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Higher Education for Smart Specialisation: The Case of the Northern Netherlands

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Abstract

This technical report presents the findings of the case study carried out in Northern Netherlands on the role of Higher Education Institutions (HEIs) in the design and implementation of the Smart Specialisation Strategy (RIS3). It is one of the case studies undertaken in the project Higher Education for Smart Specialisation (HESS), an initiative of the European Commission's Joint Research Centre (JRC) and the Directorate General for Education, Youth, Sport and Culture.

There is a long tradition of higher education in the Northern Netherlands, with the key characteristic of a strong presence of Universities of Applied Sciences and RUG University of Groningen. The regional HEIs are actively involved in strong bilateral collaborations projects and clusters and living labs encouraging collaborations within the regional innovation ecosystems, being part of key innovation ecosystem governance structures. Although regional HEIs have individually been very effective in driving particular projects, there is still not a collective institutional space for HEIs, undermining a strategic agenda for HE in the region.

The Northern Netherlands has a strong innovation ecosystem around a number of established sectors where there are robust relationships between HEIs and companies with innovative infrastructure. In the long-standing culture of collaboration of the regional innovation ecosystem, the introduction of the RIS3 has constituted an opportunity to a concerted effort to streamline innovation governance and to integrate activities to stimulate innovation. The key regional economic development issue remains the fact that it is a relatively sparse economic environment, which challenges the regional innovation governance.

The Northern Netherlands has the potential to function as a knowledge economy more efficiently at the level of the North through a better integration of the provincial knowledge economies. The connectedness of SMEs into regional innovation networks can be improved building a natural "innovation escalator" by which individual connections with SMEs grow, become networks and evolves into key regional strengths. The region attracts a growing number of talented students, which can help build stronger connections between HEIs and regional innovators to strengthen firms' innovation capacity and help in their retention. Finally, HEIs occupy a strong position in the existing regional innovation ecosystem, as a site for experimentation and reflection, and it is key that they are encouraged to continue that work.

The case study has coordinated closely with the ongoing discussions on the new RIS3 for the Multi-annual Financial Framework 2021-2027, contributing with findings that have helped the regional stakeholders in the definition of some of its future elements.

Summary

The Northern Netherlands was selected as a case study for the European Commission project on Higher Education for Smart Specialisation (HESS) in 2019, and has been implemented in partnership between the Joint Research Centre and Northern Netherlands Alliance (SNN). Supported by DG Education, Youth, Culture and Sport, the HESS project is implemented by the Joint Research Centre (JRC) in Seville. The project aims to understand how Higher Education Institutions (HEIs) can play a more effective role in the design and implementation of Smart Specialisation Strategies (S3), while helping to build partnerships with the regional authorities responsible for these strategies.

The case study aimed to ensure the regional debate on the role of HEIs in implementing S3, with three main objectives: 1) Strengthen the engagement of SMEs supported by HEIs capacities to connect them to collaborative innovation processes, 2) Maximise the potential of highly skilled talent in the region for the R&I system, and 3) Reinforce the R&I ecosystem governance with stronger co-leadership and strategic role by HEIs,

The case study was launched in April 2019 with the organisation of the exploratory meeting in which a first discussion with key innovation stakeholders took place to understand the context and identify the main challenges for higher education to engage regionally. Other HESS case studies have been addressed at regional and national level. In the previous HESS project phases, the selected regions included Navarra (Spain), North East Romania, Centre Val Loire (France), Puglia (Italy) and North Central Bulgaria. In the current phase, four more regions were selected as case studies in addition to the Northern Netherlands: Lubelskie (Poland), Lower Austria and Eastern Macedonia and Thrace (Greece). In addition, two national cases studies have been selected, namely Lithuania and Portugal.

Method

The case study has adopted the 'action research' methodological approach, meaning it has mobilised the main research actors in the region affected by the study, driven by a joint reflection on the main regional challenges and identification of potential actions to address them.

The main methodological tools used in the case study include:

- Desk research to analyse the main S3 and HEIs context in Northern Netherlands
- Fieldwork research that has included bilateral interviews with 28 experts to identify main challenges and issues (19-21 November 2019 and 3-5 December 2019), and three focus group workshops to discuss on initial findings (3rd-5th December 2019),

A shadow strategic group of key stakeholders has validated and provided feedback to the results throughout the different case study phases.

The Northern Netherlands has strongly engaged the higher education stakeholders and three provinces throughout the HESS case study, with the main outcomes and discussions constituting an important basis for the regional reflections on the update of the RIS3 for the 2021-2027 period.

Regional context

The Northern Netherlands has a strong innovation ecosystem around a number of established sectors where there are robust relationships between HEIs and companies with innovative infrastructure. It is comprised of three provinces, Groningen, Fryslân and Drenthe, and is a strong innovation region according to the Regional Innovation Scoreboard (European Commission, 2019). It is a relatively sparse economic environment, which introduces tensions in developing a strong, dynamic and autonomous regional innovation system (SERNN, 2009; Noordelijke Rekenkamer, 2013).

There is a long tradition of higher education in the Northern Netherlands, with the University of Groningen (RUG) and three Universities of Applied Sciences (Hanze UAS, NHL Stenden and Van Hall Larenstein) present in the region. HEIs are strong regional partners, although a clear issue for regional innovation is the retention of students and addressing brain drain to the Netherlands' main urban areas or abroad.

There is a long-standing culture of collaboration in the Northern Netherlands research and innovation ecosystem, presenting a relatively complex governance of the RIS3 (2014-20). Since the introduction of the RIS3 there has been a concerted effort to streamline this structure, and to integrate some of the separate activities that had been created to stimulate the RIS3 strategy.

Main results and policy recommendations

1. Connecting SMEs to S3:

The key challenge is improving the connectedness of SMEs into regional innovation networks and activities. The inexistence of a natural “innovation escalator” by which individual connections with SMEs then grow, become networks and eventually may evolve into key regional strengths needs to be addressed. It requires the management of the “micro-discouragements” or individual disincentives to SMEs to be connected that together add up to create a substantive drag in the evolution of the regional innovation ecosystem.

The main policy recommendations are:

- Addressing the management of the “innovation escalator” by which individual connections with SMEs then grow, become networks and eventually may evolve into key regional strengths.
- To develop a stronger common agenda between provinces, cities and municipalities and the lead sectors, with HEIs setting out a stronger regional platform on what they can offer collectively to develop a denser and more dynamic regional innovation system.
- Raising the innovation management skills of potentially innovative SMEs is critical and this can be supported by regional teachers and researchers. Student placements have an important role to play in this process, helping these firms to access HEI knowledge.

2. Human capital:

The “brain drain” is widely identified as a challenge and is not an easy one to address. International and local students choose the Northern Netherlands to acquire a high-quality, good value and prestigious education, however in many cases international students decide to go back to their home countries and local students look for wider opportunities in capital cities or bigger urban areas. The study points out that students can serve to provide “temporary-permanent” connections between HEIs and regional innovators, creating a virtuous cycle which upgrades demand, increases firm innovation, and indirectly increases students’ retention in participating businesses.

The main policy recommendations are:

- Develop a clear human capital vision within the ERDF OP, funding those activities that build absorption capacity in regional organisations and support appropriate skills development.
- Develop a single long-term agenda for regional innovation foregrounding Human Capital in the smart specialisation strategy.
- HEIs should identify internally and collectively what capacities they have to contribute to regional innovation skills and align that with the RIS3 and OP.

3. Governance & Innovation Ecosystem: the main challenge is the fragmentation within innovation policy in the Northern Netherlands.

The key challenge for the Northern Netherlands in the coming period is achieving a higher degree of integration, and in particular ensuring that regional innovation strategies stimulate positive synergies across the region. The role for HEIs is key in contributing to these collective activities in stimulating regional cooperation. They occupy a strong position in the existing regional innovation ecosystem, as a site for experimentation and reflection, and it is key that they are encouraged to continue this work. They are sites of expertise about the regional innovation environment and wider global trends that can be also useful. But the extent of their contributions remains limited by the regional partners’ commitment to create a strong regional power centre, and put an end to fragmented regional innovation practices.

The main policy recommendations are:

- Addressing innovation policy overgrowth, through strong political consensus to create a dense innovation ecosystem, provide strategic directions to the strategy and stronger focus on implementation.
- Emphasis on bringing emerging actors into innovation policy processes, using continuous discovery to avoid lock-in effect in historically innovative sectors.
- Create a strong unified leadership voice for HE in the NNL is absolutely necessary to create meaningful political leadership and avoid replicating local fiefdoms
- Ensure HEIs innovation networks and infrastructures remain open to newcomers, providing innovation services for new and potential innovators in the region.

1 Introduction

The objective of the Higher Education and Smart Specialisation (HESS) project is to analyse how HEIs can be better integrated into S3 policy mixes and how the European Structural and Investment Funds can be more effectively spent to achieve S3 objectives. The project also aims to explore how institutional capacity in Europe's countries can be built by strengthening the role of HEIs within the 'quadruple helix' of government, academia, business and civil society. The Northern Netherlands region has been selected as a case study region for this project, which uses an action research approach. HESS cases involve working with regional partners managing and implementing S3 and ESIF to explore how HEIs were involved in the design and implementation of the first RIS3 to help improve their contributions to the second RIS3 process.

The Northern Netherlands is comprised of three provinces, Groningen, Fryslân and Drenthe, and is a strong innovation region. According to the 2019 Regional Innovation Scoreboard, Groningen is rated Strong+, Drenthe rated Strong- and Fryslân as Moderate+ (whilst in the Netherlands, Utrecht and North Brabant are rated Leader+) (European Commission, 2019a; 2019b). These internal differences make it an interesting case study and put it in aggregate the same class of region as Northern Portugal, the North of England and the North of Norway. The Northern Netherlands provides an interesting case study because the regional interprovincial authority (the SNN, 2017a) has been actively involved in the design and implementation of S3 in close cooperation with JRC, and many stakeholders were involved in this process, including HEIs (SNN2017b). HEIs are strong regional partners, although a clear issue for regional innovation in the Northern Netherlands is the retention of students and addressing brain drain to the Netherlands' main urban areas or abroad.



Figure 1: The Northern Netherlands region in national context

The case study was launched when the Northern Netherlands started the preparations for a new RIS3, and it will help providing external reflections on the process as well as helping to stimulate the input of HEIs into the RIS3 design (SNN, 2017a). Business R&D is relatively weak in the Northern Netherlands, and HEIs are therefore critical players for the regional innovation ecosystem; an effective RIS3 for the Northern Netherlands need integrate HEIs fundamentally into all its aspects. A key issue for the previous process was that the high-level strategic interaction in the design phase was not carried through into the implementation (SNN, 2019). The case study seeks to help ensure that these strategic discussions also build sufficient actionable knowledge within the Northern Netherlands for subsequent implementation. The process seeks to address two overarching questions and five sub-questions to guide the action research process to produce actionable knowledge to optimise HEI contribution to this latest RIS3.

