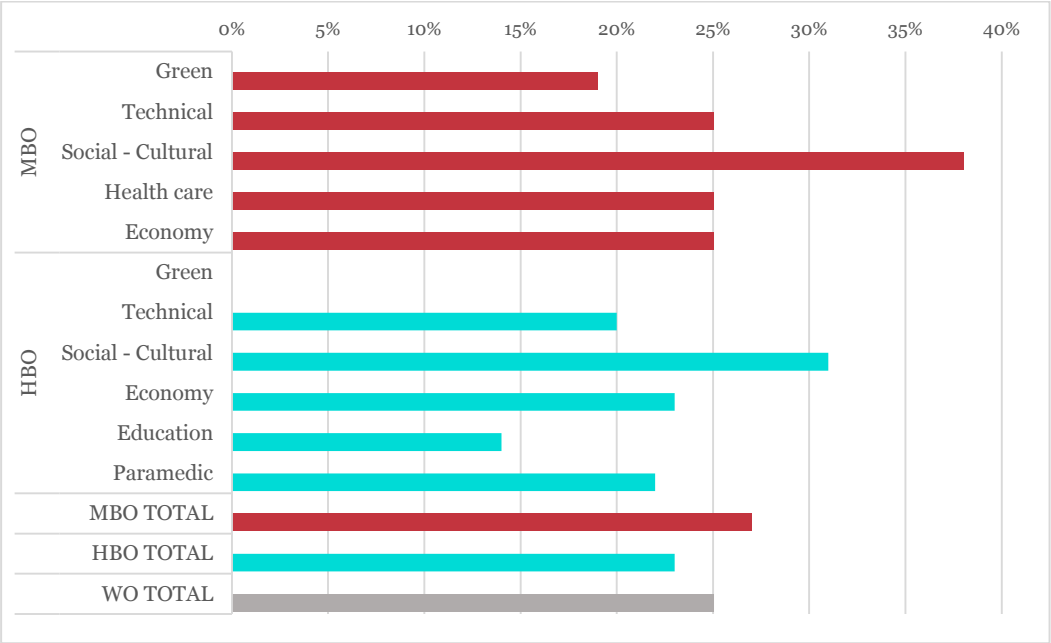


Source: Arbeidsmarktmonitor Noord-Brabant 2014[4]

In North Brabant, relatively large labour inflows are expected at a vocational level (27 % of employment at university level in 2012) during the period 2013/2018, while influxes at other levels are expected to be lower. The largest influx of vocationally trained workers is expected to come from the socio-cultural sector (38 %) while elements of the green economy remain relatively low (19 %). At university level, we see the same picture, with socio-cultural fields being the largest (31 %).

[4] Dutch secondary education system is divided into three different categories. MBO (*middelbaar beroepsonderwij*) represents vocational education, HBO (*hoger beroepsonderwijs*) represents university education, and WO (*wetenschappelijk onderwijs*) refers to science training. A description of the various levels in this graph are below:
MBO level 2. Basic vocational training to become an employee in a company.
MBO level 3. Standard vocational training for students able to function independently.
MBO level 4. Advanced vocational training to become a team leader or manager in a company.
HBO. University level education.
WO. Science training.

Figure 6: Entering the labour market in 2013/2018 as a percentage, by educational category, North Brabant



Source: Arbeidsmarktmonitor Noord-Brabant 2014

Table 1 provides a summary of the key socio-economic indicators for the region:

Table 1: Key socio-economic indicators of North Brabant

Demography		*2015*	*Evolution (2011-2015)*	*EU28 (2015)*
	Number of inhabitants	2,488,751	1.4 %	508,504,320
	Population under 30, percentage of total population	34.2 %	(0.1 %)	33.1 %
		2014	*Evolution (2010-2014)*	*EU28 (2014)*
	Inhabitants per km^2	505.6	1.5 %	116.7
Economic and labour market profile		*2014*	*Evolution (2010-2014)*	*EU28 (2014)*
	GDP (in millions of Euros)	136,938	7.6 %	13,558,617
	Employment – Percentage of population (from 15 to 64 years)	76.4 %	(1.5 %)	64.8 %
	Unemployment – Percentage of population (from 15 years and over)	7.0 %	2.8 %	10.2 %

Human capital		*2015*	*Evolution (2011-2015)*	*EU-28 (2015)*
	Persons with tertiary education (ISCED) – Population aged 25-64	25.2 %	(3.6 %)	23.5 %
	Persons employed in science and technology – Percentage of active population	45.8 %	2.3 %	31.5 %
		2013	*Evolution (2009 -2013)*	*EU28 (2013)*
	Gross domestic expenditure on R&D (% of GDP)	2.61%	0.35%	2.03%
		2012	*Evolution (2008 -2012)*	*EU28 (2012)*
	Patent applications to the EPO by priority year per million	495,976	(22.9%)	70,387
	High-tech patent applications to the European patent office (EPO) by priority year per million inhabitants	136.56	(28.7%)	15.78

Source: Technopolis Group, based on Eurostat and Statistics Netherlands data

Key sectors, clusters and value chains

North Brabant has traditionally been strong in the field of polymers. The Technical University of Eindhoven has been particularly strong in the field, although it has recently branched to other areas of advanced materials. Major polymer producers and manufacturers continue to operate in the province, such as global companies like GE-Plastics, Philips, and Océ. While partnerships between local players have existed for some time, relationships between knowledge institutes and companies were further encouraged through the government's 'leading technological institutes' strategy in the 1990s. During this period, the government invited public and private actors to submit applications as consortia for funding to form institutes that would further R&D in a number of fields related to manufacturing. The Brabant 2020 plan identifies six clusters operating in North Brabant, many of which find at least some role for advanced manufacturing:

- **High-tech systems and materials, including automotive and solar (HTSM)**. In public sector documents and discussions, this 'sector' generally encompasses at least three separate areas within the region—semi-conductors, automotives, and solar. However, it also encompasses other areas that are important to the region, such as nano- and micro-systems, embedded systems, advanced materials, and other technological development work. The province and many of its stakeholders sees HTSM as focussing on three applications: health, sustainability, and mobility. The sector encompasses more than 14,000 businesses and employs at least 112,000 people, producing €6.4 billion of goods and services in the province;[5]
- **Life sciences and medical technologies.** A few 'subclusters' exist in these fields, with a small innovation park—Pivot Park—in the city of Oss, started by the initiative of pharmaceutical

[5] Provincie Noord-Brabant, *Uitvoeringsprogramma 2017-2020.*

company MSD and medical technologies being developed largely by Philips medical divisions with various spin-offs in the area (companies such as Akeso Medical Imaging, spun off from Philips, and LifeSense, spun off from the Holst Centre);

- **Food.** While the heart of food and food technology lies in the city of Wageningen in the province of Gelderland, North Brabant also sees a role for itself in the sector. In 2012, a total of 23,070 businesses were active employing 173,380 people in the province (16 % of the total for the sector in the country). The approximate value of goods and services produced was €2.9 billion, focussed largely around production rather than R&D;[6]
- **Logistics.** In 2012, a total of 4,015 businesses operated in the logistics sector in North Brabant, which represents 15 % of the total sector in the Netherlands. These businesses produce goods valued at €8.856 million and produce a turnover valued at €4.226 million in the province (which is 15 % of the value of the sector in the Netherlands). The sector is quite diverse in the area due to the many kinds of clients with different logistical needs;
- **Maintenance.** In 2012, a total of 7,251 businesses employing 40,500 people provided maintenance services in North Brabant, representing approximately 27 % of the total turnover in the sector. Employment and the knowledge base appear to be relatively stable, with growth opportunities in aerospace (specifically the Joint Strike Fighter and various composite materials) and more general advanced manufacturing (servitisation, condition-based maintenance, and robotics); and
- **Biobased economy.** While the 'biobased economy' can incorporate elements of more traditional sectors, such as the high-tech systems and agrofood, the province still measures activities in this area separately. Food companies such as Cargill and Darling Ingredients are important to the region; however, growth in the bio-based economy remains slower than the provinces initial expectations.

North Brabant is the high-tech production centre of the Netherlands, outperforming other parts of the country by a substantial margin. The EU's Regional Innovation Scoreboard from 2014 and 2016 show North Brabant as only one of two Dutch provinces (the other one being Utrecht, just north of North Brabant) characterised as an innovation leader, though the region's index score decreased by 2 % in the last two years. According to the scoreboard, North Brabant outperforms the European average in European patent applications, innovative SMEs collaborating with others, and SMEs producing product or process innovations.

Table 2: Innovation and R&D performance indicators for North Brabant compared with the Dutch average, 2016

Innovation / R&D indicator	North Brabant	Netherlands (average of normalised figures for all provinces)
EPO Patent Applications	0.927	0.417
SMEs with Product or Process Innovations	0.619	0.615
SMEs with Marketing or Organisational Innovations	0.357	0.347
Employment Medium-High/High Tech Manufacturing and Knowledge-Intensive Services	0.549	0.510
Exports in Medium-High/High Tech Manufacturing	0.532	0.476

[6] All remaining figures have been derived by Technopolis with help from the province of North Brabant.

Innovation / R&D indicator	North Brabant	Netherlands (average of normalised figures for all provinces)
Sales of New-to-Market and New-to-Firm Innovations	0.328	0.316

Source: Regional Innovation Scoreboard 2016, EU

In the field of advanced manufacturing, suppliers are generally within easy reach. Large manufacturers in the region, such as ASML, have an embedded chain of suppliers of services and semi-finished products. Research and development, design, production, and sales all occur within 50-100 kilometres of Eindhoven, the largest magnet for companies in the region, with 70% of the first-line suppliers of several major OEMs (Original Equipment Manufacturers) located within this radius. Second and third-line ancillary suppliers also work in the region and its surroundings.[7]

As mentioned earlier, North Brabant produces most of the R&D and patents in the country, and companies with various levels of innovativeness can be found in the region, ranging from pioneers to smart followers to subsidiaries.

- **Philips.**[8] Founded in Eindhoven in 1891, Philips undoubtedly provides the most influence in terms of the DNA of business.[9] Philips, which started its life producing incandescent light bulbs, developed into a multinational corporation with interests in medical devices, consumer electronics, and lighting. In its latest restructuring in 2015, it divested itself of the lighting division, with the remaining parts of the company focussing on health and medical technologies. Many of the leading players in Brabant are spin-offs of Philips, such as ASML and NXP[10], and former staff of Philips hold leadership positions in companies around the region. Philips was also responsible for founding key institutions that unite companies and knowledge institutions, such as the High Tech Campus Eindhoven which was set up in 1998. Philips itself continues to actively help other companies to innovate through its Innovation Services unit (which includes a Materials Analysis lab).
- **ASML.**[11] ASML continues to be a world leader in photolithography machines used to produce microprocessors. They dominate the global market, holding between 80-90% market share in 2014.[12] Despite competition from the likes of Nikon and Canon, ASML continues to dominate with new innovations, enjoying record profits over the past years. In 2016, according to 2017 press release from the company, sales at ASML reached a record €6.8 billion, with a gross margin of 44.8 %.
- **NXP.**[13] NXP Semiconductors, specialised in expertise in High Performance Mixed Signal electronics, has been working on application areas such as the Connected Car, Security, Portable & Wearable technologies, and the Internet of Things. NXP has operations in more than 25 countries, and posted revenue of U$ 5.65 billion in 2014[14].

[7] Brainport 2020: Top Economy, Smart Society

[8] http://www.philips.com/

[9] While the headquarters moved to Amsterdam in 2001, its R&D footprint continues to remain in the region.

[10] Polymer Vision was another spin-off of Philips, founded in 2006. Perhaps best known for attempting to develop commercially viable foldable e-ink screens, they were bought by Chinese OEM Wistron in 2009 before eventually being closed in 2012.

[11] http://www.asml.com/

[12] Wolfgang Nickl, *Financial Model*, November 2014.

[13] http://www.nxp.com/

[14] Approximately €5.35 billion at the time of authoring this report, and €4.42 billion using the official 2014 exchange rate as published by the Internal Revenue Service of the United States.

- **DAF.**[15] Founded in 1928, DAF manufactures industry-leading trucks in Eindhoven, with its engine factory, component plant, press shop and final assembly line for CF and XF models also located in the city. In 2015, they reported an annual turnover of almost € 4.5 billion with an annual profit of almost €350 million.
- **SMART Photonics.**[16] Established in March 2012, SMART Photonics is the result of a strategic spinout from Eindhoven University of Technology (Tu/e) combined with the commercial, industrial and business expertise from former employees of the Philips Photonic Labs. They have a broad experience in epitaxy (growth and regrowth), processing, ultra-high quality control test & measurement.

The network effects and the environment built on the foundation of Philips have been critical to the economy of Brabant, and there remains little doubt that the region would be dramatically different without the company. The presence of such a strong innovator has become all the more important given the changing nature of innovation within corporate value chains. Firms today are more likely to outsource entire modules for components of a product, relying on innovations from tier 1 (and sometimes lower) suppliers. In more open value chains, subcontractors no longer follow a supplied blueprint, but rather receive a list of technical and quality specifications, giving the supplier flexibility in how a module is built. And supplier relationships are important in product development for the major innovators of the region. ASML, for example, has 73 suppliers that are responsible for 79 % of all product-related spending.[17] The tightly knit business community in Brabant seems to have embraced the idea of 'open innovation'.

Open innovation is often contrasted to the way that innovation took place before the dawn of the information age, where innovation and R&D took place within the confines of a single company and intellectual property was a closely guarded secret. Not to say that open innovation contrasts it completely with free information and collaboration, but companies have blurred the lines between competitor and partner, sharing resources in innovation processes. Marketing materials from the Brainport emphasise the open innovation ecosystem created from a substantial number of hightech systems (component) firms, mostly created by Philips (and its spin-offs, like ASML, NXP, and FEI). Open innovation is currently in fashion in many R&D areas, and North Brabant seems to be well-placed to take advantage of wider trends in innovation and supply chain management.[18]

Dozens of first tier suppliers operate in North Brabant that operate in advanced manufacturing, including companies such as

- **Frencken.**[19] A global high-tech capital and consumer equipment service provider providing complete and integrated 'one-stop' outsourcing solutions in partnership with its customers.
- **Neways Electronics.**[20] A global operating Electronic Manufacturing Services provider of industrial and professional electronics. It produces and assembles (micro) electronics, printed circuit boards, and cable and wiring harnesses right up to complete box-built products and systems.

  Norma Group.[21] A provider of Engineered Joining Technology solutions, with more than 60 years of manufacturing and product-development experience. Employing about 6,700 employees,

[15] http://www.daf.com/

[16] http://smartphotonics.nl/

[17] ASML, *Corporate Responsibility Report 2015*.

[18] Many interviewees spoke about the 'coffee culture' of Brabant, asserting that local companies would share thoughts on market trends as a part of the everyday business culture. One interviewee also believed that it was one reason why Brabant was better able to grow its manufacturing sector. There is, however, little evidence beyond anecdotes to suggest that businesses operate in a particularly open manner compared to other innovative ecosystems.

[19] http://www.frencken.nl/

[20] http://www.neways.nl/

[21] http://www.normagroup.com/

it manufactures a range of joining-technology products in the clamp, connect and fluid categories and occupies a leading position as a solution provider.

Expand the view to the second and third tiers, and hundreds of companies related to advanced manufacturing can be found operating within the region. Many of these suppliers are 'smart followers', necessary partners to introducing innovations in their products and services.

Compared to the rest of the country, industry and manufacturing employs a particularly large share of the labour force (14.8 %) and represents many business establishments in North Brabant. The construction and agricultural sectors are also quite well represented in the province, as indicated in Table 3.

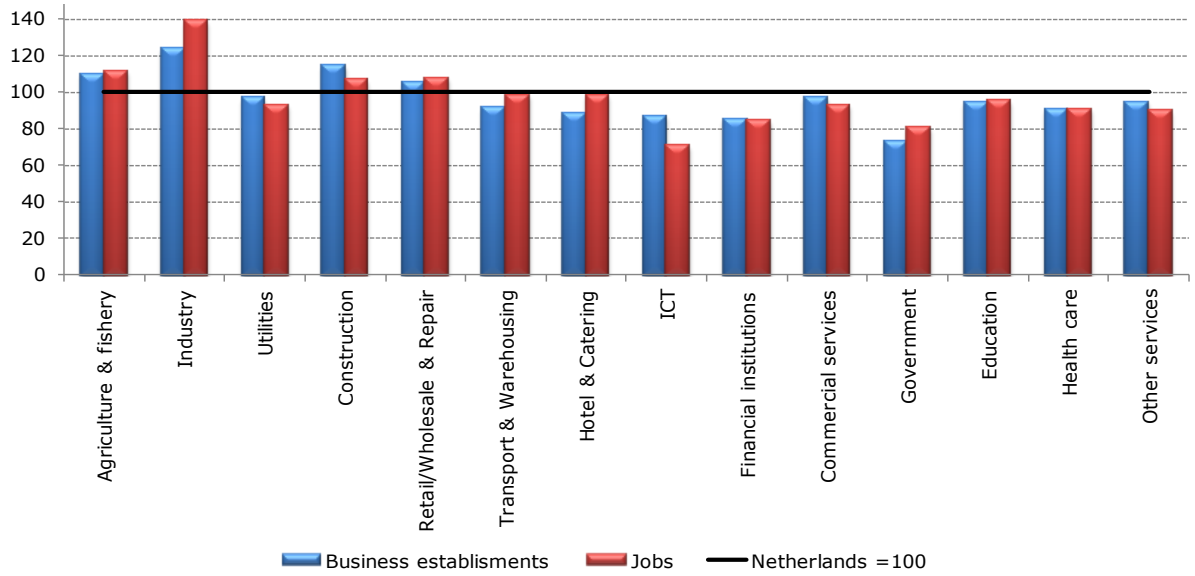
Table 3: Employment structure in 2012

Branch	Brabant		The Netherlands		Brabant/NL
	Total	%	Total	%	%
Agriculture and fishery	37,570	3.0 %	220,620	2.7 %	17.0 %
Industry and utilities	183,640	14.8 %	881,920	10.9 %	20.8 %
Construction	77,860	6.3 %	475,480	5.9 %	16.4 %
Retail/wholesale/repair	235,160	19.0 %	1,423,020	17.6 %	16.5 %
Hotel and catering industry	62,250	5.0 %	414,520	5.1 %	15.0 %
Transport and warehousing	53,340	4.3 %	352,530	4.4 %	15.1 %
ICT	28,290	2.3 %	261,410	3.2 %	10.8 %
Financial institutions	30,230	2.4 %	232,710	2.9 %	13.0 %
Commercial services	167,150	13.5 %	1,174,300	14.5 %	14.2 %
Government	53,670	4.3 %	434,630	5.4 %	12.3 %
Education	79,620	6.4 %	543,200	6.7 %	14.7 %
Health care	181,940	14.7 %	1,311,700	16.2 %	13.9 %
Other services	49,540	4.0 %	358,730	4.4 %	13.8 %
Total	1,240,260	100.0 %	8,084,740	100.0 %	15.3 %

Source: Vestigingenregister Noord-Brabant, 2012

As mentioned earlier in this report, the industrial base for North Brabant remains economic bedrock for the region and the country as a whole. As shown in the graph below, manufacturing (as represented by the 'industry' category in official statistics) provides more employment and number of enterprises than the Dutch average, as shown in the figure below.

Figure 7: Business establishments and employment structure in Brabant compared to the rest of the Netherlands in 2012 (Netherlands=100)



Source: Vestigingenregister Noord-Brabant, edited by Fanion research & consultancy, 2012

Table 4: Employment structure in North Brabant's major cities in 2012

Sectors	Breda	Tilburg	Den Bosch	Eindhoven	Helmond	B5
Agriculture & fishery	890	410	260	170	290	2,020
Industry & utilities	7,740	13,760	8,980	15,980	9,710	56,170
Construction	5,290	4,580	5,380	5,190	2,700	23,140
Retail/wholesale/repair	19,810	17,590	19,670	20,880	8,140	86,090
Hotel and catering industry	5,170	6,660	2,760	7,990	1,400	23,980
Transport & warehousing	4,040	4,330	3,330	5,630	1,390	18,720
ICT	2,220	2,010	4,940	7,320	610	17,100
Financial institutions	2,650	6,600	4,490	5,720	540	20,000
Commercial services	17,020	12,730	15,120	33,690	5,010	83,570
Government	7,680	4,290	6,650	5,140	920	24,680
Education	8,670	11,460	6,340	13,280	2,940	42,690
Health care	16,980	20,430	13,090	21,520	7,910	79,930
Other services	21,030	25,630	17,300	26,950	9,330	100,240
Total	110,550	116,310	99,060	153,320	40,900	520,130

Source: Vestigingenregister Noord-Brabant, edited by Fanion research & consultancy, 2012

Information technology and subcontracting for the automotive industry have also been traditionally strong sectors for the economy of North Brabant. The region's knowledge infrastructure — including

companies' R&D departments, education and research institutes, and public-private partnerships — is also a fundamental pillar upon which the economic structure has been built.

According to a presentation from the BOM, more than 1,400 foreign companies employ almost 90,000 people in the region. More than three-quarters of these companies were located within the province's urban network in 2012. The innovative and high-tech nature of the foreign companies established in North Brabant is typical for the province. In particular, the food industry, electrical engineering, medical technology, chemicals and the metal industry are well represented in the province. This diversity has provided an enormous boost to the development of the distribution, transport and services sectors.

Uptake of advanced manufacturing

According to the report *Brabant Activity for 2015*, high-tech systems, ICT, and services were the most important areas of the local economy and areas where continued growth and support would be seen. Subthemes around advanced manufacturing that are taken up in the region include:

- 3D printing & Additive Manufacturing;
- Photonics;
- Display/LED;
- Safety & Security;
- 3D Product Design & Engineering (VR/AR);
- Robotics;
- Big Data;
- Internet of Things; and
- Maintenance & Service Business.

One of the major areas of interest for the region is 3D printing (or, more accurately, additive manufacturing), which has a global market of around €2 billion, with a forecast for that market to grow to €200 billion by 2025.[22] Forecasts of future markets for products and processes that are subject to innovation and large change, however, need to make strong assumptions and should be held with some scepticism. Nonetheless, the trend is certainly rising, and while predictions of home use of 3D printers are certainly exaggerated, additive manufacturing presents helpful improvements with product prototypes and also for producing particular kinds of parts.

Despite ambitions, North Brabant works at a relative disadvantage to its immediate neighbours in Belgium (with respect to knowledge and software tools) and Germany (with respect to skills in mechanical engineering) in additive manufacturing. As well, other than Shapeways[23] and a few other printing companies, activity in 3D printing is largely taking place within TNO,[24] a large Dutch research institute with locations across the Netherlands. They are working to improve existing printers to improve their accuracy, speed, and print new materials. One such project is Print Valley, aiming to be a manufacturing platform that allows printing unique products from multiple materials from one machine. This would make retooling quicker and more cost-effective, increasing the likelihood of producing parts on site.

While additive manufacturing may not be the greatest area of strength for the region, the technology is used extensively in other R&D work. This includes areas in which North Brabant does hold an advantage, such as in the field of photonics. The region continues to see a number of major investment

[22] Innovatie Zuid, *Hightech systemen & materialen 3D-Printen*, 2013.

[23] http://www.shapeways.com/

[24] http://www.tno.nl/

projects at various levels of technological readiness, oftentimes centred around research being done at the High Tech Campus Eindhoven. The Holst Centre,[25] a research institute bringing together business and academics, has been developing flexible organic light-emitting diodes (OLED) using a roll-to-roll process.

ASML, the world's biggest supplier of photolithography systems for semiconductors, manufactures machines that produce integrated circuits, such as CPUs and memory chips. For more than seven years, ASML has been using additive manufacturing to lower costs and increase the efficiency of its machines. The use of additive manufacturing has allowed ASML to eliminate flow induced disturbance forces by up to 90 %, improved thermal control, and lighter weight design and robustness.

A recent SWOT analysis of the south of the Netherlands — both North Brabant and Limburg, which is just south of North Brabant — in additive manufacturing shows some of the strengths of the region in the area.

[25] http://www.holstcentre.com/

Figure 8: SWOT analysis of the region

STRENGTHS • Strong global position in several fabrication technologies, mechanical engineering and design (mechatronics, optics, lithography, printing and embedded software). • Strong high-tech cluster in the southern Netherlands as well as OEM supply chains. • Availability of (joint) 3D metal printing facilities and cooperation of high-tech supply chains around facilities. • Presence of material knowledge (such as the company DSM TenCate). • Creative industries, both around Eindhoven and Amsterdam, Arnhem and Utrecht. • Knowledge institutes such as TNO, TU/e, Fontys and Holst Centre, and also cooperation with Germany and Belgium. • Presence of product developers in aerospace, automotive, machinery, and medical devices.	**WEAKNESSES** • Limited supply chains, both for design and engineering of parts suppliers and production companies, software vendors and consulting. • Only limited OEM capacity available in the Netherlands.[26] • Limited attention to 3D printing in research and teaching at universities (at the technical universities). • Cooperation at European level around 3D printing is still very limited.
THREATS • Too low investment rate in new 3D printing technologies, leading to a disadvantage with competitors. • Developments in US and Asia are faster and financially better supported; this also applies to preventive acquisitions by monopoly players. • Current backlog compared to foreign ecosystems, market size and number of companies.	**OPPORTUNITIES** • Opportunities for supply chain to markets in the region: mechanical engineering, medical, electronics, automotive, aerospace, and consumer products (lifestyle & fashion). • Many strong potential end-users in the high-tech sector / Brainport Industries (Océ, ASML, Philips, VDL, FEI, Stork (SPG)). • Start of OEM initiatives for integrated industrial 3D metal printing systems based on existing knowledge and expertise in ecosystem. • Opportunities in the longer term in other sectors where the Netherlands is strong: offshore, energy, process industry, food. • Cooperation between (top) sectors, connecting ecosystems in Belgium and Germany.

Source: Roadmap, Hightech systemen & materialen: 3D-Printen, Innovatie Zuid, 2015

In the field of photonics, the Netherlands and the region have a strong scientific position (through Dutch universities and NWO initiatives) and an industrial profile that includes nanoelectronics and mechatronics expertise. Dutch internationals like ASML, Philips and TE Connectivity are big players in the photonics area, but the Netherlands has also over 120 SMEs active in this field, largely in the province of North Brabant. The Photon Delta initiative in Eindhoven brings industry and universities together to foster the Photonic IC technology into different markets, though Enschede (located in the eastern province of Overijssel) is also an important cluster in the field.

The project Photon Delta has been designed to generate new businesses, to strengthen the existing infrastructure, and to further build the image of the region. It consists of an alliance that includes the Technical University Eindhoven (TU/e), Brainport Development, BOM, Chamber of Commerce, the

[26] Given that this is a SWOT analysis for the Netherlands, as opposed to the greater region, it ignores the OEM capacity offered in bordering Germany and Belgium.

province of North Brabant, the companies SMART Photonics and Effect Photonics and research institutes Cobra, JePPIX and Nanolab@TUe. The Photonics Institute, operating inside Photon Delta, steers that process.

Director and TU/e professor Ton Backx has argued that the region has been growing: 'TU/e attracts significantly more students in this field than a few years ago. In the academic year 2007/2008 we were just under 7,000 students, now the student population is around 10,000. The Faculty of Electrical Engineering, with extensive knowledge of photonics, formerly had 60 entrants per year. Now there are 300. So automatically we see more students specializing in photonics.'[27]

Challenges for the future of manufacturing

In advanced manufacturing, North Brabant serves as an effective hub and attractor of talent and investment. Businesses in the region have embedded chains of suppliers for both services and semi-finished products. Research and development, design, production, and sales all occur within 50-100 kilometres of Eindhoven, the strongest city in the region, with 70 % of first-tier suppliers of major Original Equipment Manufacturers located within this radius. Second and third-tier ancillary suppliers are also embedded in the region and its surroundings.

Given the overall size of the economy, North Brabant does well growing companies into major international players. However, these players remain vulnerable to external shocks and potential buy-out. While ASML continues to perform well, the economic difficulties facing Philips are well-known, with the company's footprint in the region decreasing with the divestment of consumer products. In October 2016, US-based Qualcomm announced plans to purchase NXP for U$39 billion (€35.2 million), one of the most important players in North Brabant. These larger players are both strength and a potential weakness — they are the source for new start-ups that will be the next companies to develop in the region. However, at the same time, a takeover of a corporate headquarters can lead to job losses and large disruptions in the role of an important regional player. Management teams can be replaced and the strategic interests of the company changed. These large disruptions can pose a threat or create opportunities, as local players are pushed into new ventures after restructuring.

One further challenge in the region is one faced by many other European industry-oriented regions, namely the high demand for a skilled and well-educated workforce. Given the cultural pull of the Randstad region, the lack of qualified personnel in North Brabant continues to be a concern, particularly for SMEs that are less capable of tapping into foreign talent. The lack of a 'cosmopolitan character' — mentioned by local policy-makers — in the region, referring to is relative isolation, means that it is more difficult to attract internationally minded people, whether local or foreign, while elements related to language or working conditions (including wage levels) seem to be less of an issue.

Various regulations that structure the labour market hinder not only an optimal allocation of skills across the region, but also cross-border cooperation. The focus of many labour market reforms are around the hiring and firing of workers, where labour flexibility is often viewed as an inhibitor to risk-taking. There are limitations in the Netherlands on how long a worker can be laid off without significant compensation. Housing and health policies are also barriers, with temporary accommodation of less than one year remaining extremely expensive. Diploma recognition of professional qualifications continues to be a barrier, particularly for professionals coming from outside of the European Economic Area. If a non-European wants to practise a regulated profession in the Netherlands with a credential earned abroad, they will need to contact the appropriate non-governmental body, either Nuffic for recognition of primary or secondary education or IDW for recognition of vocational qualifications. Individuals working in professions like teacher, dentist, lawyer, fire commissioner and physiotherapist, for example, are all regulated in the Netherlands and would be required to seek recognition.

[27] http://www.brainport.nl/en/news-developments/photon-delta-het-hart-van-de-fotonica

Nonetheless, North Brabant is well positioned to take advantage of many trends in advanced manufacturing. Top-level application research is taking place in additive manufacturing, photonics, and other areas of advanced manufacturing, with world-class companies operating in the region. Research into advanced materials can take advantage of trends in sustainability, developing more durable and flexible materials that can be used in existing and new applications.

Industrial policy objectives

The scope and objectives of regional industrial policy

While industrial policy has seen a resurgence of interest in some jurisdictions, the Netherlands still rarely discusses 'industrial policy' in its modern incarnation. Rather, innovation policy is still the *modus operandi* of policy-makers. What might be terms 'regional industrial policy' in North Brabant is mostly focused on the coordination of stakeholders around the areas of specialisation for Brabant. Much of the policy focus is on spatial planning at various levels, such as support for innovation parks and the overall attractiveness of the region to talent[28]; education for both technical and entrepreneurial skills; and distributing funding from various innovation initiatives.

The national policy framework, called the 'Top Sector' policy drives the regional and local industrial policy in the Netherlands, with regional actors projecting their influence by participating in various national and international programmes that benefit the region. The region implements R&D policy tools that are provided by the national level and complements these tools with its own regional innovation strategies.

Regional Innovation Strategies

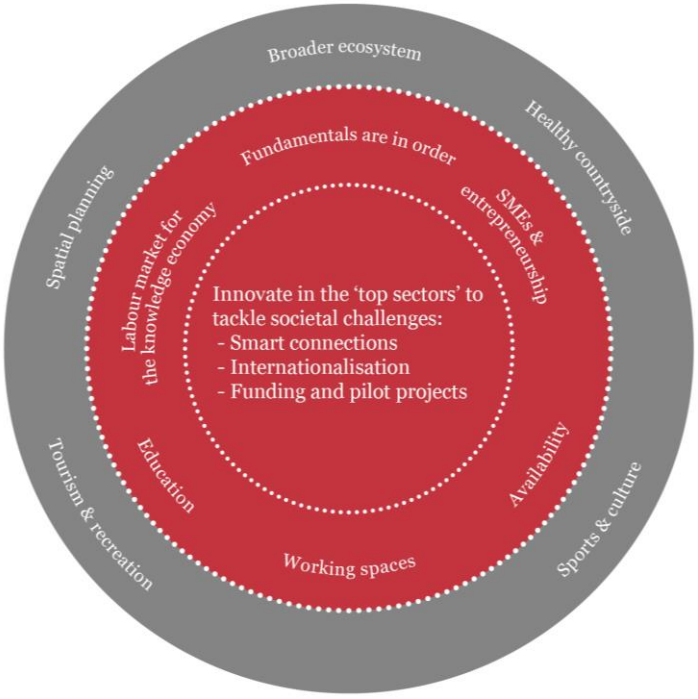
For the overall region, industrial policy is guided by the **Economic Programme Brabant 2020 plan**. This plan identifies as its main goal to make the region of North Brabant one of the five most innovative regions in Europe as the 'heart of smart solutions'. To accomplish this, it identifies three pillars on which economic development will be based in the region:

1. **Innovation in the top sectors in areas related to societal challenges.** The focus of the Economic Programme is to grow economic clusters already developed in the area in areas such as chemicals, HTSM, and agrifood to become top European performers. It sees clusters as carriers of innovation and new development.
2. **'A basis for order'** signifies a 'balanced' approach to locating industrial and innovation parks. These spatial issues are discussed and agreed in a series of Regional Spatial Consultations (*Regionale Ruimtelijke Overleggen*). This means not only providing space, but also attempting to bring companies with the right risk profiles and multimodal access needs to the most advantageous locations. Also supported under the pillar is specific attention to good transport accessibility.
3. **Supporting the broader ecosystem** through a social agenda contributes to a good business climate, which requires making connections between the economy and broader social priorities. This means developing urban facilities (sports, culture), the leisure economy (tourism and recreation) and natural landscapes (nature reserves and water quality). These topics are grouped together under the concept of 'business climate' in the Economic Programme because they are considered to be the precondition for attracting and retaining a skilled labour force and for firms to establish themselves in Brabant.