2 The HESS case study: Methodology

The research has taken place jointly by the JRC team, the expert Paul Benneworth and SNN (including provinces and major cities). The methodology is based on desk research and fieldwork activities, including workshops, interviews and events. The deployment of the methodology has been tailored to the research questions and needs identified in the case study, helping to build a progressive partnership, identify the key aspects, opportunities and difficulties faced by the different stakeholders and unfold the various ways in which HEIs can contribute to S3 in Northern Netherlands.

The main methodological tools that used in the case study include:

- Desk research to analyse the main S3 and HEIs context in Northern Netherlands
- Fieldwork research that has included firstly bilateral interviews to identify main challenges and issues, and secondly three focus groups to discuss on initial findings
- A total of 54 people have contributed to the empirical data of the report, summarised as follows:
 - 16 Face-to-face interviews with 28 people were undertaken in Groningen, Oranjewoud and Leeuwarden, 12 interviews from 19th-21st November 2019, three interviews from 3rd-5th December 2019 and one by phone. The list of interviewees and the interview questions can be found as an annex.
 - Three focus group workshops were held during 3rd-5th December 2019, covering the themes of Connecting SMEs, Human Capital and Innovation Ecosystem, with a total of 31 participants attending these three focus groups, two taking place in Groningen and one held at the Dairy Campus in Leeuwarden.

A shadow strategic group of key stakeholders has validated and provided feedback to the results throughout the different case study phases

2.1 Exploratory workshop

An exploratory meeting took place in Groningen on 18th April 2019, with the participation of JRC researcher Eskarne Arregui, EC expert Paul Benneworth, all higher education institutions, the three provinces, the city of Groningen and SNN.

The exploratory meeting constituted the starting point to launch the HESS case study, explain the aims and methodologies of the case study, explore the challenges in terms of HEIs contribution to S3, and grasp the topics of interests of the different stakeholders.

The main findings of the exploratory meeting regarding the role of HEIs in Northern Netherlands S3 are summarised as follows (see attached document for more details):

Box 1. Northern Netherlands innovation system challenges and opportunities

N-NLs challenges

- Atomized and insufficiently connected excellent initiatives & networks
- Low R&I investment by SMEs
- Participation in collaborative innovation processes limited to a small group of frontrunner SME's
- Differences between 3 provinces in innovation performance
- Lower economic performance than the Netherlands average and outgoing human capital balance
- Matching rapid changing demand for labour with sufficient, qualified supply

N-NLs opportunities

- Consistent HEIs system with important attraction of international students
- Strong engagement of quadruple helix actors in S3 design
- HEIs engagement in S3 monitoring activities
- Internationally connected R&I ecosystem
- Very well placed in creation of start-up ecosystem and living lab environments

2.2 Research objectives

The HESS Northern Netherlands case study has three general objectives:

- To improve the regional partnership between HEIs and public authorities managing S3 (SNN, provinces, other innovation agencies) and ESI Funds to increase the impact of S3 implementation
- To boost the engagement of HEIs in S3, through a more coordinated response of their three missions Research, Education and Innovation.
- To understand the main challenges of HEIs to actively engage in S3, and identify potential actions that could be taken, proposing a number of policy recommendations

Based on the first findings of the exploratory meeting, and interest shown by the participating stakeholders, the case study has focused on three research questions, summarised below:

Box 2. Northern Netherlands case study research questions

Case study research questions

1. How to **strengthen the SMEs engagement in S3** and which role can the HEI play in connecting SME's to collaborative innovation processes?
2. How the **attraction of highly skilled talent** to the region can be integrated in the R&I system?
 - How to strategically benefit from the presence of international students and the worldwide network potential this entails?
 - Which actions/programmes HEI's can take to better meet the changing labour market demand and address skills-jobs mismatches?
3. How to reinforce the **R&I ecosystem governance** and stakeholders' co-leadership of S3, supported by HEIs capacities and strategic role in building regional networks?
 - How to improve coordination and continuous interaction between initiatives and actors in the innovation eco-system, strengthening synergies?
 - Which type of actions/programmes could facilitate HEI's to maximize their potential to build innovation capabilities?

2.3 Semi-structured interviews

The interviews conducted for the purpose of the case study were carefully planned together with the local partner SNN, keeping in mind a good representation of HEI, public administrations and business. The people interviewed within each organisation has been as well selected based on the role they play in the organisation, considering aspects such as their managerial or strategic position in the organisation, their participation in the RIS3 process and funded initiatives under the NNL ESIF Operational Programme.

The very good cooperation with SNN and all the local stakeholders has made it possible to achieve a very good representation of all HEI in the region, with 21 representatives coming from the University of Groningen, Hanze University of Applied Sciences, NHL Stenden Applied Sciences University, Van Hall Larenstein Applied Science University and University Medical Centre of Groningen, 3 representatives from Wetsus cluster, and 2 from Dairy Campus/Wageningen University cluster.

The results extracted from the interviews have been discussed in multiple exchanges and phone discussions with the SNN team, as well as the RIS3 working group coordinator, to fully understand the RIS3 process in the region and the progress towards the new RIS3 under the next Multi-annual Financial Framework 2021-2027.

The full list of interviewees and the interview questions can be found as an annex.

2.4 Focus group workshops

Three facilitated focus group workshops were organised around targeted topics around the three main research questions to discuss the initial findings extracted from the interviews, and provide views about possible directions to address existing challenges in the region. The workshops were the following:

- Workshop 1 - Tuesday 3 December 09:00-11:30.
Theme: "The role HEI's play in connecting SME's to collaborative innovation processes"
- Workshop 2 - Wednesday 4 December 11:30-14:00.
Theme 'Human capital'.
- Workshop 3 - Wednesday 4 December 15:30-18:00.
Theme "Innovation ecosystem governance".

The methodology during the focus group workshops strongly relied in facilitating interactions and discussions of participants organised around three main questions:

- Is the diagnosis of the regional innovation system on the topic concerned accurate?
- Are the challenges and prescription elements highlighted reflecting the reality of the region?
- Could the strategic and operational recommendations proposed drive changes in the region?

The participants of the three workshops were carefully selected in agreement with SNN partners. The selection was based on having a good representation of some of the stakeholders already interviewed, as well as other actors not engaged through interviews and with relevant experience and positions in the topic under discussion.

The complete list of stakeholders mobilised during the focus group workshops is provided as an annex.

2.5 Shadow Group members

The methodological approach used for the case study has also included the decision to have a small group of stakeholders strongly involved in the RIS3 process discussions, which have advised and provided strategic orientations to the proposed approach and main outcomes of the HESS Northern Netherlands case study.

More specifically, the role of the shadow group members has included the following:

- Participate in the exploratory meeting in which the main aims and methods of the case study were presented, to provide vision on how the proposed activities and actions of the case study fits into the longer-term strategic vision of the provinces, universities and companies, and regions future RIS3 vision.

- Provide feedback to the main findings of the case study gathered in the JRC Technical report, particularly reflecting into how it can be integrated in the S3 governance, regional human capital agendas and future post 2020 perspective
- Participate in the final event

The shadow group members list is provided in annex 1.

3 Overview of the regional economic development context

The North of the Netherlands is a traditionally agricultural region whose economic geography was shaped by the continual process of the reclamation of land from the Wadden Sea. This newly reclaimed land was relatively fertile allowing higher agricultural productivity, whilst much of the rest of the lands were relatively thin, acidic soils formed by glacial deposition; ownership of the reclaimed land was reserved to those with the capital to recover it from the sea. This land reclamation was paralleled with the rise of turf cutting in Drenthe and Groningen to provide fuel for brickmaking, ceramics production and building materials (Klein, 1979). This led to the rise of the Moor Settlements (Veenkolonieën) that housed turf cutters, with the settlements and the newly developed canal systems being funded by rich investors in Holland. This led to a split between a relatively affluent group of farmers along with a relatively poor group of agricultural labourers and turf cutters (Thijn & Zappey, 1979). This agricultural poverty saw the Northern Netherlands become a source of outmigration, and the region's late industrialisation saw significant regional outmigration as late as the 1920s, initially to the west of the Netherlands, but latterly to the industrial centres of the east and south.

Modern Dutch regional economic development policy originated in the north of the Netherlands in response to the specific conditions faced in this region following WWII (OECD, 2014). The very first investment programme for economic development was created for the region around the city of Emmen, funded through the Marshall Fund. This was later extended as a Government Programme to seven additional declining regions outside the Randstad of which five were in the Northern Netherlands. The Northern Netherlands benefited from industrial post-war reconstruction; a tripling of industrial productivity in this period created a massive economic leap, with substantial investments in infrastructure as well as the expansion of industrial production into these formerly rural areas. The Dutch industrial concern Philips alone created manufacturing facilities in seven cities in the North, employing thousands of staff in the three provinces. The offshoring of jobs to emerging industrial economies mean that today its only location is in Drachten, Philips Consumer Lifestyle employing 2000 highly skilled workers as part of the high-technology systems cluster.

The other factor that has been influential in shaping the economic development of the Northern Netherlands has been the presence of extractive industries, notably hydrocarbons (oil and gas) but also salt. The first gas was discovered in 1939 near Coevorden although production did not begin until after the Second World War. What transformed the fortunes of this industry was the discovery of the Slochteren field near Groningen in 1959. This represented the largest natural gas reserve in Europe to date, formed the rationale to create a national domestic gas network, and created a substantial income stream for the government that was invested firstly in physical infrastructure, then latterly in science, technology and innovation driven development. The first salt was extracted in east Groningen in 1959 and transported by pipeline to the harbour city of Delfzijl where it was processed into various raw materials for the chemicals industry. The City today retains a chemical industry involved in processing and production processes from salt and hydrocarbons and the production of new materials.

The key regional economic development issue for the Northern Netherlands remains the fact that it is a relatively sparse economic environment, and in the context of the knowledge economy there is not a strong, dynamic and autonomic regional innovation system (SERNN, 2009; Noordelijke Rekenkamer, 2013). Industrialisation was driven from the outset by the presence of investment subsidies, and policy interventions remain necessary to ensure that the private sector continues to invest in appropriate knowledge for research and development. The region has a long tradition of policy co-operation to try to sustain investment levels in the region, with a regional development agency for the north (the NOM) being created in 1974 by the national Government to stimulate regional economic development across the three northern Provinces (ECORYS & B&A, 2004). The three Provinces also established a platform (SNN) in 1992 to coordinate economic development programmes and subsidies, and this platform has provided the infrastructure on with the RIS3 programme 2014-19 has operated, as well as other programmes national and European in the last thirty years.