The various pillars of the economic development plan for the region are illustrated in Figure 9.

[28] This had included plans, for example, for Eindhoven to be the Cultural Capital of Europe in 2018. In that year, Malta and the Netherlands would share the title. However, within the Netherlands, the northern city of Leeuwarden was announced as the Dutch representative over Maastricht and Eindhoven. There was also a plan for the Sportplan Brabant 2016 as a part of an Olympic bid (one that was abandoned) as well as investments in 'cultural and historical complexes'.

Figure 9: Illustration of the overall economic development plan for Brabant



Source: Economic Programme Brabant 2020 Plan, adapted by Technopolis

The foundation for industrial development and policy, according to the plan, is based around optimised infrastructure. The heart of the plan calls for intermediary organisations such as the *Brabantse Ontwikkelingsmaatschappij* (BOM, the economic development agency for the region) to partner with other organisations in the 'Triple Helix' to facilitate the positioning in the knowledge economy. This positioning, however, is relatively unstructured, largely focussed around the top sector teams and the role that the BOM plays in supporting SMEs, organising innovation parks, and matchmaking.

The policy mix supported in the region is based on the five domains: labour, technology, business, innovation parks, and governance. The aim is to exploit strengths and tackle problem areas through maximising innovation and valorisation in and between regional clusters; retaining and growing employment; and improving the valorisation of knowledge. These aims, according to policy documents, require a set of preconditions geared at:

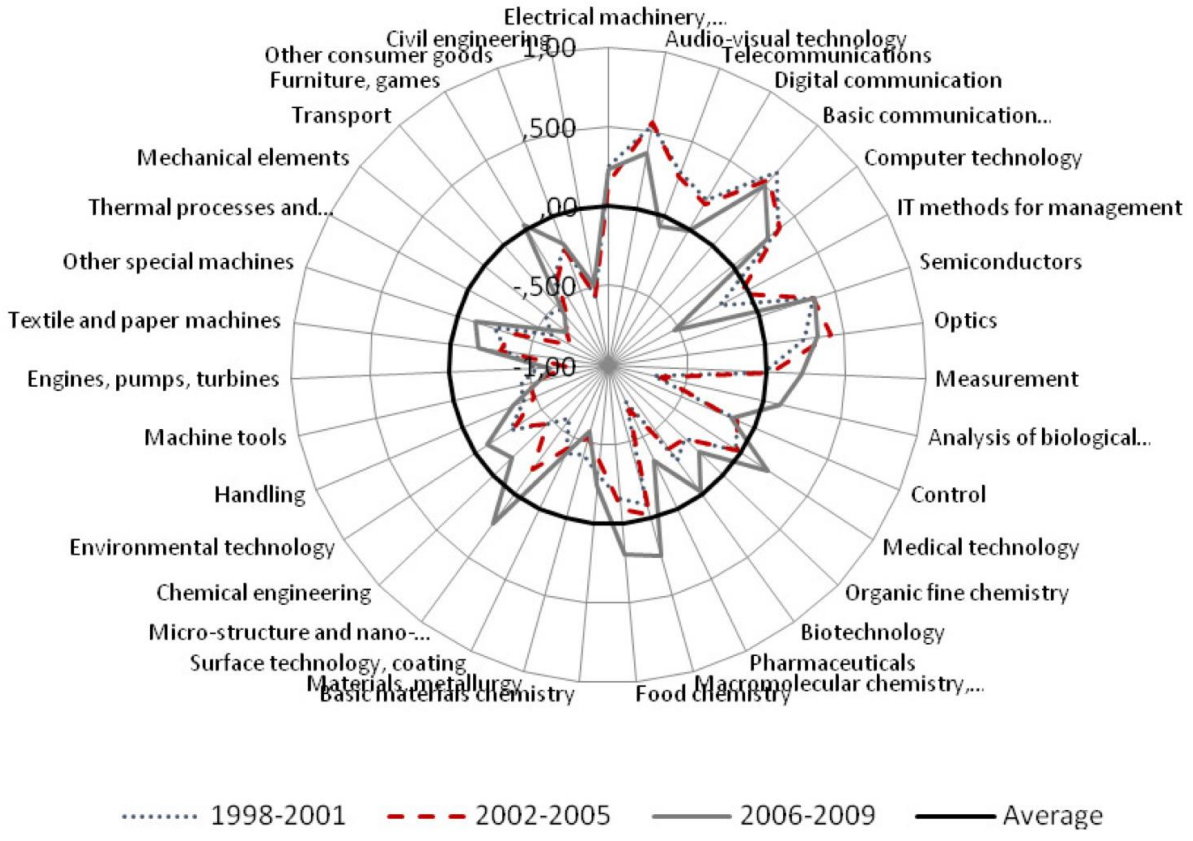
- **An internationally competitive labour market.** Given that immigration and education policy lies at a national level, the focus here is on local services that the province and partnering regions/cities can provide. In helping international knowledge workers, this means easing knowledge migrant's transition into new communities. This means providing English-language services and providing advice on various administrative requirements of the Netherlands. Some attention is also paid to encouraging cultural activities to make the region more attractive to both local and foreign workers, with the largest concern being the relatively higher attractiveness of the Ranstad region, which is generally considered to be more international and culturally diverse than the south of the country. For education, the province has set up its *Kennis Pact Brabant* (Knowledge Pact Brabant), an online knowledge sharing platform that brings together professionals in the field of labour market innovation. The community also meets offline at conferences and meetings.
- **A top international position and open innovation**. Policy-makers in the region often talk about the open culture of Brabant and the leading position that its companies have taken in promoting

open innovation, where suppliers and similar companies are looked at as both competitors and partners. Top companies operating in the region such as Philips, ASML, NXP, and others have helped to ensure that the region has performed well by global standards; however, the region is focussed on supporting the top sector roadmaps — discussed further in chapter 3 — to ensure that public sector partners are ready to help the private sector in remaining global leaders;

- **Entrepreneurship and excellent supply chains.** While policy documents speak of the need to further entrepreneurship as a critical part of education, such activities are generally driven by national actors. Regional policies generally focus on the valorisation of scientific and academic research into commercial projects, which provide the guidelines for a number of concrete operational programmes, discussed later in this document.
- **An internationally attractive business climate.** Given the areas over which regional governments have control, the focus of policies for the business climate examine attractive spaces for the establishment of new businesses and developing existing businesses. In an administrative agreement signed for 2011-2015 between the government, provinces, municipalities and the *Unie van Waterschapen* (the Union of Water Boards), the province was made the area director. Some of the key tasks that the province engages in include spatial planning and programme management of industrial parks. The interaction between the Brabant clusters also receives special attention.
- **Good governance.** Good governance largely refers to improved partnerships with regional and national stakeholders as well as the efficient running of various industrial parks in the region.

Knowledge specialisation in the region is based on a relatively broad set of technologies for the greater region, focused on five (top) clusters: agriculture and food; High-tech Systems and Materials' chemistry; logistics; and life Sciences and Health. Some of the areas of technical specialisation are indicated in Figure 10.

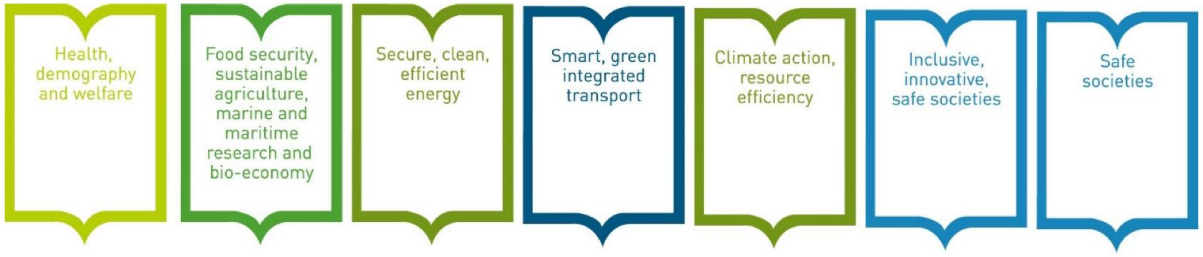
Figure 10: Technical specialisation based on patent indicators (RTAN-EPO)



Source: Smart Specialisation Strategy: The art of combination and cooperation, 2013

The **smart specialisation strategy** — which includes three regions: Limburg, Zeeland, and North Brabant — largely builds on the existing economic base that has been developing for the last two decades, with the only real shift being over the application of those technologies. Following broader Dutch policy, these new applications are supposed to help to solve particular societal challenges (such as health care, mobility, food security and safety, sustainable energy and sustainability in general), though it should be said that these challenges are also market drivers, particularly the field of health, which has been expanding rapidly with services demanded by aging baby boomers. Areas of interest to the smart specialisation strategy are indicated in Figure 10.

Figure 11: Areas with growth potential



Source: Smart Specialisation Strategy: The art of combination and cooperation, 2013

In 2016, North Brabant showed its status on smart specialisation when it took on the role of chairman of the Vanguard Initiative,[29] a network of 28 European regions dedicated to advancing industrial innovation in Europe. Based on the unique strengths of each region, collaboration takes place. North Brabant coordinated the presidency of the European Innovation network for half a year in 2015. Projects of the initiative were 3D-printing, efficient and sustainable production processes, biobased economy and nanotechnology.

Policy documents listed in Table 5 provide the broader frameworks and directions for regional development:

Table 5: Summary of key policy documents

Policy document	**Publish date / Programme period**	**Brief overview**	**Priorities linked to industrial policy**
Economic Programme Brabant 2020	2012 / 2012 - 2020	The document presents a long-term ambition to bring the province into the top of knowledge and innovation regions in Europe. The Brabant Agenda was adapted into an Administrative Agreement and the Implementation Agenda 'Ten for Brabant Administrative Accord 2011-	• Innovation in the national top sectors in areas related to societal challenges, including making 'smart connections', internationalisation, and funding experimental projects; • Attention to promoting entrepreneurship and local value chains;

[29] http://www.s3vanguardinitiative.eu/

Policy document	Publish date / Programme period	Brief overview	Priorities linked to industrial policy
		2015', adopted by the Provincial Council on July 1, 2011.	• A pro-active labour market policy for the knowledge economy; • Space for business and good accessibility; • Non-economic developments that contribute to a good business environment and the province taking advantage of opportunities to make an integrated approach; • Encouraging partnerships between business, knowledge and educational institutions and public authorities.
Brabant in an international perspective: A multiyear strategy to strengthen the international position of Brabant	2012 / n/a	This document presents an agenda for the province that expresses its ambition to join the top tier of industrial knowledge and innovation within Europe. The document speaks of ''the importance of joint action by regional partners'. The current management agreement for Ten Brabant 2011-2015 including the economic framework-programme endorses the importance of internationalisation for Brabant: ''We are aware that maintaining good national and international relations is of great importance for Brabant'.' The provincial government here has the ambition to do this jointly with the Brabant triple helix partners: (Brabant) governments, businesses, educational and social institutions.	• Internationalisation and attractiveness to foreign talent. • Focus on four areas: smart mobility, sustainable energy, healthy living, and sustainable agrifood. • Continued international cooperation
Movement in Brabant: Administrative Agreement 2015-2019	2015 / 2015 - 2019	An administrative agreement that looks to guide the region to solve major societal challenges for the province. The document sees the answer in a number of ambitions, which should be pursued through partnership with business, educational institutes, and other governments.	• Execute the Action Plan for Economic Structural Reinforcement West Brabant, with particular attention to the top clusters biobased economy, maintenance and logistics. • Further development of the Brabant leading sectors and clusters (with emphasis on the maintenance of the F-35 fighter

Policy document	Publish date / Programme period	Brief overview	Priorities linked to industrial policy
			aircraft and smart manufacturing)[30], particularly with support for SMEs. • Facilitate priority economic clusters in a spatial sense with the development of the Brainport Innovation Campus, Health Innovation Campus, and Logistics Park Moerdijk. • Support for the BOM as well as for the implementation of valorisation programmes (Entrepreneurs Elevator, Bright Move, Starterslift). • Start a revolving Leisure Investment, providing financing for short-term stays in the construction industry. • Conclude agreements for dealing with (youth) unemployment with other regions. • Give an extra boost to the region's internationalisation and branding strategy to increase the international acquisition and cooperation with other regions. • Commitment to the European frameworks and funds (OP-Zuid, INTERREG V and POP3)
Smart Specialisation Strategy: The art of combination and cooperation	2013 / n/a	A smart specialisation strategy developed for the south of the country, which includes the provinces of North Brabant, Limburg, and Zeeland. It aims to put development into the perspective of its international top clusters (a part of the national 'top sectors' policy). This includes High-Tech Systems and Materials (HTSM), chemistry, and	• Further develop new or emerging clusters and promote cross-overs between clusters; • Support existing roadmaps created by the triple helix under the umbrella of the 'top sectors' policy; • Support an internationally competitive labour market;

[30] From 2019, North Brabant will be home to the Dutch F-35 aircraft fleet of 37 planes. As a part of this deployment, the region will open the Logistics Centre Woensdrecht, which will be responsible for maintenance, including on the engines. This project is expected to provide 1,610 new jobs and the economic impact of the F-35 is expected to be € 13 billion.

Policy document	Publish date / Programme period	Brief overview	Priorities linked to industrial policy
		agriculture and food. Subfields within these sectors that are of interest include life sciences and health, smart logistics, the biobased economy and maintenance. This document emphasises policies to improve the conditions for a knowledge economy.	• Reinforcing and attracting research centres and promoting innovation, cooperation and knowledge transfer; • Creating and enhancing networks so that it is easier for companies to do business in the region and internationally; • Providing good accessibility, attractive city centres and residential environments, a distinctive cultural and recreational offer, digital infrastructure, and an international school;
Roadmaps for Top Sectors	Various dates	Roadmaps addressing the top Dutch sectors are prepared by regional stakeholders, and outline short-, long- and medium- term industrial needs and actions for the development of particular sectors, summarising strategic focal points for innovation. These roadmaps include a global market analysis as well as analyses of local strengths and weaknesses.	• Priorities vary by roadmap, though most tend to include a focus on skill development as well as R&D priorities based on local strengths and market analyses.
Brainport 2020	2011 / 2012-2020	This policy document is developed by the city of Eindhoven and the Brainport organisation. It presents an action plan in four domains: people, technology, business and basics. Concrete action is assigned within each domain.	• Attracting foreign knowledge workers; • Encouraging and attracting foreign R&D and investment; • Purchasing innovative products from the private sector; • Encouraging cooperation in the triple helix; • Improving international cooperation, particularly cross-border.
Strategic Agenda for West Brabant 2012-2020	2011 / 2012-2020	This policy document is aimed at the western regions of the province with initiatives spearheaded by 18 municipalities as well as one municipality from a neighbouring province. The	• Training and retaining skilled individuals; • Connecting with the Rotterdam / Antwerpen infrastructure vision; • Increasing the independence and

Policy document	Publish date / Programme period	Brief overview	Priorities linked to industrial policy
		policies are built on four main principles: sustainable development, broad social alliances, cooperation with neighbouring jurisdictions, and cooperation within the region.	value of older workers; • Attracting and supporting foreign workers; • Improving the cultural attractiveness of the region.

Source: Collection of Technopolis

Regional policy-making in North Brabant comes from the belief that the agenda should be driven largely by industry. While public funding needs to take into account the public interest, interviewees for this report felt that governments were largely taking on the role of nudging the innovation agenda as one stakeholder of many rather than steering it top-down. From a policy perspective, the largest concern that interviewees held was that government seemed to be stepping back from R&D funding. In 2014, for example, the Dutch Polymer Institute lost its guaranteed funding as one of the leading technology institutes. This has been part of a change in focus for government funding, where research institutes need to earn their funding at a project level, applying for government projects with other partners.

And it is true that overall funding from government sources have been in decline since the economic crisis of 2008. While R&D funding in the Netherlands as a percentage of R&D has been increasing slightly on an annual basis, governmental spending decreased quite precipitously after 2009 as a percentage of overall R&D spending in the country. It has been private industry (and foreign investors) who have been increasing spending, presumably as part of the drive to remain competitive in a global market place.

The national context in which the region works

At the national level, the policy framework under which economic development and industrial policy is guided is the Top Sectors policy (*topsectorenbeleid*). The policy identifies nine priority areas, which apply to all regions of the Netherlands:

- Agri and Food,
- Chemicals,
- Creative Industry,
- Energy,
- High Tech Systems and Materials,
- Life Sciences and Health,
- Logistics,
- Horticulture and
- Basic Materials and Water.