4 The structure of higher education in the Netherlands

4.1 The regulatory framework for the third mission of HE in the Netherlands.

The contribution that higher education can make to smart specialisation and smart specialisation strategy processes in the Northern Netherlands is profoundly shaped by the legal and regulatory framework within which Dutch HEIs operate (Jongbloed, 2018). This framework is legally established by the 1992 law on higher education and research (WHW), which makes two important distinctions, firstly between HEI missions and secondly between the types of HEIs. Under WHW, there are two kinds of HEI, the universities (WO) ('scientific education') and the Hogescholen higher professional education (HBO), which despite adopting the English name universities of applied science have strong similarities to what have historically been called polytechnics in other countries (Van Bommel, 2006). Only universities are legally allowed to carry out basic research and to access the resources of the research council.

However, since 2003, efforts have been made to increase the research base of the Universities of Applied Sciences (UAS) sector (Kvyik & Lepori, 2010), creating a parallel research foundation, National Governing Body for Applied Research (SIA) which invested in creating applied professorships in UASs (Lectoraten). In 2013, SIA was merged into the Dutch Research Council (NWO) and runs its own research schemes as well as funding UAS participation in other research programmes. UASs are eligible to bid for, and do receive, other research and innovation funding, and European funds have become an important element of the funding received by Dutch UASs, and there continues in practice to be a divergence and overlap in the kinds of research undertaken by HEIs.

The other key distinction made in the WHW is in the three missions for higher education, allocating distinct roles to each of these two sectors (WO (universities & UASs) and HBO). Universities have three missions, to deliver teaching, to undertake research and to use the knowledge they have for societal benefit, whilst those for the UASs are to undertake teaching for professions, applied research and to use their knowledge for societal benefit. However, the 1992 law also formalised the introduction of new public management by strengthening the roles of university boards in steering the overall course of the universities to deliver these respective missions. In terms of their governance structure, universities and UASs have a high degree of latitude (legally speaking) to undertake any activities that may contribute to the delivery of their missions.

What shapes the freedom that HEIs have to utilise that governance autonomy is the way that funding has been allocated to universities. Until 1975, universities simply received a block grant from government to cover their expenses whilst UASs were funded as part of the secondary education system (Onderwijsraad, 1983). Since then the sector has increasingly been steered from the centre, and today a funding formula is used which places strong pressures on HEIs; all are rewarded on the basis of student completions, whilst universities are rewarded for their research in terms of the number of Ph.D. completions. HEIs also receive student fees from participating students (roughly €2000 per student), creating incentives on universities to recruit many students. The sector has been under financial pressures arising from a need to modernise their built estate, and therefore have to pay particularly close attention to their received funding to ensure that they do not breach their financial ratios. This has had a general effect of ensuring that the primary missions for the sector have been to ensure financial stability by maximising their received funding under the funding formulae.

In parallel with that, there has been a steady reduction in per capita terms of the overall budget, and an increasing shift to hypothecated resources, whether allocated in direct competition such as through the funding councils, to implement particular restructuring plans for individual sectors, or to implement projects addressing government policy priorities. Although the Ministry had promised as early as 2003 to create a mechanism in the funding formula to reward the third knowledge transfer mission, this has still not successfully been created, with the effect that HEIs have no direct funding formula incentives to carry out the third mission. The sector has proven very effective at accessing third party funding, and in terms of funding received per capita is the second most successful European country in accessing H2020 funding.

There have been national resources to encourage valorisation activity but these have tended to come from a different Ministry, the Ministry of Economic Affairs. As noted above, from 2000 to 2011 the government invested substantial sums from the hydrocarbon fund into knowledge activities, and there are a number of activities, including for example Nanolab Zernike, that benefited from these innovation-oriented investments (OECD 2014). In 2010, the short-lived first Rutte government introduced the controversial Top Sector scheme, which top sliced 30% of the Science Council's budget and redistributed it amongst ten sectoral

panels who could only allocated it to near-to-market projects with substantial matched funds from businesses.

4.2 The institutional space for HEI initiative in regional smart specialisation strategies

Higher Education Institutions have been identified as key actors in the design and implementation of Smart Specialisation Strategies (Goddard & Kempton, 2011; Kempton et al., 2013, Edwards et al., 2017). The study of the role of higher education in regional development has raised broad attention among scholars (Arbo & Benneworth, 2019), with important attention being paid to how higher education organisational contexts (Benneworth et al., 2017) or governance arrangements (Arregui-Pabollet et al, 2018) influence on the place-based leadership of higher education in their regional innovation systems.

The expectations on the role of higher education have moved towards an 'engaged' university that mobilises its capacities to contribute to the development of the territory in which it is placed (Uyarra, 2010). The incentives introduced by public authorities can heavily influence in streamlining and boosting of HE contributions to their regional innovation ecosystems, with an opportunity for more direct incentives based on innovation performance (Jonkers et al., 2018) and stronger partnerships between regional public authorities and higher education to better match supply and demand for knowledge and skills in the context of Smart Specialisation (Edwards et al., 2020).

The European Commission has emphasised this role promoting different complementary initiatives that are helping build such transformational capacities within higher education. The Higher Education for Smart Specialisation project looking into the place-based transformation of higher education, the HEInnovate initiative¹ boosting the innovation and entrepreneurial capacity of higher education, the Knowledge Alliances and European Universities² partnerships, funded under Erasmus+ Programme, contributing to regional innovation ecosystems, or European Institute of Technology- Knowledge and Innovation Communities³ supporting collaborations in the knowledge triangle and contributing to integrate education into innovation university-business partnerships.

In the Dutch context, the legal/ regulatory framework in which higher education navigate had several implications for the orientation of Dutch HEIs towards innovation activities. Declining real resources from the state have seen institutions place increasing emphasis on the attraction of external funding, to the extent that some universities (notably Wageningen and Twente) receive more funding from external partners than from the Dutch Ministry of Education, Culture and Science (OCW). HEIs have therefore concentrated at an institutional level on valorisation activities that bring in external resources to help compensate for the falling overall levels of policy support whilst academics have tended to concentrate on those kinds of valorisation which fit most closely with their own teaching and/ or research activities.

The institutional third mission of HEIs in the Netherlands, equally applicable to the Northern Netherlands, in practice is that it is focused on the creation of investment projects that support the creation of knowledge capital and the transfer of knowledge capital to those partners able to pay for it. This has made HEIs particularly enthusiastic to participate in regional subsidy programmes that are able to contribute to their own internal investment activities.

A second element of regulation comes through the ways that the Ministry steers HEIs towards particular goals through its planning process. The government regularly publishes development plans for higher education (HOOP) which expresses government intentions and gives softer judgements on the current performance of individual institutions. The most recent soft steering applied to HEIs has emphasised a number of elements, namely profiling, internationalisation and (for universities) excellence, that potentially restrict the regional mission of HEIs.

¹ HEInnovate is an initiative of the European Commission's DG Education and Culture in partnership with the OECD promoting the innovation and entrepreneurship capacity of higher education. More information: <https://heinnovate.eu/en>

² Erasmus+ Knowledge Alliances support transnational and result-driven activities between higher education institutions and businesses bringing new approaches to learning and training. More information: https://ec.europa.eu/programmes/erasmus-plus/opportunities/knowledge-alliances_en

Erasmus+ European Universities networks trigger unprecedented levels of institutionalised cooperation between higher education institutions, making it systemic, structural and sustainable. More information: http://ec.europa.eu/education/education-in-the-eu/european-education-area/european-universities-initiative_en

³ <https://eit.europa.eu/our-communities/eit-innovation-communities>

- Profiling has encouraged institutions to choose a distinctive profile as an institution and to align their activities around those profiles; when there are regional oriented activities that have not fitted with the overall institutional profile, then they have often been run down despite opposition from regional partners.
- Internationalisation has in particular focused on increased international recruitment and the introduction of English language as the standard medium of instruction; that reduces the opportunities for graduates to contribute with their knowledge to regional labour markets where there are not large multi-national businesses where the working language is English.
- Excellence in the Dutch university context has meant an emphasis on rankings, publications in top journals and winning research funds from the European Research Council and the comparable Dutch Vernieuwingsimpuls scheme. Researchers engaged in regional valorisation activities that does not receive these excellence funds run the risk as being branded as non-excellent researchers, thereby increasing the personal riskiness of regional engagement activities.

The government did attempt to dilute the pressures of the funding formulae and encourage profiling by HEIs with the introduction of performance contracts in 2010 upon which funding could depend. These were negotiated individually between HEIs and a central committee which approved those contracts. HEIs set targets in a number of areas, in terms of teaching quality, research excellence, organisational efficiency and valorisation. HEIs were also allowed to introduce their own optional targets reflecting their own profiles, but in its realisation, only one university introduced a serious valorisation target, and that was primarily focused around the creation of new spin-off companies. The experiment was evaluated in 2016-17 and it was decided to discontinue the experiment, which had had the perverse effect of focusing HEIs on the delivery of a very limited number of similar performance indicators, and further reducing the overall institutional opportunities for regional and societal engagement activities.

A fourth element is the regional consequences of the Top Sector programme, which exerted a very strong steering effect on HEIs. The Top Sectors were defined on the basis of sectors that had been historically strong (because of the way that they were identified, which came out of the previous Innovation Platform programme). Therefore the extent to which regions were able to participate in them depended in the extent to which these regional innovation ecosystems corresponded with the needs of these national sectors, and the extent to which particular regional strengths and infrastructures could be promoted as being of national significance. Likewise, the contribution of HEIs to their regional ecosystems depended on the extent to which their research groups corresponded with regional partners, as there were many examples of universities in the Dutch periphery working in Top Sector consortia with businesses in the Randstad economic core region.

The sector has not been immune from the general shift towards emphasising the creation of impact ex ante and ex post in research activities, making the creation of impact a de facto skill requirement for winning research resources. This effect has been magnified in the Netherlands because of the dependency of researchers and institutions on the attraction of external research resources, which are becoming increasingly dependent on valorisation. From 2006 onwards, research proposals to the NWO were required to include a section describing societal impact, and that has become increasingly detailed in recent years. The NWO actively promoted collaborative research activities with a strong focus on valorisation, most latterly the National Science Agenda in which research funds were earmarked for projects deemed to be attuned with public interest.

The success of Dutch scientists in participating in European research funding, particularly H2020, required scientists to align themselves with projects aligned with societal challenges, and produce proposals meaningfully describing how they will meet those societal needs. Together with the UAS lectoraten' practical focus on business engagement, the general skill levels of Dutch scientists in terms of societal engagement and impact creation is high.

Dutch HEIs find themselves caught in an unhelpful bind as far as contribution to smart specialisation strategies is concerned, because of the different orientations of their internal architecture towards regional engagement.

- HEI strategic managers (board members) seek to identify substantial investment projects featuring knowledge exchange elements that release resources/ create infrastructures that underpin core teaching and research activities whilst strengthening the research profile.
- HEI support services are split between research services for individual researchers seeking grants, and contracting/ income generating activities around knowledge exchange.

- Individual academics engagement with regional partners fits their regular knowledge activities and when regional engagement helps contribute to their individual teaching and research.
- Some HEIs have specific infrastructures to promote valorisation, such as science parks, entrepreneurship stimulation and incubators, and employ professionals to deliver service bundles that help transfer technology into their regional contexts.

HEIs are not particularly well equipped to ensure there is good communications between these different activities, and in many cases, innovation and valorisation activity becomes a standalone set of projects isolated from universities core teaching and research activities. Likewise, it is difficult for HEI leaders to effectively represent the interests of all these different academic staff, particularly those with a presence in regional engagement that is not closely aligned with what have been identified as key elements of the institutional profile. Under the intense institutional pressures from the governmental steering, there is a key risk that Dutch HEIs engaging with their regions neglect those areas of ongoing activity that are not known about by university managers, and instead commit to projects that do not serve to bind university knowledge into regional innovation activities to create new economic development pathways.

5 The regional HEI context in the Northern Netherlands

There is a long tradition of higher education in the Northern Netherlands. The second university in the Netherlands was founded in Franeker, Fryslân, in 1585 although this was disbanded during the Napoleonic occupation and never restored. The University of Groningen (RUG) was founded in 1614 at the Initiative of the City Assembly of Groningen and the surrounding region (the Ommeland), and although the relationship of university and surrounding region was sometimes difficult, a central Academy Building was built in 1850 funded by public subscription highlighting the relative importance of the university to the city. Although other universities have opened branch campuses in the Northern Netherlands, reflecting in particular the desire of Friesland for a university, RUG remains the only university in the Northern Netherlands.

The other key element of higher education in the Northern Netherlands is provided by the Universities of Applied Science (Hogescholen cf van Bommel, 2006). These activities have a long history in the North, with the Netherlands' first teacher training programme being established in Groningen in 1797, the Academy Minerva in 1798 for arts education, and an agrarian education programme being established in 1925. UASs were nationalised in 1963 and in 1984 separated from the secondary education system making them formerly part of higher education (although clearly distinct from the university sector). The sector in 1984 was comprised of very many small institutions, and since that period, the emphasis has been on the merger of institutions, often combining highly focused professional training colleges with more generalist institutions, to create multi-site institutions. There are currently three UASs active in the Northern Netherlands, the Hanze UAS, NHL Stenden and Van Hall Larenstein.

Hanze was created in 1986 at the time of the government policy of TVC (Specialisation and Concentration) as a merger of 16 of the 24 smaller colleges in the city of Groningen. It today operates with locations in Assen, Leeuwarden and Amsterdam, with the majority of the activities located in Groningen. Hanze UAS is a broad UAS covering a full range of disciplines from fine arts to engineering and professions associated with medicine. The Institution of Engineering is located in Assen and has close working relationships with businesses in the North, including the NAM (the state oil company) and Astron (qv). The UAS has developed a portfolio of applied research closely aligned with regional needs, with specialisms in the biobased economy, energy, healthy ageing, and entrepreneurship. The UAS has a strong focus on entrepreneurship, and has produced more than 350 start-ups in recent years.

NHL Stenden was formed in 2018 through a series of mergers; NHL was formed in 1987 as a result of TVC driven mergers and with a very strong orientation towards the local region, Stenden was created from a merger of the Christian UAS in Leeuwarden and the UAS of Drenthe, which dates back to the creation of a teacher training college in Meppel. This mergers have meant that there are 12 campuses, including 4 overseas locations (in partnership with local providers); there are 6 in the Northern Netherlands, including the only UAS on a Wadden Sea Island (Terschelling), as well as locations in Assen, Emmen, Groningen, Leeuwarden and Meppel. Its applied research focuses on three main areas, vital regions, smart sustainable industries and the service economy, and there are research groups in twelve areas, including health, entrepreneurship, smart industry, sustainable materials, renewable resources and the maritime sector.

Van Hall Larenstein was formed in 2003 through a merger of two agricultural UASs, each themselves formed through a merger of smaller colleges across the Netherlands. There was between 2004 and 2015 a close co-operation with the Wageningen University & Research which ended with VHL resuming full independence in 2015. Despite these mergers, VHL is the smallest of the UASs, with around 4,000 students in two locations, Leeuwarden in the north and Velp in the east. Its applied research is concentrated into two main areas. Delta Areas and Resources is primarily concerned with sustainability and landscape management, whilst Food and Dairy is concerned with the sustainable production of food and dairy. As with the other UASs, their research is primarily focused on near-to-market activities with research and technology development involving partners in the public and market sectors.

There are a number of nationally funded research institutions and activities in the Northern Netherlands, funded through the Dutch Science Council (NWO) and the Royal Academy for Arts and Sciences (KNAW). The NWO funds a number of large infrastructures in the region, of which the most famous is arguably the ASTRON- The Netherlands Institute for Radio Astronomy radio telescope array at Dwingeloo in Drenthe and the telescope facility in Groningen, along with a biobank, a centre for biomarkers, a data warehouse and a synchrotron. The Dairy Campus national innovation and research centre part of Wageningen University and Wetsus European centre of excellence for sustainable water technology, both with research and demonstration facilities and based in Friesland. There are no KNAW- Royal Netherlands Academy of Arts and Sciences Institutes established in the Northern Netherlands, although the KNAW is involved in financing the

independent Fryske Akademy, which is responsible. There are nodes in a number of the national scientific and research infrastructure activities in the Northern Netherlands, located within the RUG, including a station monitoring greenhouse gases, the Zernike Nanolab, a bioimaging centre (within UMCG) and a proteomics research centre.

The key public research organisations in Groningen have formed Northern Knowledge in an attempt to better coordinate their individual efforts and to produce a more general contribution to the research and innovation ecosystem in the Northern Netherlands. It formally consists of the Rijkuniversiteit Groningen (and the University hospital UMCG), along with the three UASs located in Groningen (Hanze, NHL Stenden and Van Hall Larenstein), as well as 8 local vocational education colleges (the ROCs). Their aim is to help support the development of a vibrant knowledge ecosystem in the north of the Netherlands, and in particular to make knowledge held in universities, UASs and ROCs more accessible to regional users. They have identified 5 key themes as areas for collaboration, and these are areas that align well with those in the smart specialisation strategy for the Northern Netherlands, namely healthy ageing, the energy transition, the digital society, biobased economy and agro-food. However, beyond Groningen there is not such a formal platform for direct collaboration between the public knowledge institutions in the wider region.

5.1 The role of HEIs in strengthening the S3 ecosystem

5.1.1 The S3 governance structure in the Northern Netherlands

The governance of the RIS3 (2014-19) in the Northern Netherlands is relatively complex because of the high degree of institutionalisation that has emerged as a result of the extensive policy interventions in the last 40 years. Since the introduction of the RIS3 strategy there has been a concerted effort to streamline this structure, and to integrate some of the separate activities that had been created to stimulate the RIS3 strategy. There is a long-standing culture of collaboration in the Northern Netherlands that dates back at least as far as the Kompas regional development programme for the North. This longstanding innovation governance system has at times struggled to adapt to the range of pressures placed on it, with the amounts involved in investment programme making it a heavily politicised field, with corresponding scrutiny and accountability through the provincial chamber and the socio-economic council.

In contrast to some countries and regions that had to rush to draw up their RIS3 strategy in the summer of 2013 to comply with ex ante additionality requirements, the Northern Netherlands had begun its preparations in a timely way. In 2011, a position paper was produced, the "Northern Netherlands and EU 2020" by a range of partners including SNN, HEIs, ROCs, NOM, SERNN and the Chamber of Commerce. This report identified five clusters that had been present in the Strategic Agenda Northern Netherlands (2007-13) as being a strong basis for any putative RIS3 strategy (Edzes et al., 2011). SNN then asked SERNN to provide advice on the RIS3 strategy explicitly building on the RIS 3 strategy, as well as the regional blueprint (houtko olschets) for structural funds 2014-20 published in 2012.

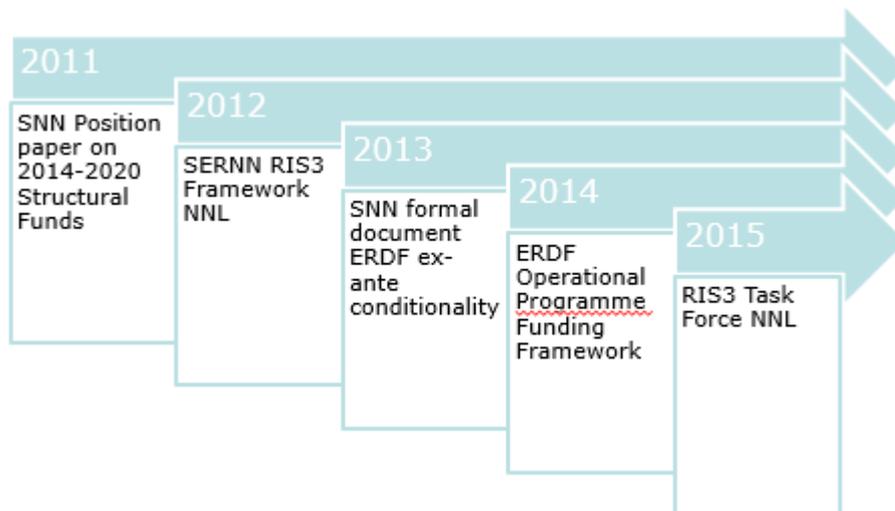
This document was published in July 2012, following both internal research as well as consultation with 39 regional stakeholders including the regional knowledge institutions. This advice recommended the choice for four regional sectors, Agrofood, Healthy Ageing, Energy and Tourism, as well as first signalling the potential to align the RIS3 with grand societal challenges, including smart growth, sustainable society and cross-border working. In the final RIS3 produced by SNN in 2013 (published in English in September), the choice was definitively made for a challenges based approach, using resources to create linkages between knowledge institutions and businesses/ clusters to drive innovation around these four sectors, sustainable agro-food, healthy ageing, clean energy and clean water provision.

Following the publication of the RIS3 strategy, a further document was produced in 2014, the Northern Innovation Agenda, which was adopted by the newly created Northern Innovation Board, envisaged by SNN as providing steering and oversight to the RIS3 in the programming period. In 2018, the NIB merged with another organisation to create the Economic Board of the North of the Netherlands. The ERDF Operational Programme is overseen by a Programme Monitoring Committee involving a range of partners from government, education, business and civil society, and there is also an independent body that assesses the applications made for support through the Operational Programme. In total, the regional RIS3 dossier can be considered as being comprised of the following documents and analyses (including Annexes)

- Position paper (SNN): 2011 (the Northern Netherlands and the EU2014-20).
- Met kennis beter (SERNN): July 2012. (Advice on a framework for RIS in NNL)

- Houtkoolschets (DB-SNN): July 2012 (pitch to NL government on future of SFs)
- S3 Strategy (SNN): Sept 2013 (formal document to meet ex ante conditionality)
- Operational Programme ERDF (PMC): October 2014 (funding framework)
- Northern Innovation Agenda (Taskforce RIS3 Northern Netherlands): January 2015

Box 3. Northern Netherlands RIS3 documents definition progress



The key governance issue regarding HEI involvement in S3 is that of the disconnect between the strategic decision-making and implementation (AmbtelijkeWerkgroep, 2019). There are many useful initiatives and the HEIs were fundamentally involved in both the development of the strategy and the proposal of the initiatives. However, this has not achieved a more systematic integration of the HEIs into the RIS3 strategy. This issue relates to one of the properties of good contemporary innovation policy, which intends to incentivise, steer and pump-prime good behaviours from all actors and not just subsidise desirable outcomes.