The Top Sector policy aims to maintain the competitiveness of the Netherlands and to keep its international top position. The policy framework allows authorities to coordinate and steer companies, universities, and research centres through funding that encourage cooperation. In the nine sectors, these parties work together on stimulating innovation and education. The top sector funding can include tax benefits, innovation credits, and grants, but also a number of other initiatives, the most important of which include building of scientific infrastructure in which stakeholders can share:

- **National Icons Competition.** The government recognises several projects or products every two years as a part of a national competition, which are then marketed globally as highlights of Dutch technology. The winning entries address major social issues.
- **Innovation Expo.** An event held every two years that aims to accelerate innovation. The Expo comprises 3,000 representatives from the private sector, public bodies and knowledge institutions.
- ***Volg Innovatie* database.** Managed by the Netherlands Enterprise Agency, the database highlights resources that the Ministry of Economic Affairs has allocated to projects.
- **National Science Agenda.** The Ministry of Economic Affairs' National Science Agenda identifies future themes for publicly funded scientific research. It looks at questions like: What areas hold promise for the Dutch science sector? How can science help find solutions to social issues? How can science create economic opportunities for innovation?
- **Innovation Attaché Network.** Innovation attachés, based at Dutch embassies and consulates, help Dutch companies doing business abroad, generally through match-making activities.
- **Smart Industry Agenda.** The Smart Industry Agenda aims to strengthen industry by promoting the use of cutting-edge IT and technology, like 3D printing, nanotechnology, and robotics.

The Smart Specialisation strategy for the region North Brabant, Limburg and Zeeland is coherent with the National Smart Industry Agenda. The Smart Industry Agenda most closely addresses the needs of advanced manufacturing, outlining a vision for 'smart industry', which might be best described as a form of personalised manufacturing. The belief is that manufacturing is increasingly taking into account individual needs of customers rather than focussing on producing identical parts and products that can fit into the widest possible set of applications. Under the term 'mass personalisation', the idea is to have machines and production processes that are capable of producing individualised products without requiring a complete retooling of the line. Flexible manufacturing and 3D printing, both areas of specialisation for the region of North Brabant, potentially enable mass customisation at a lower cost, allowing manufacturers to also rethink value chains.

> *Definition of Smart Industry from Dutch stakeholders. 'Industries that have a high degree of flexibility in production, in terms of product needs (specifications, quality, design), volume (what is needed), timing (when it is needed), resource efficiency and cost (what is required), being able to (fine)tune to customer needs and make use of the entire supply chain for value creation. It is enabled by a network-centric approach, making use of the value of information, driven by ICT and the latest available proven manufacturing techniques.'*[31]

The Smart Industry Agenda has two main objectives:

- Strengthening Dutch industry by maximising the use of the latest information and product technology developments so that industry can produce tailor-made products more efficiently and flexibly using 'Network Centric Production' techniques.
- Bringing new business models, products, and services to market, both on a general level and in areas not traditionally engaged in production, such as the service sector;

Within this Top Sectors framework, which identifies nine priority sectors, three sectors cover advanced manufacturing: agrifood, chemicals as well as high-tech systems and materials. While

[31] As quoted in numerous stakeholder documents, for example, Tilburg University, *Back to Campus: Smart Industry* and ICT+, *Smartportal in smarter industries*.

stakeholders for each of these sectors have generated roadmaps, the Smart Industry Agenda sees its goal as deepening the connections already created as a part of this framework.

Links to other policies

Regional industrial policy is quite focussed and specific since it is often an application of public policy that has been formulated at the national level. A large part of this regional industrial policy is executed by a number of economic development agencies, with one regional agency and a number of sub-regional agencies based in some of the major cities in the area. These agencies are responsible for executing policies in the following areas:

- **Capital investments.** Capital investments are drawn from €3 billion working capital that was built with the sale of Dutch energy producer and distributor Essent to RWE in 2009, which had been partly owned by various provinces in the country (with North Brabant owning a 30.8 % stake in the company).
    - Energy Funds Brabant**.** €60 million for projects aimed at saving energy or generating renewable energy.
    - Innovation Funds Brabant. €125 million to supplement funding from private investors to SMEs that innovate in the fields of high technology, life sciences, the bio-based economy agro-food, logistics, maintenance, healthcare, smart mobility, and agriculture. Other possible areas for investment include the leisure and creative sectors.
    - Broadband Funds Brabant. €50 million to accelerate the construction and adoption of broadband internet in the region.
    - Green Development Funds Brabant. €240 million to build, together with public and private partners, the Nature Network Brabant, looking to help physically connect regional parks.
- **Foreign direct investment.** The region views foreign direct investment as a necessary input for skills and resources. The regional development agency, *Brabantse Ontwikkelings Maatschappij* (BOM), has a team of approximately 10 people responsible for attracting investment to the region.
- **Spatial planning and infrastructure.** This includes support for a number of industrial parks, including Pivot Park Oss, Campus Helmond, Metal Valley in Drunen, and the Brainport Innovation Campus.
- **Matchmaking.** This includes access to the Innovation Attaché Network, providing services to exporters and Dutch companies working abroad via the embassy and consulate network.

Lessons from previous policy cycles

Before 2004, policies to support regional economic development were led by the national government with a philosophy of redistribution, helping poorer performing regions to 'catch up' with other areas of the country. The main critique of this policy orientation was, however, based on an efficient use of resources. It was determined that building upon strengths rather than focussing on weaknesses (while helping to physically connect weaker regions to stronger ones in the hopes of achieving some network effects).

In 2004, however, the national government changed focus quite dramatically, moving away from an egalitarian view of economic development to one that espoused the philosophy of building on strengths (and helping other regions tap into those strengths). This policy was labelled 'Peaks in the Delta' (*Pieken in de Delta*), which identified six regions of the country along with their matching sectoral strengths, producing a package of instruments that would facilitate innovation. Policies drawn up at the time focussed largely on spatial planning, with only a relatively small amount of attention paid to sector-specific issues. Policies tended to focus on transportation, housing, business parks, and other elements of the general business environment—the idea was to connect skills, resources, and businesses.

While evaluations of the Peaks in the Delta programme were generally positive, the Dutch government continued to move in a direction of decoupling from specific regions. In 2010, the transformation of regional development continued with the introduction of the Top Sectors policy. The focus continued to be on sectors and regions where the Netherlands excelled, but with more attention paid to sector-specific issues and infrastructure than choosing a specific geographical cluster. The Top Sector policy also saw further engagement of stakeholders, who were responsible for bringing forward action plans which the government then supported.

Given the focus on finding the strategic advantages of various regions and supporting them to exploit these advantages in the global marketplace, it is perhaps unsurprising that this led to a change in focus for governance of economic development in the country. Rather than a nationally focussed policy looking to balance economic opportunities across the country, responsibilities were devolved to the regions who would be better situated to understand the local context. The Ministry of Economic Affairs, largely responsible for economic development from a national perspective, turned its attention towards the regional development agencies of the Netherlands (*Regionale Ontwikkelingsmaatschappij*, ROM). Currently, there are eight ROMs operating in the country, with a further one being developed to represent the interests of the provinces of Utrecht and Flevoland.

Future plans

Stakeholders across the Netherlands are very clear when it comes to future changes to industrial policy. With two major changes to the direction of policy in the last decade, stakeholders have made very clear that they do not want another major shift in policy, but rather small tweaks to the existing policy framework. One critique of the Top Sectors policy is the level of overlap that can take place. Advanced manufacturing, as discussed earlier in this chapter, fits under the umbrella of at least three of the sectors of interest, meaning there are three sets of stakeholders that are driving policies that will influence the role of manufacturing. However, to eliminate the top sectors and replace the approach with some other framework is perceived as discarding the progress and thinking that is currently done and starting with a new round of stakeholder consultation.

Another reason that future changes to industrial policy should be relatively small is the lack of any full evaluation of the programme. The Ministry Economic Affairs, who would be responsible for the evaluation, claims that the 'integrated systems approach' means a new evaluation framework needs to be developed and that a full evaluation is not expected until 2017.

A 2016 report from the Advisory Council for Science, Technology and Innovation (*Adviesraad voor wetenschap, technologie en innovatie*, AWTI), however, has provided at least an initial look into the framework (AWTI, 2016). It undoubtedly reflects the concerns of stakeholders, with its call for building on the foundation that has been built over the past few years, bringing specificity and adjusting the balance between stakeholders and sectors. In their analysis, the AWTI believes that the Top Sector policy moves the Netherlands in the right direction, but requires some tweaks to the policy mix. A few key points to come out of the report in terms of the policy mix are as follows:

- The current policies focus heavily on developing cooperation between actors, funding, and high-tech skills. They miss a broader look at entrepreneurship skills and assistance in breaking into markets.
- Further specify how much attention and resource should be given to individual top sectors, as they are currently treated in a relatively equal manner. These top sectors could also be further specified, which would clarify questions over prioritising funds for infrastructure and over which projects to provide funding.
- Very specifically, the AWTI recommends that the government should increase the subsidy for private companies participating in research programmes with public research institutes to 40 %.

Industrial policy governance

Institutional set-up and responsibilities

While the overall direction of development policy is driven at a national level, regional policies are steered by the regional government with its executive powers. The province of North Brabant plays a role as the main driver of policy direction within the confines of regional policy. Their powers are derived from the national government, which provides them with authority over areas such as traffic and (public) transport, the environment, public housing, and, important for regional, industrial policy — the direction for spatial planning. The regional government provides direction to the various regional development agencies, which are expected to execute on the general strategy developed at the provincial level. As mentioned in other parts of this report, they also distribute the limited funds available to them.

Provincial authority rests with a Provincial Council (*Provinciale Staten*), directly elected every four years and the legislative authority in the province. This council has two primary duties. First, they define the frameworks within which the Provincial Executive (*Gedeputeerde Staten*) governs the province. Second, they monitor the Provincial Executive's execution of its duties. The Provincial Executive consists of executives or vice governors who each have individual portfolios. The entire executive is responsible for decisions on all policy areas, though must consult with the Provincial Council.

The most central body for executing components of regional development is the Brabant Development Agency (BOM), the body responsible for executing the provincial strategy which works along four core activities, namely

- FDI (specifically targeting that 90% of activity be in the 'top sectors' for the region and 25% being knowledge intensive),
- capital investment (with loans of up to €2.5 million),
- new business development, and
- business parks (restructuring approximately 300ha of land in 2015).

It plays an important role in advanced manufacturing as one of the main funders of the Holst Centre, an independent R&D centre responsible for developing technology in wireless autonomous sensors and flexible electronics as well as for the matchmaking role that it plays across the province.

A number of sub-regional agencies covering smaller sub units or even cities also attempt to exert some influence, with the most important being Brainport Development, located in the centre of Eindhoven. Its mission is to encourage cooperation between academic institutions, businesses, and government institutions; to provide investor services; and to conduct wider matchmaking activities, both locally and internationally. Arguably, it provides a degree of overlap between activities conducted within the BOM, just with a tighter geographic focus of the city rather than the wider region. Therefore, the BOM and Brainport Development have agreed to intensify their collaboration on investment promotion to ensure this is done purposive and efficiently and have signed a cooperation agreement.

Other sub-regional agencies that operate in the region are:

- **REWIN.** The regional development agency for the western part of Brabant, supporting companies with location services, providing financing to growing businesses, and giving advice on business planning.
- **Midpoint Brabant.** A regional development agency representing the centre of the province, including focussed around the university city of Tilburg. As with the other agencies, Midpoint focusses on matchmaking and financing of business cases and pilot programmes (with funds largely coming from the Regional Economic Action Programme (REAP).

- **Samenwerkingsverband Regio Eindhoven.** An organisation that encourages cooperation with and between regional municipalities and represents 21 provincial and national level organisations with regional interests.

These agencies, with lower resourcing than available at the BOM, play a role of largely providing platforms for information exchange and helping to connect local businesses with the information that they need to grow (through matchmaking). Nevertheless, Brainport receives the greatest amount of attention due to the high concentration of major companies that operate in the area, in particular the High Tech Campus in Eindhoven.

In addition to the various regional centres for policy and its execution, the regional offices of the Chamber of Commerce's Entrepreneur's Plaza (*Kamer van Koophandel Ondernemersplein*) play an important role in executing policy goals. It operates in five locations across the country, including one in Eindhoven. The focus of the Entrepreneur's Plaza is to provide advisory services to SMEs, largely helping with financing issues and putting entrepreneurs into contact with the appropriate regional bodies. The Chamber is an important body for small organisations given that it is generally the starting point for those seeking information.

The Chamber, having been restructured in 2014, reports directly to the Ministry of Economic Affairs and is composed of 12 regional chambers as well as a national one. Its list of official duties include the following:

- Helping create business plans for entrepreneurs
- Registering businesses and freelancers
- Allowing access to the trade register
- Providing advice on running a business in the Netherlands
- Stimulating business growth through its support of SMEs

From a public policy perspective, the Chamber plays its largest role through various surveys of its members, identifying the needs of businesses in the country and providing that information to the Ministry.

Regional governance in a national context

As mentioned in the previous chapter, regional (industrial) policy is largely driven by initiatives at and funding from the national level, with the specificities determined at the regional or even local level. The design and funding of regional policy is the responsibility of the Ministry of Economic Affairs (*Ministerie van Economische Zaken* [EZ]), with three separate policy-making pillars. The Directorate General for Business and Innovation is both responsible for developing industrial policy — including the Top Sectors policy — as well as developing policy for the regions.

While the ministry has been responsible for developing the overall framework for the Top Sectors policy, sector-specific roadmaps are developed by 'top teams' that have been assigned by the ministry. Development of policies for the top sectors takes place in the form of 'network governance', where some control over policy-making is given to private and non-governmental organisations. The development of policies is done within nine 'top teams'. These top teams come from, according to the ministry, the grassroots and consist of a representative from industry, a researcher from a knowledge institute, a representative of the government, and a small and medium enterprise (SME). The roadmaps that these top teams produce provide action plans and agreements that determine how the sector can be strengthened in the coming years.

Beyond the board level, governance within these 'top teams' varies according to the needs and philosophy of the members of the team, as decided by the board. For example, comparing the roadmaps generated by the chemicals and HTSM sectors, differences over the number and specificity

of roadmaps is readily apparent. The complexity of governance also varies considerably. The main bodies managing each of the top sectors are summarised in the table below.

Table 6: Governance structures of two top sectors which North Brabant have identified as crucial

Chemicals Top Sector	**High Tech Systems and Materials Top Sector**
Board of Directors. **Sector Council.** Provides advice to the Board and is made up of individuals from industry, knowledge institutes, and government. The council is appointed by the Board. **Strategy Board.** The Strategy Board is composed of the chairmen and vice-chairmen of the Programme Board and representatives of other key sectors. They assess the feasibility and consistency of proposals from the Programme Board. **Programme Board.** There are four Programme Boards that are responsible for implementing the four main lines in the Top Sector Chemistry. They produce the roadmaps and key research proposals. The presidents of the Programme Board are taken from industry while the vice-presidents are taken from science. These Boards cover the following topics: Chemical conversion, process technology & synthesis; Chemical nanotechnology & devices; Chemistry of advanced materials; and Chemistry of life. **Bureau of the Top Consortia for Knowledge and Innovation.** Members support overall management and also help the Programme Board. Council for the Bureau of the Top Consortia for Knowledge and Innovation. A three-person council to which the bureau reports. **Communities of Innovation.** Public-private research initiatives in the field of chemistry. There are currently two COIs within the Top Sector Chemistry: *COAST.* Analytical science in the Netherlands. *ISPT.* Institute for sustainable process technology.	Board of Directors. **Roadmap Council.** Made up of the leaders of the teams responsible for producing the roadmaps for various subsectors. These roadmaps include: Advanced instrumentation; Aeronautics; Automotive; Components and circuits; Embedded systems; Healthcare; High tech materials; Lighting; Nanotechnology; Photonics; Printing; Security; Semiconductor equipment; Smart industry; Solar; and Space. **Council of the Future.** An independent Supervisory Board that works as a sounding board for ideas from the Board, providing advice. **Director's Team.** Appointed by the Board and responsible for the daily management of Holland High Tech and policy implementation. **Office.** Staff that support the Director's team with all activities.

Looking at the composition of the Board of Directors for High-Tech Systems and Materials, for example, the province of North Brabant remains well represented, with a former president of the Technical University of Eindhoven as head of team HTSM and the SME representative being the CEO of NTS-Group, also located in the province. This representation is not because the region has specifically been assigned to lead efforts in the sector, but rather represents the strengths and expertise already existing in the area.

In addition to the nine top sector teams there are several other initiatives that cross-cut the sectors, such as the 'action agenda' Smart Industry. The Smart Industry Agenda is one that has been initiated by the Ministry of Economic Affairs and is executed by the various branch offices of the Dutch Chambers of Commerce though with input from various top sector teams, such as Chemistry and High-tech Systems and Materials.

Role of universities and research institutes

The Netherlands hosts four technical universities that form a federation to take forward technical research in the country (the 4TU federation), namely universities in Eindhoven, Delft, Wageningen, and Enschede (Twente).[32] One of these universities is located in the province of North Brabant, namely the Technical University of Eindhoven. It is very well integrated into the business community in Brabant, providing both contracted research and an opportunity to seek out government funding through public-private partnerships. The research conducted within various groups at the Technical University of Eindhoven is both fundamental and applied.

While many activities operate under the 4TU umbrella, certain facilities are physically hosted at different locations across these four universities. The Technical University of Eindhoven hosts two major facilities, specifically in support of the material sciences and advanced manufacturing:

- **NanoLab.** This facility is part of a broader national infrastructure with four locations (including the two other technical universities and in the city of Groningen), providing tools for researchers engaged in nanotechnology. The Eindhoven facility specialises in the following areas:
  - Deposition of organic, magnetic, and semiconductor nanostructured material;
  - Processing of III-V-based integrated nanophotonic devices; and
  - Advanced nanoscale processing.[33]
- **Multi-scale lab**. This lab is run by the Mechanics of Materials group. It attempts to bridge the gap between traditional materials science and mechanical characterization labs by integrating mechanical testing with microscopic observation.

In the field of advanced materials, universities in the region have traditionally been strong in the field of polymers, an area in which the university continues to hold strength. One particular area of specialisation for TU/e is service modifications and coatings. However, knowledge in this field has recently diversified. At TU/e, the focus has moved to super molecular structures, trying to understand the lifecycle of bio-technical materials. This knowledge area is being advanced due to a greater interest in bioeconomy, with the university looking to feed into the general interest in reducing the footprint of new materials by either extending their life or reducing the costs of repurposing or disposing of materials in products that have reached end-of-life.

TU/e holds a relatively unique position in the country in advanced materials, though this largely comes out of conscious policy choices of the government and university administrators. One of the reasons to set up the 4/TU apparatus was to acknowledge limited public resources available to further basic and applied research. As such, each university and region specialises in a different sectoral strength, looking for synergies rather than direct competition for talent and resources.

While TU/e arguably represents the heart of research for North Brabant, several other knowledge institutions support research in the region, including the Fontys University (a part of TU/e), Philips NatLabs, Microcentrum Nederland, and TNO Industries. From a public-sector perspective, TNO Industries is undoubtedly the most important, as a semi-public applied research institute, which receives public support to bring together research and the business community into applied results. **TNO** was originally founded in 1932 as a semi-public applied research institute. While it receives approximately 40 % of its revenue directly from the national government—with the remaining funds coming from public and private sector contracts — it remains independently run. It operates in five key fields:

[32] In May 2016, the University of Wageningen was added to the original 3TU federation, now called the 4TU federation.

[33] NanoLabs, 2016. Philips, at the High Tech Campus in Eindhoven, also runs a facility in partnership with the national NanoLab called Philips Innovation Services.

- **Industry.** This includes support for areas such as big data, space technology, sensors, optical systems, 3D printing, biobased materials and the Internet of Things;
- **Healthy living.** The mandate around health and lifestyle is relatively broad, including areas such as personalised medicine, but also food technology (such as additive manufacturing techniques in food);
- **Defence, safety, and security.** Again, the mandate here is relatively broad, looking at both internal security threats from terrorism as well as external threats, including cyber;
- **Urbanisation.** This includes research into areas such as mobility, infrastructure and buildings, spatial development, and environmental management;
- **Energy.** This area is largely focussed around 'hybrid energy systems', which look to bring together traditional energy sources with more sustainable ones.

As the largest research institute in the Netherlands — and with locations in Eindhoven and Helmond (the centre for automotive research in the country) — it is an important player in conducting applied research. The organisation not only has significant domain knowledge, but also understands how to leverage public and private sector resources both locally and internationally.

Fontys University engages in five research areas:

- architecture of embedded systems;
- thin films and functional materials;
- mechatronics and robotics;
- automotive control and
- business entrepreneurship.

The Fontys laboratories which work on thin-film technologies include areas like inkjet printing, screen printing, slot-die coating, spin coating, vapour deposition and sputtering as well as 3D printing techniques in their Objex lab.

Universities and research institutes make their policy presence felt largely through the top sector teams, as described earlier in this document. This provides a conduit by which universities can understand the needs of both government and industry, and vice versa. It should also be noted that stakeholders report good interaction between the university and industry, with one complaint being that the university is 'tapped out', with very little spare capacity to engage in further projects. Stakeholders, in fact, complain that government funding for the public side of education remains inadequate to the task at hand, and that further resources would be multiplied by the private sector, further enhancing the innovative capacity of the region.

Role of innovation (industrial) parks and platforms

Given the provincial government's role in spatial planning, it remains unsurprising that various innovation campuses play an important role in the region. The most relevant and important campuses are the High Tech Campus in Eindhoven which specialises in various high-tech companies, from the major players to start-ups (with support services provided in the park); Pivot Park in Oss, which specialises in high-end pharmaceuticals; and the Automotive Campus in Helmond. A fourth innovation park being built near the Eindhoven airport is under development at the time of drafting this case study, called the Brainport Industries Campus, which will specialise specifically in high-tech manufacturing.

One of the important contributions to the business community, both established firms and start-ups, is the provision of shared research facilities on these campuses. Campus companies can make use of the technical infrastructure without individually having to make the related costly investments. They simply buy in whatever they have a need for. And funding for that infrastructure comes from both the national government as well as the BOM and the supporting city, generally under the umbrella of OP South (OP-Zuid), described later in this document.

One example of the kind of institution that provides shared facilities is the Holst Centre, located on the High Tech Campus in Eindhoven. It is one of the important institutions in the region that functions as an intermediary between various organisations to bring about the necessary cooperation. The Holst Centre currently supports collaboration between more than 60 partners, including major international players like Philips, ASML, and Samsung. This open collaboration environment, in which organisations pool R&D resources and share in the intellectual property, serves four main functions:

- Increased innovation by bringing together ideas from different players;
- Sharing facilities and competencies;
- Reducing time to market; and
- Sharing R&D costs and risks.[34]

The Holst Centre was founded in 2005 as a partnership between the Dutch public research institute TNO and the Belgian non-profit research institute IMEC. The centre provides facilities, including rooms, material and process analyses, test and measurement instrumentation, laboratories, measurement services, as well as design and fabrication support. While the Holst Centre is, at its core, an R&D centre specialised in wireless autonomous sensors and flexible electronics (which requires advanced materials to produce), its critical added value lies in its understanding of how to create bespoke intellectual property agreements between various parties. As an independent intermediary with technical knowledge, the Holst Centre seems better situated to stimulate cooperation between various parties (whether private-private or public-private).

In light of the region's goals to help develop SMEs and overcome the difficulties they face in a collaborative environment, in 2014, the Holst Centre reached an agreement with the Brabant Development Agency (BOM) to help SMEs gain access to some of the intellectual property created at the Centre. In the agreement, it is stated that the BOM will identify and work with innovative SMEs and start-ups, helping to sign licensing agreements between Holst and the SME. The goal would be to accelerate SMEs entry into the flexible electronics (and wireless sensor) systems markets.

Funding for the Holst Centre comes largely from the partners, who pay fees (and potentially also provide research resources) in exchange for access to the intellectual property being developed on the site. Approximately 60 % of the centre's funding comes from these fees, with the rest coming from various government sources.

In addition to the shared facilities that promotion open innovation, each of these campuses also provide a networking platform for stakeholders. The open innovation campuses in the region play a major role in networking between big and small companies. In this way, shared business facilities play as important a role in bringing together businesses, universities, and government as the shared research facilities.

Institutional capacity

The most significant policy lever available to the province is the four main capital funds available to local businesses, with revenues from €2 billion invested in working capital providing a stable source of resource to support local business and innovation (as described further earlier in this document). This revenue source supports the Innovation Funds Brabant, providing €125 million per year of seed funding, a large part of which is diverted to SMEs. The largest fund, BOM Capital, is responsible for providing seed and early-stage funding to innovative companies, providing capital anywhere from €250,000-2,500,000. Funding is provided based on technological, legal, management and market aspects. From 2007, the Fund has invested in 40 companies, the most recent investment in advanced materials being in EFFECT photonics, a spin-off from the University of Eindhoven specialising in optical System-on-a-Chip technology. The BOM tries to find promising companies at every stage of

[34] Sieberen Schaafsma, *Holst Centre: Flexible wireless systems*, 2014.

their growth if they have strategic significance to the local business climate, showing high economic and social returns, but are unable to attract sufficient investment from private sources.

One major change that has taken place in the transition from the Peaks to the Top Sector policy has been a reduction in so-called 'structured' funds, moving more towards project-based funding to which governments (in partnership with other stakeholders) apply. This has the advantage of decoupling funding from a strict geographical area, but also reduces institutional stability for organisations that rely on this funding to survive.

A former Managing Director of the Holst Centre has argued in the past that the lack of a consistent flow of funds has had an influence on staff, with concerns over job security rising before the start of every new policy cycle, and also makes long-term strategic planning for the organisation more difficult. This problem is compounded by the network of public funders, each of which finances different aspects of the organisation, with some tying funding to equipment and others providing subsidies to only local companies that work in partnership with the centre. While the inconsistent nature of funding can certainly be problematic, this is in some ways unavoidable and the nature of working in an innovative and ever-changing field. The greater concern for the region, however, is the level of funding being provided (a problem not just for the centre, but for most innovation support mechanisms).

Funding from the national government for the top sectors largely comes from the Ministry of Economic Affairs as well as the Ministry of Education, Culture, and Science. Because much of the funding passes to the regions through public bodies and also cross-border partnerships, there is no reliable breakdown of how much of this funding passes through to North Brabant.

In recent years, innovations in the policy environment have not been focussed on activities, but rather on governance. The Advisory Council for Science, Technology and Innovation argues, in fact, that the entire Top Sector policy programme's focus is on new modes of governance. The report specifies

> In essence, the top sector approach is a way of working. It is not so much a policy innovation (key policies have already been introduced, substituting generic policies for targeted one), but rather an administrative innovation. It is an institutional innovation to shape public-private partnerships. The approach typifies shared responsibility, with the initiative taken first and foremost in the field, by businesses and—in recent years, increasingly—at public knowledge institutions. The role of government has changed from programmer and financier to facilitator and organizer. Representatives from business, knowledge institutions, and governments develop shared visions, agendas, and joint roadmaps.[35]

As such, given that public policy is being produced and implemented in the 'shadow of hierarchy' (where government bodies have authority, but do not use it), initiatives to strengthen public policy have largely focussed on developing public-private partnerships rather than governmental restructuring. Governments play an important role in financing, though the subtle difference lies in how finance is used to facilitate activities driven by stakeholders rather than financing specific projects determined by national bureaucrats.

Funding for economic development in the province of Brabant receives approximately 3 % of the €1.2 billion in 2016. Of the approximately €39.6million budget made available from the regional government, around one half is allocated to general infrastructure building and a further one quarter for economic development, specifically aimed at the six clusters (and top sectors of the Netherlands) as identified in the plan.

The adequacy of public sector funding, which tends to lag behind the private sector funding in R&D spending, is a constant source of debate, with most stakeholders arguing that the government needs to do more to support competitiveness. While many assume that reduced funding is having a negative effect, little concrete evidence has been provided to suggest that the lack of regional funding has been a particular hindrance to competitiveness of the region. As some of these same stakeholders suggest, North Brabant continues to outperform all other regions of the country when it comes to developing

[35] AWTI, year, p. 13-14. Own translation from the original Dutch.

intellectual property. In the view of one interviewee, the province of Overijssel—with higher levels of government funding relative to private sector funding—government money can hinder an entrepreneurial spirit. Pursuing government funding, in the eyes of the interviewee, required a different skill set—particularly given concerns over the lack of valorisation skills across the region (and Europe as a whole), it remained unclear whether government support for research & development was the best way to drive businesses to consider the business implications for the research that they were trying to complete.

Agenda setting and advocacy processes

The main role of the regional government is to coordinate and co-fund strategic initiatives developed by stakeholders in the region. In the main regional innovation programmes and many regional initiatives and projects, the regional government is always involved, either directly or represented by the regional development agency BOM. The province serves to connect and coordinate the many initiatives rather than leading or initiating them in a top-down mode of governance. According to the provincial government, innovation is primarily a task for companies, in close cooperation with knowledge institutions. The province mainly wants to serve as 'inspirator, stimulator, and coordinator', and as such, takes a back seat in terms of agenda setting.

The framework for this agenda setting and regional economic policy is based on the ab0ve-mentioned national Top Sector approach, a governance model characterised by public-private cooperation in nine top sectors. Typical of this approach is shared responsibility. The role of government has changed from programmer and financier to facilitator and organiser. The national government is working together with representatives from business, knowledge institutions and other governments on shared visions and agendas and joint roadmaps.

Advocacy for the provinces in terms of altering national policies that affect the regions is done partly in the *Interprovinciaal Overleg* (Association of Provinces, IPO). This representative group of the provinces informs and guides the formal preparation of policies for the regions of interest. They also share knowledge and information with provincial partners and stakeholders. The IPO has an extensive network, which includes elements of the national government, parliament, ministries, the European Union and civil society in the areas where the provinces are active. In addition to its national interests, part of the IPO agenda also turns to European strategy. This strategy considers how European instruments can contribute to provincial goals and ambitions and lies out the basis for the development of European dossiers. The House of the Dutch Provinces in Brussels (HNP) plays an important role in implementation of the IPO agenda. The HNP has a signalling function and promotes the common interests of the provinces and the IPO in Brussels.

Several SWOT analyses have been carried out for several strategic plans, either cross-regional — such as in the Smart Specialisation strategy for southern Netherlands that covers the three southern most regions of the Netherlands or the SWOT analyses contained within the Brainport 2020 plan, which covers only the city of Eindhoven (though is also applicable for the surrounding areas as well). Regional SWOT analyses are conducted on a regular basis as regional development plans are developed.

Cluster and regional organisations also engage in creating visions and agendas. These are mostly developed in a triple helix context, with various stakeholders on board. Examples include the Logistics Agenda Brabant and regional planning in the field of bio-based economy. In other cases, there are visions and agendas available for part of a Brabant cluster, such as the West-Brabant composite maintenance cluster, a group of institutions in the west of the province focussed on maintenance for the aviation sector. There are other roadmaps available that are not focused on defining the Brabant situation but national campaigns, such as the roadmap of the Dutch Institute for World Class Maintenance (DI-WCM) and more technologically oriented roadmaps drawn up under Top Sector Policy, as mentioned earlier.

Top sector approach

At a national level, the top sector approach is organised in top teams, in which businesses, knowledge institutions and government form a 'golden triangle', collectively setting the agenda for each sector. Top teams are responsible for designing a programme of action and implementation. They are supported by a direction-team that advises the Top team on choices regarding the content and the strategy. The top teams engage in activities around four focus topics:

i) knowledge and innovation,
ii) development of human capital,
iii) development of trade and cooperation with other countries, and
iv) rationalisation of legislation.

For the benefit of knowledge sharing and innovation, Top Consortia for Knowledge and Innovation (TKIs) are created that stimulate public-private collaboration projects. Within the TKIs, scientists and entrepreneurs of the nine top sectors together look for ways to bring new services and products to the market. The TKIs are followed by several direction-team members. They also advise the Top team on the progress and budgeting for the TKIs.

To carry out this joint plan, businesses and knowledge institutions are expected to add their own resources. They are also expected to apply for external resources provided by the national government, such as the Knowledge and Innovation Allowance (TKI-allowance) that is applied for by different TKIs to execute their TKI-programme, and in the case of SMEs, funding from the SME Innovation Incentives scheme for fast growing, starting entrepreneurs. Also, a portion of the capacity of the federation for collaborating research institutes for applied science (TO2 federation) focused on the agendas of the top sectors. Universities can draw funds from earmarked Netherlands Organisation for Scientific Research (NWO) funding. The sources of funding from the NWO are largely generic.

According to a report from the AWTI[36], while the top sector approach is good at bringing in opinions from all parts of society, it sometimes appears closed to those outside of the decision-making networks, with the established order being well-represented and newcomers finding it difficult to gain access. Although there have been steps put in place since the beginning of the top sector approach, this sentiment persists.

Policy coordination mechanisms

The general approach of the Netherlands in terms of industrial and economic development policies has bottom-up and top-down, and might best be characterised as a form of network governance**,** for example with the development of policy in the top teams. This is a mode of governance in which government bureaucracies relinquish some control over policy-making to private and non-governmental organisations (such as research organisations), which is supposed to lead to more efficient and effective decisions. The common metaphor used in the literature is one of steering. Governments control the direction of policy through their division of resources or public pressure; however, they do not dictate exactly what needs to be done through regulation (Börzel et al, 2006). The state's role shifts from instigator to mediator of stakeholder networks, which can be seen in the series of policies that have been outlined above. Even resources are meant to encourage stakeholders to take particular actions, but the decisions around specialisations to pursue and improvements to the business environment that are required generally come from those actors.

This approach also fits quite well with the Dutch culture that is generally characterised by consensus building (also called the 'polder model'), in which major stakeholders are involved in many policy-making situations in all parts of the economy. The involvement of various stakeholders can be seen in the number of Advisory Councils at a national level, which incorporate various elements of society

[36] AWTI (2016) Flexibiliseren, differentiëren, scherper kiezen. Balans van de topsectoren 2016.

that research and provide advice (with various levels of legal ramification) to the government. While these councils operate at a national level, it can still be instructive to note a selection of the broad range of councils, which operate independently from the bureaucracy, namely:

- Advisory council for science, technology and innovation;
- Scientific council for government policy;
- Advisory committee on migration affairs;
- Advisory council for international affairs;
- Council for culture;
- Council for health and society;
- Dutch energy council;
- Council for financial relations;
- Council for rural areas; and
- The social and economic council of the Netherlands.