Effective spending of ESIF in HEIs involves funding activities that help reshape the HEIs to make them more systematically connected with regional partners/ innovation – through their core teaching and research activities, and not simply funding worthwhile technology transfer projects. The issue in the previous period was the extent to which the ESIF funded projects did effectively combine to shift the HEIs’ internal innovation support architectures, and it is not clear to what extent that shift has happened. There is the question about the extent to which the demands of the S3 governance approach in the Northern Netherlands allows the HEIs to develop internal self-knowledge and to mainstream support activities more effectively into their overall institutional framework.

5.1.2 S3 consideration of HEI capacities

In the case of Northern Netherlands the S3 process was somewhat drawn out with successive documents resting sometimes invisibly on analyses and deductions made in antecedent documents (see 5.1). To make sense of the consideration of the HEI capacities in the S3, it is necessary to reflect on the way that HEIs capacities were considered in these antecedent documents. A very brief precis of this consideration is provided below, in the order in which these documents were produced.

- Position paper (SNN, 2011)

This document set out the ambitions from the key partners in the Northern Netherlands for the use of the structural funds for the forthcoming programming period. The key challenge for the region is identified as improving the region’s relative performance in the knowledge economy, something “that requires making full use of the potential of the strong presence of knowledge infrastructure of the Northern Netherlands, with the University of Groningen, the UMCG, colleges and academies, and the existing alliances” (p.3). Interventions were directed through five clusters, each with its own so-called triple helix structure, again involving universities, naming specific examples such as Wetsus, Energy Valley, INCAS3, the Carbohydrate Competence

Centre and the Healthy Ageing Network. Both improving qualification levels and graduate retention were seen as being important for regional development, giving HEIs an important role in that dimension.

- Met kennis beter, (SERNN, 2012)

This document was an Advisory Report produced by SERNN as the basis for consultations with regional partners to guide the S3. Its SWOT foregrounded the breadth of knowledge institutions as a clear regional strength, whilst highlighting the lack of highly skilled personnel and a mismatch of skills and jobs, as well as the lack of tightly focused regional knowledge institutions. This document identified four industrial clusters that were concentrated in Northern Netherlands, and highlighted that the RIS3 needed to ensure that investments flowed to knowledge institutions which helped make HEI knowledge more widely accessible to the clusters, such as with Wetsus. The regional labour market was also identified as one key mechanism to transfer technology and knowledge from HEIs (and colleges) to regional businesses in these four cluster areas. The potential was identified to stimulate interactions between knowledge actors and between clusters through the use of centres of excellence. Universities, and in particular through their participation in H2020 were seen as effective conduits to bring new knowledge into the lead clusters. It recommended alignment with the then recently-published national human capital agenda, and recommended therefore the development of regional human capital agendas for these top sectors to ensure skills availability matched regional needs.

- Houtkoolschets (MINEZ, 2012)

Although this document was prepared for a discussion between the four NUTS1 regions and the Dutch Ministry, its analysis overlapped with the analysis of the SERNN document and is also therefore reflected in the S3 document (MINEZ, 2012). This document noted on the first page that the region's knowledge institutions had developed very effective partnerships with the regional top sectors, reflecting very strong regional partnerships. The analysis highlighted low regional skills levels as a problem, but noted that regional HEIs were engaged in a number of key clusters (highlighting water and agriculture). This is the document that first recorded the shift from a cluster approach to a societal challenge approach, as a means to better connect regional HEIs' knowledge with regional users and beneficiaries. This document proposed 5 goals, one of which being "knowledge and innovation strength", stimulating knowledge interactions, clusters, and infrastructure, supporting living labs and the development of talent.

- S3 Strategy, (SNN, 2013)

The focus for the RIS3 strategy (SNN, 2017a; SNN, 2017b) was knowledge mobilisation, using challenges to produce knowledge and solutions in living lab contexts linking businesses, knowledge institutions and HEIs. This strategic document highlighted seven potential clusters, and made a selection of five in part reflecting sectors with concentrations of knowledge in regional HEIs; the four challenges chosen are also areas where there are clear knowledge strengths in regional HEIs. The S3 also identifies ten living labs that are important for the mobilisation of knowledge, and regional HEIs are involved in various ways in those living laboratories, along with three 'crossover projects' to create regional knowledge concentrations (Carbohydrates, Water Sanitation & Fall Prevention). One of the targets for their 'Results Oriented Approach' was to state there would be a target set for the conversion of regional knowledge into new products and services. The S3 also proposed creating a Northern Netherlands Index to measure progress around the S3 implementation. Horizon 2020 and the Top Sector programmes (in the regional HEIs) are presented as being important for contributing to the overall RIS3 effect. The section on regional collaboration sees the regional HEIs as contributing to implementation in many ways, supporting collaboration, raising skill levels and increasing the knowledge intensity of lower education levels.

- Operational Programme (ERDF, 2014)

The Operational Programme ERDF of the Northern Netherlands is strongly rooted in the RIS3 strategy and takes forward the analysis and sectors selected by the RIS3 (PMC, 2014; SNN, 2014). The primary focus of the Operational Programme is in stimulating innovation in SMEs by assisting them to access various kinds of knowledge resources more easily. Those measures that are oriented towards HEIs include highly skilled staff, specialist knowledge held in regional HEIs and participating in company-HEI networks. Regional HEIs were seen as being important participants although the rubric required that the primary purpose of any project needed to be in ensuring innovation-stimulating resources could be better accessed by the SMEs. 76% of resources are being allocated to strengthening RTDI, with one priority being filling knowledge gaps necessary for innovation in priority sectors, casting a clear role for regional HEIs, and a second in building networks to assist SMEs access knowledge from partners including regional HEIs. A specific goal was set to increase the number of SMEs working with knowledge partners (including universities) from 31% in 2010 to 35% (2023).

The investment framework delineates specific activities requiring an input from HEIs, including living labs, technology transfer infrastructures and human capital development programmes. There are also roles for regional HEIs to play in the second priority area, promotion of the low carbon economy.

- Northern Innovation Agenda (TNN, 2015)

The NIA (Taskforce Noord Nederland, 2015) represents an attempt to ensure that the RIS3 strategy maintains its currency during the programme period by a close and ongoing interaction with regional partners, including HEIs, with a project group that was intended to include universities (this has subsequently been merged into the Economic Board of the Northern Netherlands). In this document, the idea emerges that HEIs can function as launching customers for some kinds of innovation developed by regional SMEs (although the idea was long present that the government could play that role notably in water technology, as early as the KOERS strategy of 2009). The document emphasised the existing strong partnerships between innovators and regional knowledge institutions and that the vision was to strengthen that by 2020. This document gives a systematic list of interventions that could be potentially funded in each of the sectors (business, government, HEIs, intermediary organisations) to deliver the identified goals. This means that HEIs contributions are extensively considered in the NIA. For the theme Renewing the innovation ecosystem, the recommendations are for projects to fund HEIs to simplify their SME support mechanisms, to better profile their centres of excellence, and to act as launching customers.

5.2 State of play of HEI collaborations with innovation ecosystem actors

The collaboration within the regional innovation ecosystem in the Northern Netherlands is – as explicitly identified in a number of the SWOT analyses – is relatively strong, and the regional HEIs are actively involved in this in three main areas. Firstly, there are strong bilateral collaborations around particular projects – 1/3 of regional SMEs have had knowledge exchange activities with regional HEIs in the last three years. Secondly, universities are actively involved in the collective arrangements that have been created to encourage collaborations within the regional innovation ecosystems, including the cluster activities (such as Energy Valley) and living labs. Thirdly, the universities engaged with innovation ecosystem governance activities, including participation in the Innovation Board and the Economic Board for the Northern Netherlands.

The one area where collaboration has been weaker is in the collaboration around the innovation governance associated with the S3 process, this third element, with the Northern Innovation Agenda not becoming the collective continually updated vision. There is a lack of flexibility and initiative in the interaction between regional partners to ensure that individual projects add up to something that leaves a lasting imprint on the regional innovation ecosystem. There is a desire amongst regional partners to ensure that this governance is improved in the forthcoming programming period (2021-27) to improve the quality of collaborations, and ultimately to use these projects to create a forward momentum for knowledge economy investments.

There is a clear geography in the innovation ecosystem both in terms of HEIs and other actors, creating a profound problem for involvement. Groningen is as a province a Strong+ innovator, and many RIS3 investments have gone to Groningen. Likewise, there is a concentration on HEIs in Groningen, certainly in terms of their knowledge economy capacity. Collaborative projects funded through the Operational Programme have therefore been predominantly concentrated in the province of Groningen, and the existence of Northern Knowledge as a collaboration of HEIs in Groningen that there is a lack of learning within regional HEIs about operating collectively, and to develop sectoral approaches to innovation ecosystem contribution.

Although regional HEIs have individually been very effective in driving particular projects, there is still not a collective institutional space for HEIs and that in turn undermines having a strategic agenda for HE in the Northern Netherlands that is more than the sum of the contribution that individual projects make to the regional economy. This is not necessarily a criticism of regional HEIs, because it is certainly mirrored by divisions within the political landscape of the Northern Netherlands where Provinces are keen to insure knowledge economy investments benefits their territories. It is under these circumstances unsurprising that Wetsus and NHL Stenden should be more focused in their engagement at the scale of Fryslân than at the level of the Northern Netherlands. There is therefore a tendency to think in terms of the necessary critical mass in terms of the city or Provincial level, around very tightly focused themes, than to think where critical mass exists at the level of the region (where you can drive between any two mainland points in less than 90 minutes).

5.3 The role of HEIs in S3 implementation

The Northern Netherlands is a relatively innovative economy, although HEIs and other publicly funded knowledge institutions play an important role in supporting that knowledge economy. That is reflected in the extent to which HEIs have been involved in S3 implementation. There have been a total of 93 funded projects to date under the four priority areas; a total of 36 of those projects have involved HEI participants, and 11 of those have been led by HEIs and other regional knowledge institutions (including ASTRON). Regional HEIs have been in close dialogue with the programme secretariat in SNN, and through their ongoing dialogue were active in shaping the creation of the funding streams. They have also been important in terms of the drawing down of subsidies, providing co-funding and leverage and maximising the impacts of these expenditures on the regional knowledge economy.