Each of these bodies will have representatives from various stakeholder groups folded into the organisation in some form or the other.

Coordination between national and local governments

The top sector approach, as has been mentioned in other sections of this report, has seen policy coordination take place within the triple helix of businesses, educational institutions and governments. Each of the nine top sectors has developed a social network and has a unique organisational structure with their own rules, agreements, and arrangements to drive innovation within its respective sector.

For example, the management model of the Top Sector Chemistry is to 'decentralize where possible, centralize where necessary'. The model allows for basic research and for research and innovation proposals from the wider field, including chemical regions. This ensures better connection with and in the innovation process from basic research to innovation, particularly for SMEs.

Given that the regional government only involves itself with facilities, science parks, and labour market activities, coordination with the top sector teams is limited to the involvement of local stakeholders in the various teams. One interviewee argued that, in fact, North Brabant missed opportunities for funding because they did not help local stakeholders to more closely align with the priorities set by the top sector. There is no formal process by which regional policy-makers interact with these teams, but there is an awareness of the strategic direction that each team is taking.

Coordination between local stakeholders

In the 1990s, regional collaboration generally started out as a voluntary form of network governance. Municipalities collaborated across their administrative borders on an ad hoc basis when a particular agreement made sense to neighbouring government or stakeholders. They would agree to collaboratively address problems. This cooperation was formalised to a degree through the 2015 national Law on Collaborative Arrangements (*Wet Gemeenschappelijke Regelingen*) that made it possible to grant legal tasks (and resources) to these voluntary collaborations. This law, however, is sometimes considered to be too cumbersome to foster cooperation, and occasionally private law contracts are also signed between municipalities to establish the rules around cooperation on a particular project.

Given the ad hoc basis for cooperation, as represented in various levels of regional development agencies and other stakeholder associations, there is very little formal coordination that takes place (though this has not stopped these various organisations from recognising many of the same issues facing the region and proposing similar solutions).

Use of policy intelligence

All regional public actors rely on different policy intelligence tools to a certain extent. In general, they rely on reports commissioned from independent contractors, which provide analysis of various aspects of the region, such as market studies. They also rely heavily on statistics collected by the national office. For example, the *Onderzoeks- en Adviesagenda 2015* (Research and Advice Agenda 2015) from the province of North Brabant presents 21 themes for policy research that would need to be conducted, including the sources for that information. The vast majority of these research themes will lead to reports or evaluations that have been produced by either private sector consultancies or university partners (who will also have received external funding from the province) conducted by bespoke research.

One platform for policy intelligence does appear, however. And this is the BrabantKennis platform. BrabantKennis is an independent development council with representatives from all parts of North Brabant society, who think actively about the design and layout of the region. They use interactive and multimedia forms (social media, webinars, hackathons, etc.) to circulate knowledge on the North Brabant society to promote the 'collective mind' of Brabant.

BrabantKennis maintains a number of portfolios on which they share information with policy-makers and other stakeholders. One of these portfolios includes Kijk op Brabant (Look at Brabant), which presents not just statistics for the region, but also what's behind them, for example debates and stories from citizens that are translated into recommendations. It looks to answer questions such as how is North Brabant currently performing? What are the major trends and developments? And what are the challenges for the province and its inhabitants?

Policy implementation

The industrial policy mix

The framework for industrial policy, as mentioned in the previous chapter of this study, is set at a national level. Regional actors are largely responsible for giving shape to the policy framework, taking advantage of national and European funds in a Triple Helix partnership. As such, the industrial policy mix relies mostly on a project-based implementation. Local and regional policy initiatives, which include both industry-specific and horizontal measures, are predominantly grants, equity infusion, and loans.

At regional and local level, the main type of policy instrument to implement the economic policy objectives is the support to industrial and innovation platforms created as a part of the Top Sectors policy. This comes from the general policy goal to create an open and collaborative business environment, on the ground of which industries can innovate, reinvent themselves, and face global competition. Contrary to traditional cluster policies where the focus was put on cooperation between companies and research organisations and on fostering research and innovation projects, the platform approach stresses the importance of global ecosystems.

Funding for economic development is specifically aimed at the six clusters (and 'top sectors' of the Netherlands) as identified in the plan. This funding specifically supports the following areas:

- Various funds in support of innovation, energy efficiency, and broadband internet (such as a lending scheme to Lithuanian-based Mabib to lay fibre-glass for areas without existing coaxial cable for high-speed internet);
- Building international networks via departments responsible for internationalisation of businesses, public affairs, and branding;
- Matching funds from European funded programmes, such as INTERREG, the Rural Development Programme, and the European Regional Development Fund;
- Support for economic clusters and innovation parks, such as the Green Chemistry Campus in Bergen op Zoom;
- Specific support for high-tech systems and materials, which includes three pillars:
  - Manufacturing and equipment;
  - Design and development; and
  - Software and services.
- Support for various other sectors of the economy, such as aerospace and maintenance; health, automotives, agro-food, and the creative industry

Furthermore, there are several important programmes, driven at the national level but used within North Brabant, including:

- Funding available via the National Science Agenda, which currently attempts to address 140 research questions under five themes and 16 subthemes, including:
  - Society, the environment, and the economy
  - Individuals and society
  - Sickness and health
  - Technology and society

  - Building blocks of existence[37]
- Access to the Innovation Attaché Network, providing services to exporters and Dutch companies working abroad via the embassy and consulate network;
- The Smart Industries initiative, under which various Field Labs have been funded and various educational initiatives are being driven, including labs in Eindhoven as mentioned earlier in this report;
- Seed Capital for techno and creative start-ups;
- Innovation credits (direct loans) for projects with technical feasibility but which cannot attract funding through technical means;
- Along with the European Investment Fund, a € 200 million fund-of-funds for ICT, clean-tech, med-tech, renewable energy and life sciences;
- An Innovative Future Fund, making € 5 million available for innovation SMEs conducting research; and,
- A single tax credit scheme for research and development (R&D), offsetting R&D against salaries taxes (which tend to be quite high in the Netherlands);

The region's role in manufacturing can be felt in participation of various programmes being driven by the Top Sectors policy. One such upcoming initiative is the Brainport Industries Campus Innovation Programme located in Eindhoven. This project will look to jointly develop state-of-the-art technological product and process innovations in robotics, mechatronics, 3D printing, and embedded electronics and software—essentially, everything around the 'smart factory'. This physical space will provide a place to share facilities, conduct joint experiments, and trial production runs in the 'Factory of the Future'. Some of the shared facilities include 3D printing machines, measurement systems, fibre-optic internet, server rooms, stock control, logistics, quality control and waste processing. Plans for the site includes five planned factory buildings covering 65 hectares. The campus will provide not just a space for experimentation, but also the shared facilities that smaller SMEs can use, such as shared business services. This includes reception, cleaning, IT, and security, which are drawn from a pool of workers that the innovation park employs.

Financing of the campus is largely provided by the province and the city of Eindhoven, who have guaranteed a loan of €11 million, while providing a further €1.5 million of subsidies for the furnishing and operating the main Atrium. While the initiative receives government funding, the site itself will also be a revenue generator, with companies paying jointly for the use of machines and services.

Key initiatives from the region

While the provinces have no formal role in innovation and R&D policy, North Brabant exerts its influence through its interaction with stakeholders and also through the use of capital funds under their control, as discussed in chapter 2. Other key policy interventions include:

Energy Funds Brabant[38]

The province established the Energy Funds Brabant that has €60 million available to it, which provides equity and subordinated loan capital up to 25 % of the required capital to companies that apply. It is managed by the BOM, focussing both on projects with sufficient scale (such as wind farms or geothermal) as well as smaller scale projects. The fund does not support a project directly, but through partnerships with a specific objective, such as solar panels on social housing or LED lighting

[37] A full list of items of the National Science Agenda is available at http://www.wetenschapsagenda.nl/publicatie/nationale-wetenschapsagenda-nederlands/

[38] https://www.brabant.nl/Politiek-en-Bestuur/Agenda-voor-Brabant/Investeringsfondsen/Energiefonds.aspx

for SMEs. The fund does not just provide financial resources, but uses smart capital to create a more sustainable energy supply in Brabant (measured in CO2 reduction per euro invested).

BOM Foreign Investments[39]

BOM Foreign Investments, a division of the regional development agency, aims to strengthen the industrial and economic structure of value chains in the region. The services that it provides include a complete foreign investment promotion and acquisition programme. BOM Foreign Investments facilitates foreign companies' direct investment in Brabant, whether developing a first European presence or optimising existing European operations. Companies can obtain information, strategic perspective and practical assistance. BOM's services are confidential and free of charge. These services include

- Providing all relevant information concerning the national and regional business climates, including labour, taxes, industrial sites, office locations, residence and work permits, international schools and quality of life;
- Personal guidance through the complete site selection process; organising fact finding trips and ensuring that all available real estate options (new, existing, buy, rent); and
- Introducing companies to a large variety of relevant contacts: national or regional, government or industry, OEM or supplier, public or private consultants, education and training institutes, real estate and development agencies.

BOM Business Locations[40]

Given the province's key role in spatial policy, the division of the BOM responsible for providing support to companies looking for new locations is key in achieving policy objectives. The provincial strategy for business locations has shift emphasis in recent years, from a physical spatial approach (such as directing the expansion of workplaces, prevent degradation of existing business) to a more economic approach. North Brabant's priority clusters receive priority, as per the top sectors policy at a national level, mentioned earlier in this report.

BOM Bedrijfslocaties B.V. has mainly focused on restructuring outdated industrial parks and is generally limited to resolving problems of NIMBY companies.[41] The business locations initiative has focussed on six clusters and campuses, including Pivot Park in Oss, the High-Tech Automotive Campus in Helmond, and Aviolanda in Woensdrecht. The focus is not primarily on physical restructuring, but on the development of economic clusters at a specific location, attracting the right types of companies to further development. This might include analysing value gaps in a location to determine how best to improve the economic performance of a particular geographical location. BOM Foreign Investments would, of course, potentially play a role in trying to attract foreign companies that might fill value gaps with particular value adds.

Industrial and innovation parks

In addition to the many private sector projects of varying sizes that are running in the region, the ERDF OP South Netherlands has allocated €321.6 million for the period from 2014-2020 (with €113.6 million coming from the European Commission). This project covers the province of North Brabant, Limburg, and Zeeland, bringing together public and private sector actors into large projects.

The OP South programme[42] is divided in four specific objectives:

- strengthening and broadening the open innovation system;

[39] https://www.investinbrabant.com

[40] https://www.brabant.nl/politiek-en-bestuur/provinciale-staten/vergaderingen-ps/lis/20141223/download.aspx?qvi=51954

[41] NIMBY: Not In My Back Yard

[42] OP Zuid, http://www.stimulus.nl/opzuid/

- strengthening the valorisation possibilities of SMEs;
- sustainable strengthening of the system within which the supply and demand of jobs are aligned within the RIS3 top clusters; and
- stimulating innovation regarding the smart rollout of low-carbon technologies and instruments, focusing on the build environment.

The allocation of budget to projects is divided over these four objectives.[43] The province's role is in deciding what clusters to support and to provide management services to the various cluster organisations that have been set up.

POPP for Starters[44]

POPP for Starters is a programme that prepares a start-up to receive follow-up financing and marketing. The name stands for 'Proof and Optimize your Pre-Seed Program'. It links companies to an investor that will provide a €25,000 investment and with support from the programme explore the opportunities and pitfalls of a new business. The supported company goes through a custom process, providing cost-efficient and market-oriented development steps. The advertised result after six months is:

- A strong team;
- A complete business case;
- A demonstrator or working prototype;
- A launching customer or partner;
- A view of continued funding.

Shift2Start (S2S)[45]

With the support of the Automotive Campus in Helmond, this initiative also supports start-ups, though specifically aimed at the automotive industry. The programme starts with an initial online assessment of the feasibility of a business idea. If the outcome of that test is positive, then a business will receive support to produce a business plan, with experts looking to find the best product market combinations for the new start-up. Important input for the business plan is the feedback from the markets to secure the right requirements as well as financing. S2S can also provide management support during the early stages without requiring an equity share from the start-up founder(s).

BrightMove[46]

An initiative supported by the BOM, Brainport, and TU/e with funding from the national government, the province, and Samenwerkingsverband Regio Eindhoven, BrightMove is the Valorisation Plan for the Southeast Brabant region. Through its partners it delivers the necessary knowledge, skills and loans to support business start-ups and spin-offs in the region in the realisation of their business plans in the region. BrightMove has three principle tasks as its objectives:

- **Support innovative start-ups.** Scouting, screening and supporting start-ups in building a financially sound business plan, including its financing, linking to 'launching customers'[47], and providing guidance via a professional team of business developers, patent experts and financial experts;

[43] OP Zuid - Results, http://www.stimulus.nl/opzuid/resultaten/

[44] https://www.wonderlab-s.com/?page_id=1054

[45] http://shift2start.eu/en/

[46] http://www.brightmove.nl/

[47] A launch customer, in this case, refers to the first customers for a start-up that put them on a path to sustainability.

- **Transferring knowledge.** Knowledge transfer from research institutes and high tech companies with R&D departments, including the creation of development environments ('Living Labs') in which researchers, start-ups and companies work to bridge the difficult development phase;
- **Stimulating entrepreneurship.** The very early involvement of active and result-oriented training to encourage students and entrepreneurship.

High-Tech Business Lab[48]

Supported under the HTSM roadmap, ambitious high-tech SMEs can find support to explore and develop their ideas. The programme is specifically aimed at companies looking to join existing or establishing value chain, looking to become OEMs. Participants receive support from specialists within the High Tech NL network, which is a network organisation that brings together various companies in the region involved in high technology. This includes support in the areas of technology roadmap planning, business development, risk management, legal issues, marketing and sales.

NextOEM[49]

NextOEM is the only accelerator for high-tech growth SMEs in the Southeast of the Netherlands, which includes North Brabant. It is run jointly with partners of the Brainport Region, helping SMEs to develop and grow faster through accelerated professionalisation and improved financials. The NextOEM programme is based on innovation, not as a technology but like developing an innovative culture, helping businesses in all sectors and all industries to think and behave differently, and looking at how existing products and services can be taken to new markets.

Because the programme is indirectly product related it has been applied to various technical fields. The aim of the programme is to create knowledge innovation, adding value to SMEs within different segments of regional value. A unique point of the programme is that it is tailor-made, using what they term a 'Golden Egg Check', measuring the rate of growth of companies and providing advice according to those growth patterns. By measurement of the growth a steering mechanism is created to steer on sustainable growth of the innovative SMEs.

The duration of the programme is one year and it starts with a scan of the participant. After this scan, the programme is tailored to the needs of the participant.

Agrifood Capital[50]

Agrifood Capital is a grouping of firms, governments and educational institutions in the north eastern part of the province. It supports collaborations on innovative solutions to social issues around sustainability, nutrition and health. Agrifood Capital North Brabant wants to excel in 2020 as the top region in agrifood. This support includes:

- Networking and making connections;
- Process and programme management;
- Facilitating initiatives with co-financing from the Regional Fund; and
- Public affairs and communication.

Projects specific to advanced manufacturing

In the field of advanced materials, the Fieldlab CAMPIONE[51] receives support as a part of a consortium of around 20 companies (including Sitech, Tata Steel and Dow), 10 knowledge institutes (such as TNO and Tilburg University), and three support organisations (namely, the BOM, the Strategic Board Delta Region, and Midpoint Brabant). It is a project that looks to make maintenance of

[48] http://www.hightechnl.nl/innovatie/high-tech-business-lab

[49] http://www.nextoem.com/home

[50] http://www.agrifoodcapital.nl/

[51] https://www.smartindustry.nl/fieldlabs/campione/

machines in the chemical industry more reliable and efficient. Rather than maintaining machines based on a time, CAMPIONE has developed sensors and software to monitor machinery in real-time, which allows for a maintenance schedule to be put in place for when machines actually need servicing. This increases up-time, predictability, and overall productivity. The results from the field lab should lead to prototypes that can then be used in the field.

The Photon Delta[52] project that aims to strengthen the photonic ecosystem in the South of the Netherlands and is executed by the University of Eindhoven, the BOM, SMART Photonics and others. Photonics is based on the interaction of light (photons) and electrons (electronics), which can have numerous applications in computers, lasers, LEDs, solar cells, and optical chips. The project aims to generate new business in this field, strengthen the existing infrastructure and further build the Brainport brand. It will do this by building an 'end-to-end ecosystem' all along the value chain.

Further project examples include the development of intelligent packaging with fibre-optic sensors for the chemical process-industry by three SMEs, 2M Engineering, KeyTec and FOCE; the open learning and innovation labs in Eindhoven that aim to develop excellent open access education material; and the EnergyWall in Tilburg that aims to develop infrastructure integrated PV technology and to demonstrate 300Wp solar panels.