This importance of HEIs to the delivery of the innovative aspects of the structural funds was also evident in the previous programming period (2007-2013), the first time that innovation really emerged as a strong theme suitable for promotion by the structural funds. In this period, around 18% of total ERDF subsidies were provided to project consortia including HEIs, and around half that amount was provided to project consortia led by regional HEIs. Total project expenditure for these activities were around seven times the total invested subsidy. The data provided by regional partners for the programming period 2007-2013 lacks higher disaggregation for a more detailed analysis.

Table 1. ERDF expenditure on innovation activities in HEI sector, Northern Netherlands, 2007-13

	Total expenditure	%	Total subsidy	%	Leverage
All sectors	€1,191,457,335	100%	€191,820,400	100%	6.21
Involving HEIs	€251,441,893	21%	€33,985,313	18%	7.40
Led by HEIs	€113,479,895	10%	€18,111,459	9%	6.27

Source: authors own calculations based on SNN data.

In the programming period 2014-2020, the Northern Netherlands has chosen to align almost all expenditure (with the exception of the technical reserve) onto the two ERDF objectives 1 and 4. There are four specific priority areas within the RIS3, namely the human capital agenda, knowledge development, innovation & valorisation (ERDF Objective 1) and the promotion of the low carbon economy (ERDF Objective 4). In table 2 below, we present the breakdown of the allocation of these funds between the four objective areas, identifying the extent to which HEIs are involved in projects under those four priority areas, and in which they are leading those priority areas.

The Human Capital Agenda is specifically related to the higher education (scientific education and primarily higher professional education), creating the higher level skills necessary for the promotion of innovation. Although this only represents 2.4% of total ERDF expenditure in this period, all of the funded projects to date include HEIs as partners, and $\frac{3}{4}$ of those projects are led by HEIs, such as projects creating high value-added skills for the biotechnology sector. Universities are likewise disproportionately represented in the knowledge development projects, representing 15% of all program expenditure but with universities involved in 41% of project expenditure; one of the largest of these projects is Innofest, which funds key regional knowledge partners including HEIs to develop knowledge to be more directly applicable to non-innovative companies that nevertheless have a high innovative potential.

Universities are conversely slightly underrepresented in Innovation & Valorisation, involved with projects accounting for 24% expenditures and low carbon economy (17% expenditures). This is not necessarily surprising given the role of Dutch HEIs in terms of creating knowledge capital and human capital; much of the innovation and valorisation activities are related to healthcare sectors where innovation takes place much closer to the knowledge base such as a living lab for eHealth (and often in the public health sector which may in turn be affiliated to HEIs). Low carbon technology projects are typically related to water, energy and packaging, including for example a low energy computing project together with the ASTRON facility in Drenthe.

Table 2 ERDF expenditure on innovation activities in HEI sector, Northern Netherlands, 2014-2020

Priority Area	All projects	Projects involving HEI	HEI investments
Human Capital Agenda	€ 5,254,757	€ 5,254,757	€ 2,545,831
	1%	100%	48%
Knowledge Development	€ 62,241,977	€ 32,825,930	€ 12,657,949
	17%	53%	20%
Innovation. Valorisation	€ 184,164,370	€ 52,611,640	€ 21,956,623
	49%	29%	12%
Low Carbon	€ 122,736,091	€ 15,230,917	€ 6,117,671
	33%	12%	5%
TOTAL	€ 374,397,195	€ 105,923,244	€ 43,278,074

Source: Data and table by SNN (July 2020).

Turning to consider which areas the individual HEIs have spent their resources on, table 3 below shows the total project expenditure by HEIs on projects within the 2014-20 programme. By way of clarification, what this table shows is the total amount spent on program elements undertaken by HEIs within consortium – there is a leverage of c. 7 for the programme as a whole, so these expenditures are underpinned by much lower overall subsidies. The biggest recipient of funds is the Rijksuniversiteit Groningen, which undertook projects totalling around €10m in the period. Perhaps surprisingly, the next biggest expenditure was with institutions outside Northern Netherlands, including the Radboud, Twente and Delft Universities, and the national research centres TNO and ECN. There was around €1.6m of expenditure in non-HEI knowledge centres, including ASTRON, the Leeuwarden Medical Centre, the Roden Health Hub and Wetsus. The second largest regional investor was the UMCG (the Groningen university hospital) with the three UASs investing substantially less than these amounts, with Van Hall Larenstein participating in one project on the biocircular economy.

In terms of which HEIs have been most active in contributing to which of the four priority areas, we see that the majority of the contribution to the human capital agenda has come about through expenditure by NHL Stenden, whilst all the other HEIs have contributed in some areas. Knowledge development has been led by the university and the UMC, with involvement from other regional HEIs and knowledge institutions. Innovation and valorisation has been dominated by the RUG, with other substantive contributions coming from the UMC and also from projects by partners outside the region. Finally, the low carbon economy projects have primarily involved expenditure from knowledge institutions outside the Northern Netherlands, with RUG also substantively involved and a few more marginal activities in other HEIs and knowledge activities.

Table 3 Total Project Expenditure on HEI involved projects, ERDF, Northern Netherlands, 2014-2020

HEI	Human Capital Agenda	Knowledge Development	Innovation. Valorisation	Low Carbon	Total
RUG	€ 1,483,149	€ 1,424,080	€ 13,522,552	€ 2,316,053	€ 18,745,835
NonNN	€ 0	€ 179,580	€ 578,516	€ 188,444	€ 946,540
MCL	€ 0	€ 0	€ 113,343	€ 0	€ 113,343
UMCG	€ 0	€ 8,882,539	€ 3,010,738	€ 0	€ 11,893,278
Hanze	€ 281,386	€ 600,459	€ 2,768,439	€ 1,486,775	€ 5,137,059
NHL Stenden	€ 781,296	€ 373,681	€ 441,905	€ 171,540	€ 1,768,422
VHL	€ 0	€ 40,384	€ 0	€ 0	€ 40,384
Other	€ 0	€ 1,157,225	€ 1,521,130	€ 1,954,859	€ 4,633,214
Total	€ 2,545,831	€ 12,657,949	€ 21,956,623	€ 6,117,671	€ 43,278,074

Source: Data and table by SNN (July 2020).

An additional investment instrument is provided by the REP fund from the Ministry of Economic Affairs, intended to provide a national and regional investment stream to complement the European investments. This invested a total of €90m into projects with a strategic emphasis for the north of the Netherlands. Of these 12 projects, only one of them did not involve HEI partners, the RIG investment subsidy for large business investments into the north. The other projects all involved a total subsidy investment of €85m and a co-financing granted of €135m, producing a total investment into the north of €220m. A number of these projects have related to specifically improving the regional innovation infrastructure around the clusters of strategic interest, most notable investments into Wetsus, the Energy Academy and the Dairy campus.

Table 4 Subsidies provided to strategic regional projects, Northern Netherlands, 2014-20

Project Name	Total subsidy provided
Wetsus	€38.480m
Dairy Campus	€15.000m
Energy Academy Europe Facilities	€14.500m
World Class Composites Solutions	€5.842m
Region of Smart Factories (RoSF)	€4.411m
ZAP Groningen: the innovation cluster	€2.544m
CarboBased	€2.334m
LNG; game-changer in shipping	€1.348m
Nice Matters	€1.000m
Inbiolab Chemistry & Engineering	€1.000m
TOTAL	€86.461m

Source: Data and table by SNN (July 2020).

Arguably the greatest limitation in terms of the participation of the HEIs in the delivery of the RIS3 strategy was the HEIs capacities to remain engaged during the implementation phases of particular projects. Although HEIs were active at the strategic level during the formulation, consultation and finalisation of the RIS3 strategy, once subsidies had been allocated and project funding won there was a tendency within HEIs to focus on delivering those projects rather than continually attuning the projects to the overall programme fulfilment. The main focus should be on the individual projects adding up to the overall desired outcome, namely the strengthening of the position of the region in the knowledge economy by improving focus on the four identified challenge areas.

6 Results

6.1 Connecting SMEs

6.1.1 Introduction to the key drivers and trends around connecting SMEs

One of the biggest challenges for smart specialisation strategies is in connecting to SMEs (small and medium sized enterprise). The smart specialisation strategies have been premised upon entrepreneurial discovery processes that reveal and harness a diverse set of knowledges held by a wide range of actors in a regional territory. The strategic process then finds ways to firstly identify where new valuable combinations can be made, then secondly integrates them into the overall regional strategy, before thirdly ensuring that funding instruments support and make possible real new combinations in practice. This is intended to try and defeat an inertia that can emerge in regional innovation partnerships where a few key active stakeholders – often with very partial or limited interests – unduly shape EDPs, strategies and implementation, with the result that the strategies do not create new regional development pathways.

This is not a particularly surprising situation; the vast majority of all firms are always small, and lack the resources, structures and capacities to effectively participate in these three key processes. Not all firms are sufficiently innovative to be able to meaningfully participate in these activities, but participation rates are typically so low across all three of these phases that this can undermine the sense that there is any kind of new activities being created. The simple reality is that for most firms, the only realistic opportunity to engage is in joining into activities and projects once those strategies have been finalised. But if those strategies have not been drawn up in ways that allow regional SMEs to participate, then that can undermine the success of the implementation. A typical example here are high-tech clusters consisting of existing strong partnerships; they can be extremely inaccessible and even irrelevant for other regional companies.

This is the key issue of SME connectivity in smart specialisation strategies, in that the strategies have to create opportunities for actors that on the whole are simply incapable of clearly voicing their interests in a way that can be heard. Many of these companies need fairly basic kinds of knowledge that on their own are not necessarily sufficiently complex to involve universities in.

They may not have the time to work together with other companies to draw up a shared knowledge agenda that universities could potentially become involved in. They are not always able to signal what kinds of potential they have that could be unlocked by a shared project or piece of infrastructure that could be supported by regional funds. The only way that regional partners can hear these voices are if this long tail of potential innovators can be better connected to other stakeholders that do have the capacity to understand where those opportunities might arise.

The key issue is therefore one of aggregation – connecting SMEs together to turn these many small problems into something that can form a research and innovation agenda that is sufficiently dense to form the basis for a regional specialisation. These connections are not always simplistic: successful projects and programmes often depend on a wider ecosystem of partners with many different connections. These ecosystems link universities, UASs, regional colleges, applied technology organisations, consultancies, large firms and SMEs together in ways that are sometimes quite informal, serendipitous and tacit. In short, knowledge linkages to SMEs are activities that are precisely those activities that are not reducible to fixed-length projects with clear outputs, and which are difficult to include in smart specialisation strategies and Operational Programmes.

6.1.2 Overview of the situation in the Northern Netherlands

These drivers and trends had a very specific manifestation in the context of the Northern Netherlands as reported in the interviews and confirmed in the focus groups. The main issue was that there was a very long tail of SMEs that were not active in high-technology innovation of the kind that is readily identified and supported by policy processes such as smart specialisation strategies and Operational Programmes. There were relatively few innovation leaders, along with a few clusters of innovative businesses in areas such as medtech and advanced materials and high technology systems. But at the same time, other schemes such as innovation vouchers suggested that there were far more firms attempting to engage with universities and become innovative than were being reached by policy makers. An interplay of five factors was leading to a substantive underperformance of the policy framework to support innovative SMEs in the Northern Netherlands.