Talent and the top sectors

As mentioned in other sectors of this report, the concern over skilled labour has remained a critical concern for the region; however, from a policy perspective, the region has few policy options on which it can ensure that talent is available. The region tends to focus on spatial planning and cultural issues, which remain under its domain, to try to both attract new talent and ensure that existing talent (both local and foreign born) wants to stay within the region.

However, the top sector teams are also an avenue for planning on how to train and attract top talent. As an example, the HTSM top team has developed a 'human capital agenda'. They have developed a four-point action plan to ensure that labour remains available within the region now and in the future. It should be noted, however, that this document is generally intended to influence policy-making at a national level. The points of the action plan include:

- Action 1: Increase the intake into science and technology education
  - Programmes for companies and educational institutions should stimulate the interest and awareness of young people for technology.
  - Professional organisations like KIVI NIRIA (the Royal Dutch Engineering Society should examine the possibilities to certify engineers and craftsmen as a way to encourage lifelong learning and to enhance the status of the profession.
  - The central government should support awareness programmes for young people by including a technical test in the CITO final exam,[53] incorporating science and technology as a compulsory subject in teacher training, and not penalising students scholastically who show technical talent.
  - The government should make training in the hard sciences, like mathematics and physics, relatively attractive and studies with little market attractiveness more unattractive, such as through differentiation of tuition fees and setting a fixed number of places for each profession.
- Action 2: Increased participation of companies in education to increase connection
  - Classes in technical fields should require 10 % content from people working in the private sector. Companies and educational institutions must work in the region to achieve this

[52] http://www.photondelta.eu/

[53] The Cito exam (Cito-toets) is an independent assessment of final year Dutch primary school students.

objective. The government could encourage this interaction by adjusting requirements for professors and introducing tax incentives.

- Businesses, schools and governments should selectively invest in Centres of Expertise and Centres for Innovative Craftsmanship. The top team supports the Eindhoven region's proposal for a Centre for Innovative Craftsmanship. It also calls on other regions to develop initiatives in areas including aerospace, mechatronics, and maintenance.
- Ensure that companies and educational institutions use the technology and application areas of the Innovation Contract for the top sector HTSM as a basis for national and regional alignment of priorities in higher education.
- In line with these priorities, there should be a balanced and recognisable development for businesses with Minor degrees, Associate degrees and Professional Masters programmes.

- Action 3: Attracting and retaining international knowledge
  - The top team HTSM will start an international branding campaign under the name 'Holland High Tech' to promote the Netherlands as a place to be for high-tech activities. This campaign will support companies and educational institutions to recruit professionals and students abroad.
  - Public and private partners in a region provide good reception of foreign knowledge workers.
  - The government bottlenecks for companies with short-term stays of international knowledge must - even if they are employed by the company itself - dissolve quickly.
- Action 4: flexibility of the labour market to avoid losing knowledge and expertise in production fluctuations.
  - Companies in the region should work out arrangements to exchange staff during production variations at individual companies.[54]
  - Businesses, unions, and financial institutions should continue working on arrangements to improve access for temporary workers to private and public services, such as mortgages and corporate training facilities, which only workers with permanent contracts tend to receive access.
  - In a time of crisis, the government should use instruments like the *Kenniswerkersregeling* [the rules and regulations around knowledge workers with temporary permits in the country[and part-time unemployment more flexibliy to prevent the loss of knowledge and expertise.

Policy implementation process

Policy implementation varies per support mechanism that has been put in place, but generally speaking, there is an open application process, and those that meet the criteria requirements for the programme in question will receive support. Rather than collecting applications for a specific deadline, and then distributing resources and support, the process is much more fluid and reacts to the needs of businesses rather than the bureaucratic policy cycles.

The interaction between actors during the implementation process occurs largely within the specific networks of the supporting institutions as well as the formal resources that have been allocated to each programme.

Policy measures available to regional companies in North Brabant include:

- **Knowledge and Innovation Allowance (TKI).** Applications for the TKI require application to the individual management teams that are responsible for the top sectors, as assigned by the EZ.

[54] This can be seen as a way around Dutch inflexibilities in its labour laws, allowing people to retain employment, but allowing companies to shed staff when a project fails.

Applications are submitted via the eLoket system. eLoket is an electronic portal for digital applications for subsidies run by the Netherlands Enterprise Agency. Access to the eLoket system requires an application, and for the TKI, level 2+ authentication (on a 4-point scale), which requires basic documentation, generally available through the Dutch Chamber of Commerce and various ministries.

Applications need to be made by (and executed by) at least one research institute and a private company working together. The projects can consist of fundamental research, industrial research, experimental development, or a combination thereof.

Award criteria for TKI funds vary from top sector to top sector and initiative to initiative. As such, there is no standard award criterion. Below is but one example of award criteria for an application, this one of the Top Technology Twente: The UT Impulse Program (part of the HTSM top sector)

- *External funding:* external private parties will finance the same number of doctoral positions as the UT is funding, in cash contributions that cover the total cost.
- *Novel:* the programme must involve new research (possibly in the form of an extra work package for an already active study).
- *Necessary:* the doctoral positions to be funded by the UT are required in order to realize the external doctoral positions.
- *Strategic:* the programme is aligned with the university's strategy.
- *Excellent:* the research is of excellent quality.

- **SME Innovation Incentives, Top Sectors.** Applications are similar to the TKI, though aimed specifically at SMEs. Applicants use the same eLoket system, and once they have received their level 2+ authentication, they need to submit a project plan of not more than 10 pages.
- **Netherlands Organization for Scientific Research funding (NWO).** The NWO funds scientific research in the country, primarily distributing funds to research institutions, focussed on universities. They have individual programmes that support the top sectors programmes, each with their own award criteria and procedures. NWO partnerships include more than two dozen programmes around advanced manufacturing, a few of which include:
  - *ARC-NL.* Public-private research focusing on the challenges of EUV technology such high intensities, optics and photochemistry, which fits into the roadmap for Semiconductor Equipment. NWO invests in 2016/2017 through two lines ARCNL: the core funding and IPPs within the ARCNL. Private funding of €7.0 million from ASML and NWO funding of €4.5 million.

    Qtech. NWO is providing additional investments in the period 2016/2107 in three roadmaps that focusing on the fundamental physical questions concerning quantum technology (and computing) via a free part (strategic program) and IPP (no. I39) with Microsoft. Both ASML and Microsoft will make a substantial contribution. QuTech has since October 2014 set out in the Roadmap for Nanotechnology of the Top Sector HTSM while QuTech was appointed National Icon. Private financing of €8.44 million from Microsoft and €7.5 million from NWO.

International cooperation

While regional innovation policies focus their attention on a particular political geography, the reality is that the borders do little to demarcate how business and academics cooperate and participate in various value chains. The location of the Chemelot Campus, a science park in the city of Geleen specialised in chemicals and materials, is a good example of this. Located in the province of Limburg, organisations working in the park have some connections with the largest city in the region,

Maastricht, including the university. However, while the University of Maastricht has a faculty of health, medicine, and life sciences, it lacks faculties for math, physics, and chemistry.[55] But only 75km from Eindhoven, the Technical University of Eindhoven (TU/e) provides plenty of partnership opportunities.

One such cooperation that includes organisations based out of Brabant is the Chemelot Institute for Science & Technology **(InSciTe)** facility, founded by DSM, the universities of Eindhoven and Maastricht, and the province of Limburg. This public-private partnership was set up to facilitate research in both sustainable health as well as the sustainable production of new chemicals and materials.

Another important cooperation is the Brightlands Materials Center, set up on the Chemelot Campus in 2015. The Center was set up as a cooperation between 15 organisations, including the province of Limburg; companies like TNO, DSM, and SABIC; and universities TU/e, Wageningen University, and Maastricht University. An investment of nearly €45 million, the centre looks to conduct research into nano-coatings, new materials for 3D printing, and new lightweight materials for the automotive industry.[56] They work in three main programme areas: additive manufacturing, lightweight automotive, and opto electronics (electronic devices and systems that source, detect and control light).

Also, as mentioned earlier in this report, Tier 1 and Tier 2 suppliers tend to be located within 100km of the major centre of Eindhoven, an area that stretches over national borders into Belgium and Germany. The city of Aachen, just across the border in Germany, is a particular hub for advanced materials, with organisations such as AMAC, Katcon, AZL Aachen, and Frauenhofer (both production and laser technologies) engaging in activities around advanced materials. They form numerous business and research networks (some of which are discussed in other sections of this report), such as Mikrocentrum, DSP Valley, Leuven.INC, TEFON, ATC, LifeTec Aachen-Jülich, CAR e.V. Flanders' DRIVE, FMTC, and LifeTec Network.

Given the natural links between major centres in the area, it seems like a natural step to leverage European funds to foster that cooperation. In 2010, the Top Technological Region/Eindhoven-Leuven-Aachen (TTR-ELAt) was formed and is one of the largest cross-border collaborations supported by various levels of government in the region. Its role, while not formally institutionalised, has been to support the area into a 'technology hotspot' in the areas of chemicals and advanced materials, high-tech systems and health sciences.[57]

[55] The university is trying to build capacity in the area by partnering with other institutions in the region, forming the Aachen-Maastricht Institute for Biobased Materials (AMIBM) on the Chemelot Campus in 2016.

[56] *Tweede Fase van Brightlands Materials Center van Start [Second Phase of the Brightlands Materials Centre has Begun]*. https://www.tno.nl/nl/over-tno/nieuws/2016/2/tweede-fase-van-brightlands-materials-center-van-start/

[57] Claire Nauwelaers, Karen Maguire, and Giulia Ajmone Marsan, *The Case of the Top Technology Region/ Eindhoven-Leuven-Aachen Triangle (TTR-ELAt) – Regions and Innovation: Collaborating Across Borders*, OECD, 2013.

Figure 12: Map of the Top Technological Region/Eindhoven-Leuven-Achen

The Brainport is the leading organisation in the ELAt, and as a part of its coordination activities, it also engages in some lobbying activities. They have four main discussion points with various national and regional stakeholders:

- Increase and improve use by stakeholders of cross-border public funding for research and innovation projects with cross-border partners, looking at obstacles that stakeholders have faced and legislative changes that could improve cooperation and innovation;
- Foster the use and transferability of knowledge vouchers from one region to another;
- Enable cross-border, multilateral public funding by integrating the timing and criteria for access to resources that foster collaboration in innovation; and
- Address intellectual property issues and the 'taxpayer's dilemma' in publicly funded cross-border research projects.

While the TTR receives European support and has this plan for lobbying, its visibility with various stakeholders in North Brabant is generally low. The European Union's Interreg programme has been more successful in driving cooperation in the region. While this programme is aimed specifically at advanced materials, the fifth iteration of the Interreg programme in Vlaanderen-Nederland has supported important initiatives in the sector, making investments of more than €300 million in the border region possible. Programmes that have been supported under Interreg include:

Accelerate[3]

This project is aimed to improve the scientific infrastructure shared across the Dutch-Belgian border for research in additive manufacturing, specifically looking at Fused Deposition Modeling (FDM), Digital Light Processing (DLP) and material jetting tend to be limited to projects between governments. Five research centres share knowledge and resources:

- TUA West;
- Chemelot Research Facilities B.V.;
- Brightlands Chemelot Campus B.V.;

- Centexbel;
- KULeuven-Campus Kortrijk.[58]

'2B Connect'

This project gives a direct interpretation of the Biodiversity Strategy 2020, where the European Commission committed to the development of green infrastructure, emphasising the importance of cooperation with and between companies to achieve biodiversity targets. '2B Connect' provides at least 70 commercial parks with financial and knowledge resources to improve the layout of the area to improve its biodiversity This green infrastructure plays an important role in maintaining green corridors for wildlife and also provides less noise, better air purification and a pleasant setting for outdoor activities.

Sustainable Buildings by Demi Moore

'Demi Moore' focuses on energy efficiency in real (historical) heritage, where older building often perform poorly because of the material used, the size of the rooms, as well as the absence and the difficult installation of insulation. Through demonstration projects that develop from this European Commission funded project provide for innovative applications of energy efficiency and use of renewable energy in monuments. In conjunction with the deployment of upgraded energy efficiency for heritage buildings, the programme aims to develop an international standard for certifying the sustainability of monuments (BREEAM standard tailored monuments.

[58] While none of the main players in this programme are located in Brabant, Chemelot works extensively with TU/e, and as such, Brabant still sees direct benefit for this co-operation.

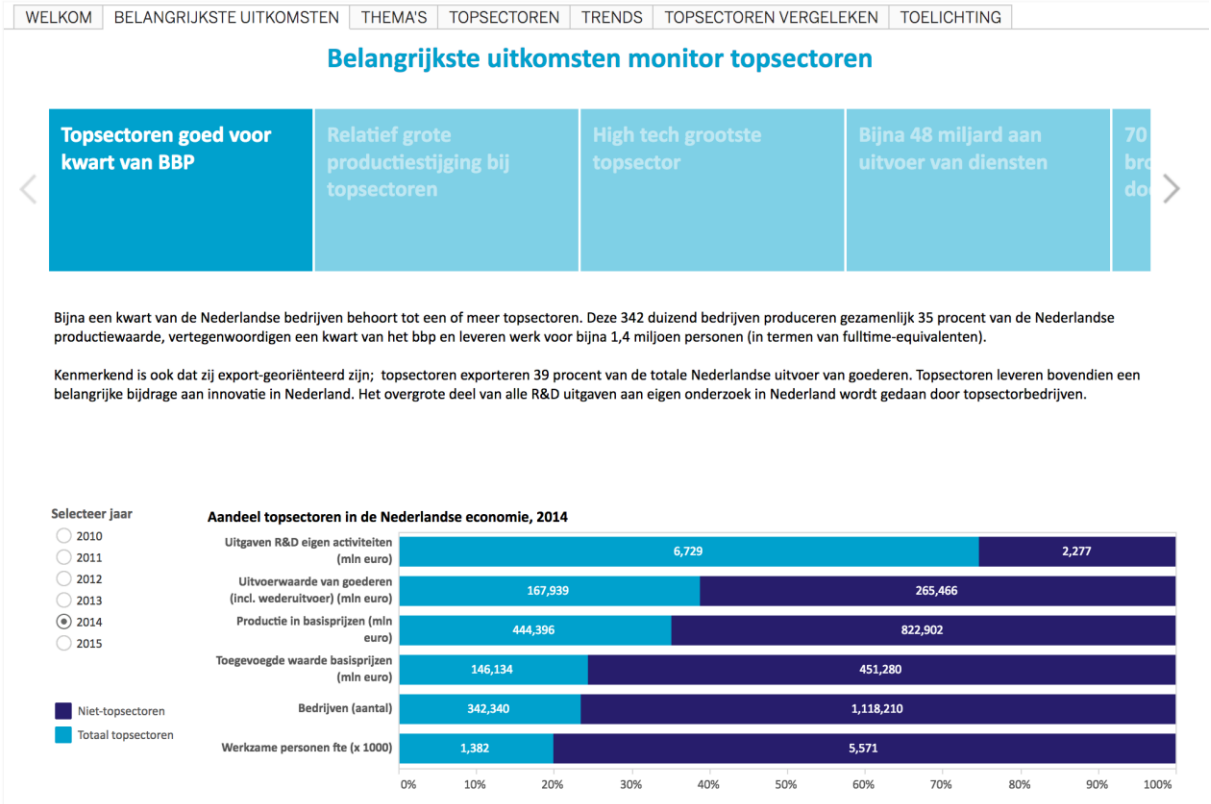
Monitoring and Evaluation

Monitoring process

Previously, the government of North Brabant had played a role in monitoring and evaluation of the success of various policies being executed in the region. However, since the regional government recently reduced the budget for the annual economic monitor, the main line of monitoring and evaluation of the implementation of policy now comes from the Ministry of Economic Affairs, which conducts evaluations of the regional economic development agencies and the progress of the top sectors (though, in the latter case, an evaluation is still forthcoming). In addition to the formal evaluation processes, data on progress for the top sectors are collected by Statistics Netherlands (*Centraal Bureau voor de Statistiek* [CBS]) in a scoreboard, which is publicly available.

These scoreboards provide an annual breakdown of statistics on indicators considered to be important results from the top sector policies. The diagram below, for example, shows just a few of those indicators, such as R&D spending, value added in goods, number of companies, and personnel issues.

Figure 13: Dashboard Monitor for the Top Sectors, 2016



Source: Statistics Netherlands[59]

Statistics for each of the top sectors are collected along a series of indicators that include the following themes:

59 https://public.tableau.com/profile/centraal.bureau.voor.de.statistiek#!/vizhome/DASHBOARDTOPSECTOREN2016/WELKOM

- Macro-economic, such as production and added value;
- Business, such as number of companies (including newly established and failed) and SMEs;
- International trade, such as exports and re-exports;
- Employment, such as number of employees and independent workers;
- Innovation, such as R&D spending;
- Education, such as number of graduates;
- Green growth, such as amount of emissions; and
- Policy instruments, such as amount of subsides and economic missions.