1. The first of those was that there were many SMEs that were active in traditional industries that tended to be framed as low-technology and non-innovative. It was clear that there were sectors such as agriculture that were indeed highly innovative. The Dairy Campus in Leeuwarden and the potato starch research activities in Groningen are related to agricultural sectors that have the potential to be highly innovative. At the same time, they are led by a relatively limited number of companies that have the resources and the funding to invest in building relationships with the university. The Avebe innovation centre at the Zernike campus is a good example of the ways in which the RUG, Hanze and UMCG can build links to businesses in putatively low-technology centres, offering linkages and opportunities for other businesses, researchers and students to work on those activities. But at the same time, for those lower-technology industries without lead companies such as Philips or AVEBE there are real questions in the extent to which SMEs in those sectors are able to connect to HEIs.

2. The second issue was that the innovation policy arena was in a position of extreme maturity which potentially hindered dynamic change of those involved. The Northern Netherlands has been a recipient of regional policy since the Marshall Fund investments in South East Drenthe in the 1950s, and there are very strong coalitions that exist around regional development policy. The Dutch government were very strong in pushing from 1998 onwards the idea that regional development must be driven on the basis of success rather than compensating failure. As a major regional policy recipient, actors in the Northern Netherlands have this long experience of being required to demonstrate their success, and increasingly that they are driving innovation. This has created 'strong ties' in the policy networks that are not always immediately open to new players.

3. Thirdly, and related to this, is that there also a number of long-standing clusters and regional networks. The two most obvious examples of this are the Water Campus in Leeuwarden and the High Technology Systems cluster around Drachten, but this also includes activities such as what was called until very recently Energy Valley in Groningen. Others such as the Dairy Campus working on research, innovation and education in the dairy industry or the important health cluster with the Healthy Ageing Network and the University of Groningen and UMCG being part of the EIT Health Knowledge and Innovation Community in partnership with 150 EU world-class organisations from the EU. These clusters have for the last decade had to orient themselves to national policy agendas and networks as a result of the Top Sector policy, however also strongly looking to their international relevance through increased critical mass, continuously looking to expand their networks through an ambitious research programme and actions to attract international business.

4. The fourth issue is that there has been a strong sub-regional geography chosen for the kinds of activities to be supported, such as water for Friesland, energy for Groningen and sensor technology in Drenthe. The activities and their locations have central locations within their respective provinces, and this can reduce their accessibility to companies in other parts of the region. Although the Northern Netherlands is by no means a geographically large region, its knowledge spill-overs occur primarily locally, which signals its innovation capacity outside the main capital cities, contributing to a balanced and de-centralised innovation system. However, a perception of provincial specialisations instead of regional ones should be avoided, introducing the needed incentives for potential innovators with specialisations that are hosted by another province to access those knowledge services effectively.

5. The final problem is that despite this long history of competitiveness and innovation policy in the Northern Netherlands, there has been a continuity problem which has hindered the steady development of companies up what might be considered as the "innovation capacity escalator". In an ideal scenario, a potential innovator encounters a knowledge source and is persuaded that innovation is possible, and they develop a one-off project that helps that firm become innovative. That firm then realises the value of innovation and begins a more recurrent relationship with that knowledge source. In the course of multiple innovation processes, the firm becomes aware of other companies facing similar questions, and starts to develop its wider networks. Over time, those wider networks incorporate more knowledge providers and start to function as a cluster. With the best will in the world, the policy framework has not supported that steady evolution and has rather focused on one-off projects that disappear after their completion.

6.1.3 Analysis of the key processes at play in the Northern Netherlands

The issue of SME connectivity is affected by the regional environment in the Northern Netherlands and the underlying structure of the regional knowledge economy. The fundamental point is that the Northern Netherlands is a sparse polycentric urban region with a strong rural hinterland. The most important city is

Groningen, and then there are smaller cities in Heerenveen, Leeuwarden and Drachten, and then smaller cities in Drenthe including Assen and Emmen. These smaller cities do not have a strong regional knowledge function; their knowledge spillovers are primarily restricted to their immediate localities. Although the region is small in geographical terms, there is also relatively low mobility in the region, local areas are self-contained in terms of the patterns of commuting, service use and interactions. It is only really the city of Groningen that plays a strong regional role.

One key dimension here is the lack of strong agglomeration and urbanisation economies outside the main urban core area of Groningen, and the problems that exist in connecting SMEs that are outside these core urban areas to the correct knowledge networks. There are local campuses and innovation hubs from a number of the regional HEIs outside their main campus areas; Groningen has opened a University College in Leeuwarden. Likewise the merger that led to the formation of NHL Stenden has given it campuses at Assen, Emmen, Groningen, Leeuwarden and Meppel, as well as on the Frisian island of Terschelling. Nevertheless, these local activities tend to be relatively small and specialised, and without the critical mass to offer a wide range of services for local SMEs.

There is one UAS that is specialised on agriculture and the biobased economy, Van Hall Larenstein, but that has its Northern Netherlands campus in Leeuwarden, and is not necessarily immediately relevant to all rural SMEs. One particular sector that was regularly named were companies innovating in improving service provision and liveability in the rural areas; their relative lack of size, capital and R&D intensity and remote rural location made this group of companies relatively difficult to access.

The regional connectivity issue is therefore at least partly an issue of how can the size of Groningen and its role as a global hub be borrowed by places (and their innovation activities) outside Groningen to create more regional critical mass in knowledge economy activities. There appears to be a relatively high attrition rate in terms of becoming innovative for those innovative SMEs which fall outside a quite narrowly defined core. Those firms that are not high-technology businesses in priority sectoral areas with their own R&D engineers located in the region's main urban areas are disconnected from the regional knowledge infrastructure and are difficult to influence using the policy levers identified in the RIS3 strategy. And taken in aggregate, this discouragement effect prevents any kind of "innovating escalator" operating which can produce competent innovators around which new innovation projects, networks and potentially clusters can be built.

6.1.4 Key success factors in producing positive results

This suggests a model for the emergence of the knowledge economy in the Northern Netherlands, which is as a kind of "ink blot" that has gradually been spreading out; several lead companies and universities develop a "research & innovation club" and smaller businesses are able to participate once it is operating successfully. The core of this knowledge economy is based around high technology businesses in priority sectoral areas with their own R&D engineers located in the region's main urban areas. These tend to be relatively well connected to regional HEIs, and there have been many projects successfully developed drawing upon the networks and connections between them. Success in this sense is an extension of the ink blot to cover more innovative firms who could perform better if they could develop more structural connections with regional networks and HEIs (this is the 'Connecting SMEs' challenge for the Northern Netherlands). From the interviews and focus groups, we were able to identify a range of promising activities where the RIS3 had contributed to the KE Ink Blot spreading out, and the activities which helped to drive this typically offered one or more of the following six mechanisms.

1. Access via informal networks. The first element of "connecting SMEs" comes through the use of informal networks to access SMEs. Building connections between innovators and researchers involves quite a lot of commitment to have any chance of success, and informal networks can help build trust between partners prior to the point that a go/no-go meeting takes place. Alumni networks were identified as one of the most vital assets to connect into regional businesses, because many potential and novice innovators do employ graduates that have connections back to their universities. These can in turn help build up connections which involve much less commitment than R&D projects (see 2. below), but at the same time help to build "organisational proximity" between companies and HEIs which can in turn help facilitate better subsequent collaboration.

2. Low barrier-to-entry activities. The second element of "connecting SMEs" into regional innovation comes through offering activities to potential innovators that have a very low barrier to entry but still allow meaningful connections to build up with regional knowledge providers. The Northern Netherlands is extremely skilled in the use of education to play this role, partly because of the preponderance of UASs in the region. But the Innovation Workplace concept that has been developed in the Northern Netherlands is genuinely

impressive in terms of the structured way that it builds up connections between firms and HEIs through the use of student projects. What is more remarkable are those examples of innovation workplaces that do not just involve higher education but also vocational training (the Dutch MBO institutes) which in turn increases the chance that the firms can access knowledge that will be immediately relevant to them.

3. Follow-up trajectories. The third element of connecting SMEs into regional innovation was through the existence of follow-up activities that allowed innovating SMEs that had had a useful low-intensity interaction with HEIs (potentially through an innovation workplace) to undertake a follow-up activity. These were less systematically organised than the Innovation Workplaces and tended to rely on having a strong amateur coordinating the activities, and strong local policy support for the activities. A number of these had been organised around the Centres of Excellence and the Centres for Innovative Craftsmanship. The lectoraten from the UASs here played an important role, providing the necessary stability for the projects that allowed the activities to continue beyond the immediate project funding life.

4. Shared research agendas. A fourth element of connecting SMEs into regional innovation was through activities which allowed individual company issues to be developed and combined into collective problems which were then sufficiently substantive to represent a meaningful knowledge request for universities. That is something that large companies tend to be relatively good at doing, and it is challenging to involve SMEs in those discussions. Where this was successful in the Northern Netherlands was where there were higher-level discussions between HEIs and large innovative companies, alongside lower-level discussions between HEIs and SMEs, often around applied research and student projects. The critical element here was in those centres developing pathways that allowed the knowledge in those SMEs – often at an operational and applied level – to influence the high-level strategic plans and to ensure that the projects, programmes and strategies were interesting and accessible for potential and novice innovative companies.

5. Sustained research directions. What the ERDF is good at funding is the infrastructure to support knowledge collaborations, such as the proeftuinen (living laboratories) that were funded under the last Operational Programme. The challenge for the Northern Netherlands is in identifying potentially promising areas that are genuinely novel and which incorporate more SMEs into their activities. Where this happened in the region, it was when there were some companies and HEIs that were working together on a collective set of activities, often in a rather low-intensity way, and they were able to sustain that direction of travel to build up the impetus for a large activity. These activities tended to be driven by individuals within HEIs who saw the value of these activities and were able to persuade their boards of the value in supporting and investing in those activities to create a cluster that would then support high quality research activities (see 6. Leveraging, below).

6. Leveraging expert innovators. The final element of connecting SMEs came through the leveraging of the expert innovators, usually large R&D intensive companies that were making use of the ERDF and other innovation funds to support their core activities. One key role that the HEIs were able to play was in ensuring that the proposed activities could be leveraged to create spillovers for smaller, less expert firms. The most convincing examples of this we found were in the Campus locations that were developed with a few lead anchor innovators, and then facilities operated by HEIs alongside shared space for other innovators, researchers, companies and students. The visit to the Water Campus provided a very clear example of how this can be achieved, with a full spectrum of knowledge activities from Ph.D. research through to engagement with school children, with extensive support from public authorities at the regional, provincial and city scale. There are similar campuses and locations around the region specialised in such areas as energy, the biobased economy, sensor technology, and high-technology systems. In each of these campuses, the fertility of the ecosystem was provided by the productive interplay of the anchor innovators and the knowledge institutions (primarily HEIs but also TNO and other publicly funded innovation organisations).