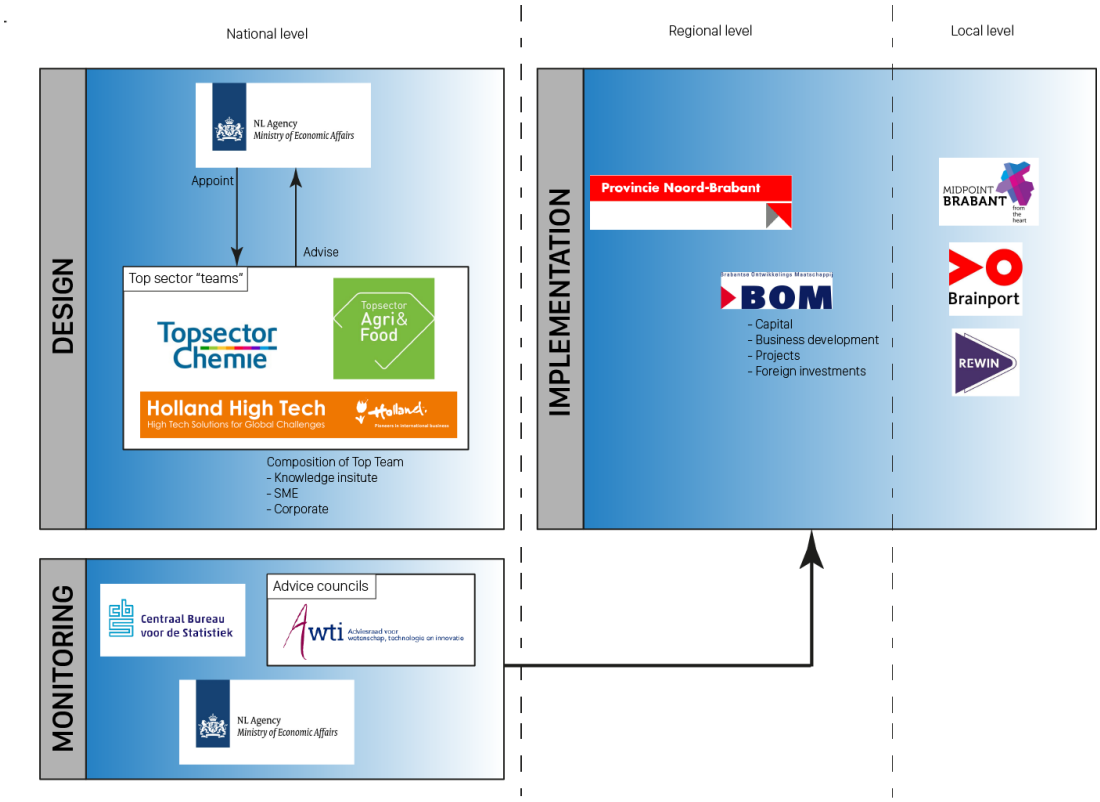
As an instrument for regional development, the Ministry of Economic Affairs conducts regular evaluations of the regional economic development agencies, such as the BOM. Generally speaking, the evaluations take place approximately once every five years and are subcontracted to external consultants to complete. The last one to take place was in 2015.

The province, while not a main source of evaluative capacity for the region, also performs evaluations with the assistance of consultants. The most recent evaluation conducted was on various valorisation programmes, such as Bright Move and Starterslift.

In addition to these two sources of structured monitoring of policy implementation, the Netherlands has a further accountability mechanism in a series of advisory councils and planning bureaus that provide advice and report directly to parliament. The agency most relevant to industrial policy in the Netherlands is the Advisory Council for Science, Technology, and Innovation (AWTI). While the legal foundation, authority, and autonomy of these various agencies differs, the AWTI produces advice based on either a parliamentary request or its own judgement as to what is important. Once a report has been produced, the Minister that is responsible is legally obliged to respond to any recommendations that may come out of this report.

A visualisation of the general governance structure of policy-making, implementation, and monitoring is shown in Figure 14 below.

Figure 14: Presentation of key industrial policy actors and stakeholders within the Netherlands



Source: Technopolis Group

New developments

Recently, new developments are taking place that may change the monitoring landscape. There are renegotiations by the Dutch Statistics Office (CBS) and the regional governments about regional monitor services provided by the CBS. An example of a new service is the launch of regional big data hubs by the CBS. A new CBS Urban Data Centre was launched together with the municipality of Eindhoven in late 2016, that tries to use knowledge from the CBS to develop Eindhoven into a data-driven smart society. One of the pillars of the project is to translate national data to region-specific data for Eindhoven. This way, the CBS hopes to make regional implications of developments in society visible.

Furthermore, the Brabant Knowledge (*Brabant Kennis)* platform was installed in 2014, which tries to give a new impulse to regional policy. The platform offers a learning and experimentation environment in which citizens, entrepreneurs, knowledge institutes and governments together perform research and develop knowledge about the future of the Brabant community. Scientific- and consulting professionals work together with citizens and experts from different institutes in Brabant to develop a knowledge-cloud and find new insights and solutions to societal issues. New multi-media formats will be used, such as social media, webinars and hackathons.

An independent council has been set-up with representatives of all layers of the North-Brabant community that actively thinks about the shaping and structuring the Brabant Knowledge platform. Furthermore, the council is responsible for agenda setting of topics and the content of the annual plan. In this way, the council of Brabant Knowledge is responsible for the planning and control-cycle: from activity planning and budget to monitoring and reporting.

Assessment of the regional industrial policy capacity and its transferability

Given that policy initiatives are generally developed at the national level (though executed at the regional level), there are few public policy initiatives that are truly developed at the regional level that can be classified as industrial policy. North Brabant remains relatively unique in having a relatively large capital fund — based on sales of regional assets — that provides them with a steady flow of resources with which to fund economic development through capital investments. The availability of sovereign funds at a regional level is unique in Europe, with only a few funds existing at a national level that are used to support economic development, notably the Ireland Strategic Investment Fund (originally funded out of the state pension fund) and the Norwegian Government Pension Fund Global (funded from oil revenues).[60] It is not clear how many regions would have the capital resources required to provide for income in this manner.

Despite the fact that systematic evaluation of regional policy has not taken place, several good practices in the region of North Brabant can be identified. Foremost, the region uses the triple-helix collaborations and the 'Brainport Model' as unique selling points for the region as a good business location (Smits 2011). In 2011, the Intelligent Community Forum (ICF) awarded the Eindhoven region the title of intelligent community of the year. ICF referred to the crucial role of Brainport and mentioned several additional policy measures and collaborative efforts that contributed to the industrial and innovation climate in the region of Eindhoven:[61]

- The Brainport model of public-private partnership (for example fostering healthcare while generating economic opportunities in the region by involving hospitals, insurance companies, technology manufacturers, local government and individual patients to design and implement realistic technology solutions with a profitable operating model)
- A track record in collaboration (for example the Automotive Technology Centre involving 125 organisations in collaborative projects, or the Taskforce Technology, Education and Employment promoting the interest of young people in engineering, attracting foreign knowledge workers, career counselling and lifelong learning)
- Responding to the economic crisis, in close collaboration with Dutch national government (for example funding research projects for more than 2.000 workers who faced layoffs to preserve their skills until the economy recovered)
- Enabling infrastructure (for example one of the most long-standing projects of Brainport and the SRE concerns the roll-out of high-speed broadband infrastructure, among others to more than a hundred schools)
- Open innovation (for example the platform 'OnsNet', in which Brainport acts as a facilitator and negotiator while players pursue their own interests in collaboration with others).

These measures and efforts have been continued and improved after 2011, allowing Eindhoven to remain 'a manufacturing centre in a high-cost country'. For example, updating the Brainport strategic agenda, sustaining economic growth by increased support for start-ups and scale-ups and pushing PPPs and open innovation in several fieldlabs.

National policy and regional success

It is difficult to draw conclusions about the success of the performance of the national policy framework as a driver of regional policy, since the Dutch government has failed to produce a systematic evaluation of its performance. The theoretical basis for focussing efforts on sectors where

[60] http://www.swfinstitute.org/sovereign-wealth-fund-rankings/

[61] http://www.intelligentcommunity.org/eindhoven

the Dutch have performed the best matches the Smart Specialisations strategy of the European Union; however, as some interviewees pointed out, the geographical concentration of industry does not tend to overlap with the various national and regional administrative jurisdictions in the Netherlands. In North Brabant, for example, the BOM seems the most natural executive body for innovation policy in the region; however, various small economic development agencies aimed at cities or sub-regions of the provinces exist, including REWIN, Metropoolregio Eindhoven, and Midpoint Brabant (headquartered in Tilburg along with the BOM). These other regional development agencies have been created to help develop parts of the province outside the heart of Eindhoven, but create an extra layer of policy effort. From an efficiency perspective, this duplication of effort creates unnecessary duplication; however, representatives of sub-regional agencies would likely argue that resources would tend to get diverted to Eindhoven without this sub-regional representation.

Overlapping jurisdictions, however, have not stopped effective cross-border cooperation within the country. The continued growth of the innovation park Chemelot, requiring cooperation between the provinces of North Brabant and Limburg (as well as the national government) is a good example of how this cooperation can work — though it should be noted that Chemelot is also funded at a European level and from other partners in other Member States, which may have helped to dilute any concerns over the physical location of the innovation park.

Lessons on regional development

While no evaluation of policies has taken place, an overall evaluation of the effectiveness of the regional development agencies was published in May 2016, looking at the major economic development agencies. One major change that has taken place in the transition from the Peaks to the Top Sector policy has been a reduction in so-called 'structured' funds, moving more towards project-based funding to which governmental bodies (in partnership with other stakeholders) apply. This has the advantage of decoupling funding from a strict geographical area, but also reduces institutional stability for organisations that rely on this funding to survive.

Much of the focus by evaluators as well as interviewees has been on the role of public bodies in supplying capital to smaller enterprises, with the evaluation of the economic development agencies going so far as to recommend that governments need to do more in taking on an 'anti-cyclical' role in funding, increasing public funding for bankable business plans when other private funders are withdrawing from the market (based on the assumption that withdrawal from the market is part of some general slowdown and that when the market picks up again, those business plans would remain viable). Despite this critique, the evaluation is generally positive about the role that capital funds have played in helping companies to produce further innovations.

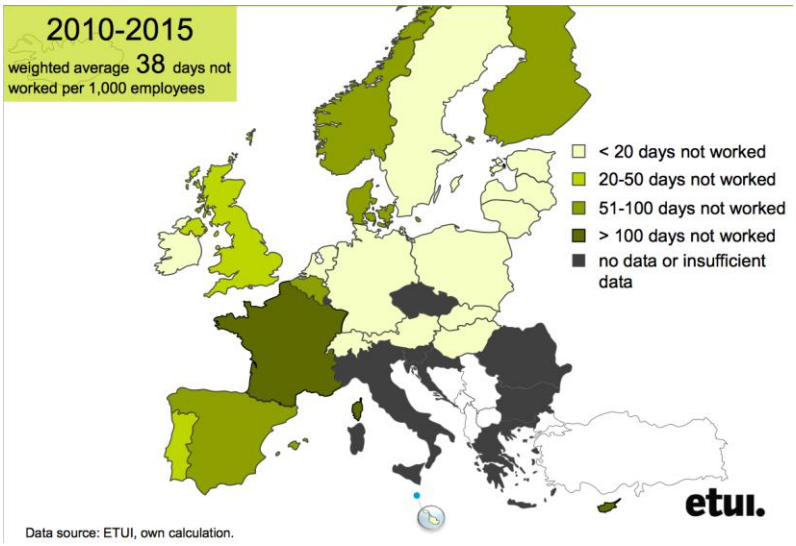
What is different is the relative hands-off nature of industrial policy within the regions. The government — both nationally and regionally — works more as a facilitator, connecting parties that can help each other grow while providing funds that can help to lubricate the process. The policy area which has the greatest influence on industrial policy is around spatial planning, with resources made available for innovation parks.

This hands-off approach to policy-making means that a lot of faith is put into stakeholders to decide on the distribution of funds. While the government may set the framework for the distribution of those funds — launching calls for action for which applications need to be made — there could still be concerns over so-called crony capitalism, where companies with inside access to policy-makers ensure that resources flow to them. However, as a jurisdiction, North Brabant (and the Netherlands as a whole) have a political and social culture that generally do a good job of supporting open innovation, public-private partnerships, and network governance without becoming too obstructive to new players.

The concept of the 'polder model' — where employers and employees have been social partners in the government as a part of the Social and Economic Council (SER) since the 1950s — the Netherlands is well accustomed to private sector participation in policy-making. This council, while less powerful than the AWTI in terms of legal authority, still holds an important role in providing for a wide consultative base for public policy. Any policy decisions that encounter stiff resistance within the SER

tend to be changed. The success of this dialogue can be seen in indicators such as Days Lost Based to Industrial Action, with the Netherlands experiencing fewer strikes than other Member States.

Figure 15: Average days not worked due to industrial action in Europe



Based on the findings of the case study, the following good practices can be highlighted.

Table 7: Summary of good practices/industrial policy capacity

Factors of good practice	Good practice	Short description	Transferable elements to other regions
Multi-stakeholder involvement and cross-institutional collaboration	Bottom-up policy co-ordination through top-sector teams	Sector-specific roadmaps are developed by 'top teams' with representatives from industry, a researcher from a knowledge institute, a representative of the government, and a small and medium enterprise (SME). These roadmaps provide action plans and agreements on a sector's development.	While the Dutch example provides a lot of flexibility in how to organise the top-sector teams, jurisdictions that have a heavier hand in steering policy could still adopt elements of those teams, while ensuring that government representation remains as strong as desired.
Combining resources from different stakeholders for capital-intensive R&D facilities	Support for Fieldlabs	Field Labs are shared facilities where companies and research institutions develop targeted solutions for both testing and implementation. They also strengthen links with research, education and policy on a specific themes. Some have a regional focus, others a national and even European focus.	Shared facilities with support from stakeholders should be fully transferrable to any region on the condition that stakeholders have sufficient stake in the facility.
Publicly available scoreboards to continually monitor innovation and benchmark against other (national) regions	Regionally focussed innovation scoreboards	Scoreboards that provide an annual breakdown of statistics on innovation policies on indicators such as R&D spending, value added in goods, number of companies, and personnel issues. Importantly, these figures are publicly available.	Easily transferrable, especially when the scoreboard is limited to the borders of a single Member State.

Policy pointers

Based on the case study the following policy remarks have been formulated:

- There are a lot of open questions around the role of funding of research and development, which provides funds to reduce labour and other costs. Many stakeholders complain that these funds are inadequate. A few others, however, argue that even those funds that are available function as a crux.
- SMEs have a difficult time contributing to collaborative research projects given the resource commitment required, something which the province is attempting to address. They provide information to SMEs on how best to create the IPR and business agreements to successfully gain from collaborative projects. However, SMEs that do join collaborative agreements still suffer from a size disadvantage. The Holst Centre, as an intermediary between larger and smaller businesses, is a good step towards addressing this power differential.
- Related to the previous point, there is a heavy focus on integrating SMEs into the business ecosystem, but it is not clear that this is always necessary or even possible given existing capacity constraints of SMEs. There should be a focus on culture change within SMEs, who are unaccustomed to working with knowledge institutes and a realisation of the limitations that SMEs face.
- Various regulations that structure the labour market hinder not only an optimal allocation of skills across the region, but also cross-border cooperation. While the focus of many labour market reforms is around the hiring and firing of workers, housing and health policies are also significant barriers. Diploma recognition of professional qualifications continues to be a barrier.
- North Brabant is unique proof that the innovative capacity of a region and a sufficient cluster of companies can work as a magnet for foreign talent. Unlike other hubs for work which tend to be major city centres — such as London, Berlin, Paris, or Amsterdam — Eindhoven (and the surrounding city centres) are relatively small. The total population of Eindhoven is only approximately 200,000 people, yet it draws a relatively large number of foreign workers. This foreign talent remains paramount given the demographics of the region. The focus on attracting talent relies on leveraging major companies as a 'selling point' for incoming companies and talent via foreign direct investment promotion activities.
- North Brabant, like many other European industry-oriented regions, faces a continuing challenge due to the high demand for a skilled and well-educated workforce. Given the cultural pull of the Randstad, which is considered the more attractive region of the country to live and work, the lack of qualified personnel in the region is a continuous issue, particularly for SMEs that are less able to tap into foreign talent.
- As illustrated by one participant, national and regional governments have detailed support plans in place for particular areas of strength. Coordination between the national and regional level, while imperfect, is quite good. What is missing from this picture is a better idea of what should be coordinated from Brussels and what should come from the national and regional governments. One interviewee expressed concern over the lack of coordination between the SME instrument within the Horizon 2020 programme and support instruments within the Netherlands, for example.
- From a monitoring and evaluation perspective, there are some questions around objectivity. Given that policy is driven by businesses and knowledge institutes, North Brabant has few outside voices to question the relevance of the activities being conducted. The province does not conduct a lot of independent critical reviews. It characterises one of the main problems with network governance in that there is a threat that institutional capacity and knowledge become hollowed out as other stakeholders take responsibility for policy formulation and execution.

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