6.1.5 Challenges undermining effective contributions

The interviews and focus groups also provided the opportunities to identify where there were still problems in connecting SMEs into innovation activities that had not been addressed in the last programming period. These are the key challenges that need to be addressed if the HEIs in the Northern Netherlands are to harness their knowledge capacities to maximise the regions' innovative capacity. Some of the challenges were not really innovation challenges, but were a result of other factors at play, such as the sense of parochialism and separation between three provinces which continue to function as politically distinct entities. Some of these challenges were revealed through the fact that when they were addressed, then the results were impressive, such as the fragmentation within the knowledge sectors. Other challenges emerged as a consequence of the wider policy arena, whether the peculiar requirements of ERDF funding, the way that the region had chosen to

allocate its resources, or the fact that the Dutch government had allocated all skills funding nationally to intermediate labour market projects. We identified six areas where there were still problems in connecting SMEs and which should be the future focus for maximising HEI contribution to regional economic development.

1. Restrictive thematic interpretations. The first challenge arose because of a tendency to take excessively stringent, and often very technologically-focused, interpretations of thematic areas. This partly arose because these thematic areas had tended to be formulated by existing innovators, and the innovators in these areas that were engaged with the consultation processes tended themselves to be R&D intensive companies, with a technological focus. The result was that areas such as healthy ageing or the energy transition tended to be exclusively regarded as producing technological solutions for particular problems and not in addressing the social dimensions of these problems, such as in creating new ownership models for distributed energy infrastructures or maintain service provision in remoter rural areas.

2. Restrictive staffing requirements. The second challenge was that the practicalities of the whole approach presupposed that participants would have full-time R&D staff and R&D administrators who could spend large amount and possibly all their time working on innovation projects. The reality in the Northern Netherlands is that the bulk of innovation is carried out in firms led by either directors or employees who are already doing income generation activity; demands that these staff then shift entirely to doing R&D activities is unrealistic because they are not easily replaced to fulfil their duties. This also has the effect that it increases the riskiness of innovation, which because of the financial aspects is already a risky activity for a small business. The overall effect is to reduce the number of firms that are able to construct innovation projects in practical ways that are not excessively risky.

3. Missing knowledge chain links. A third element that is clearly a challenge for firms is that there is not necessarily a single expert that has all the necessarily knowledge to address their problems, but rather that it is spread across different actors. Firms need 'knowledge bundles' but in many cases there are no mechanisms that are pulling together knowledge bundles even virtually.

Some of the cluster organisations and centres of excellence are bringing together a range of knowledge actors that could be integrated into knowledge bundles. But a recurrent problem remains that it is too easy for a firm to become discouraged through contact with universities.

There are intermediaries and brokers that can help companies, but they risk ending up chasing subsidies rather than helping firms to build up the necessary knowledge contacts.

4. Fragmentation in the knowledge sector. In the context of this project, one of the criticisms that was constant made was the fact that the regional HEI sector had not managed to coordinate itself to provide consistent support for SMEs. One area of disconnect was between the strategic priorities of the institutions and the actual activities undertaken by HEI researchers, and the fact that no one at a central HEI level knew all the activities that were taking place. A second area of disconnect was that there was no consistent knowledge of what kinds of knowledge assets there were across all HEIs around particular sectors and societal challenges. There were some promising collaborations, such as the VHL-NHL Stenden shared site in Leeuwarden and between the HEI and regional college sector. Combined with a continued competition between the institutions as well as collaboration, the overall effect that this had for innovative SMEs was to make the knowledge landscape extremely confusing and thereby discourage collaboration.

5. Governance challenges. There was sustained criticism in the interviews and the focus groups regarding the governance and decision-making around the instruments, and in particular around the necessary flexibility to create a supportive policy environment for innovative SMEs. The governance model should look to introducing appropriate channels for SMEs voices to be heard, considering their needs in terms of innovation environment and support instruments. The region has been particularly careful in the integration of SMEs in Smart Specialisation. The ERDF Operational Programme includes supporting schemes for SMEs, with one scheme for individual SMEs assessed by SNN and a second scheme to support HEI-companies collaboration in larger consortia assessed by an independent panel of experts committee. In this regard, the second scheme has received very positive feedback from the EC impact evaluation in 2018. Both, the one assessed by SNN and the one by external experts are evaluated based on objective evaluation criteria, thanks to the extensive experience of SNN in innovation projects evaluation and a reputed name of external experts.

Despite the efforts, it seems the effect of this was to discourage SMEs from coming forward and making proposals that had the highest chance of getting funding not that made the greatest contribution to being funded. There was also a confusing effect from the proliferation of subsidy funds, from the ERDF, provincial funds, inter-municipality funds, and national funds, all seeking to promote innovation in the Northern

Netherlands, but each with their own requirements and priority areas. The net effect of this challenge was to create a sense of lock-in within the kinds of projects being proposed, repeating existing successful activities rather than diversifying and upscaling the regional knowledge economy infrastructure.

6. Skills for innovation. The biggest limitation for innovation in the SME sector in the Northern Netherlands is the fact that innovation is incredibly complicated business. For SMEs it is complicated by the fact that there are a few individuals in a company who are trying to balance a huge range of activities, connecting SMEs to innovation requires connecting them to those with the skills to carry out, upscale, exploit and generate profit from innovation. It is genuinely amazing that there is no scope within the RIS3 strategy to think strategically about how innovation skills can be built within the SME sector, so that they can participate in innovation projects in a way that maximises the benefit to the company. Although the HE sector is helping to educate individuals with better understandings of how to innovate, there remains a problem in linking these skilled graduates to companies in ways that those skills are used to improve SME innovation performance.

6.1.6 Strategic and operational ways forward

There are some fairly straightforward strategic changes that could be made that would greatly facilitate connecting SMEs better into regional innovation processes.

- There is a need for a political structure for the region that better reflects the reality of the region; the Northern Netherlands is a polycentric region with an extensive rural hinterland, and connections between places need to be managed at a regional scale to maximise knowledge spillovers and critical mass, in place of today's parochial approach.
- The region's HEIs need to be better at influencing the regional agenda. An urgent first step would approach to be the development of a regional HEI platform that begins to map the region's knowledge assets and resources in ways that are accessible to users, and which does not quickly channel users towards visiting one HEI rather than another.
- There needs to be a foregrounding of the human capital dimension for SME innovation, in particular the skills necessary for innovation and managing innovation projects, and providing SMEs with access at the margins to the necessary skills to enable them to participate in innovation projects.
- There is a geography to innovation in the Northern Netherlands, and there is a need for balanced access to regional knowledge resources, ensuring the campuses knowledge hubs are widely spread across the region, while ensuring dense clustering effect with the rich territorial network of actors.
- There is a need to better upscale small-scale successes. This is true at every level from the individual microbusiness that may not be able to grow, to a one-off collaboration that is allowed to wither after a promising success and fails to become a network or cluster organisation.
- There is a need for a more ambitious strategic perspective and to ensure that the strategic level represents a pathway to upscaling existing regional to create transformative regional impacts, rather than the current situation which is that priority areas represent what is currently done well.

There are also a number of more operational changes that could be implemented in the coming programming period that would make it possible to optimise the contributions that HEIs are able to make to connecting SMEs to regional innovation.

- The proeftuinen were generally regarded as being a very successful way to bring together diverse groupings of researchers and other stakeholders to work together on innovative projects that added up to more than 'the sum of the parts'; a similar approach could be applied in other contexts and other themes outside the more immediately high-technology.
- There seemed to be a clear opportunity to create a link and use students more actively in open innovation projects; there were open innovation projects, and students were active in innovation workplaces, but the connection had not been made to use students systematically to drive open innovation.
- There is a need to ensure that there is a proper consideration of the various non-technology dimensions in the projects created, from ensuring that there is support for social innovation activities, incorporating and developing the necessary skills for innovation, and supporting non-venturing entrepreneurship (e.g. intrapreneurship, institutional entrepreneurship) that nevertheless drives innovation activities.

- There could be better use made of the Practoraten in the regional vocational colleges to create links into potential and novice innovating businesses, and to help their staff become aware of the opportunities and demands of participating in innovation activities.
- More joint funding of activities is needed between HEIs and VET colleges in NNL; there were a few impressive examples of the way that this allowed creative collaborations of education institutions to create productive knowledge ecosystems where students and researchers could be coupled to SMEs to drive applied research and development.
- The single activity that HEIs could offer to raise regional innovation levels is a fast track training programme for aspiring innovative SMEs that accelerates their learning to make them experts in driving continuous innovation.

6.2 Human capital

6.2.1 Introduction to the key drivers and trends around human capital

There can be a tendency for policy makers to make an artificial and unhelpful distinction between technological innovation and human capital development. For regional innovation, human capital levels are strongly associated with innovative performance. When human capital is acknowledged as being important for technological innovation, then this tends to be framed in terms of high-level skills such as PhD.s for R&D engineers. Innovation strategies therefore have a tendency to frame the human capital challenge as producing highly skilled personnel for the most innovative sectors.

But just as innovation is not exclusively a process of technological development, not all innovation is driven by the development of new rods, and does not exclusively take place within activities formally badged as “R&D”. The benefits of human capital for regional innovation processes come about through skilled, knowledge employees autonomously using their knowledge in the course of their work. Some of that may be in R&D engineers deploying scientific and entrepreneurial knowledge in formal innovation processes. But the deployment of knowledge in application contexts depends on a much wider array of skills being present, at a variety of skill levels, that can ensure that that knowledge can be used effectively. This issue of complementary knowledge is also important, meaning that the value of human capital lies not only in its relevance to the problem but in its capacity to be applied together with complementary kinds of knowledge. This means that human capital for innovation is not just about skill levels, but the capacities of different kinds of employees at different levels to be able to work together effectively about innovation.

The challenge here for education in contributing to innovation is in providing both the knowledge competencies but also the knowledge combination competencies. The notion of 21st century skills (European Council, 2018), has been developed to try to articulate this point that it is not just possessing knowledge, but seeing opportunities to apply it and working with others to use it in the context of application. There are now a range of pedagogies in use that foreground teamwork and creativity amongst learners, with creativity as a key transversal skill for lifelong learning (Lucas & Venckutè, 2020). Entrepreneurial education has emerged as a trend to encourage learners not just to think about using their knowledge to create new businesses, but also to proactively seek out opportunities to improve existing processes and practices in business. The EntreComp framework can be a useful tool to use in fostering entrepreneurial learning in higher education, helping to link the worlds of education and work and stimulating social innovation (Bacigalupo et al., 2016).

In the context of this project, this is clearly something that applies to the higher education sector, in ensuring that students are learning how to apply knowledge, often in multidisciplinary teams. But this is not just something for the university sector; there is an understanding that all kinds of terminal qualification including at the vocational level also need to create graduates that are comfortable with knowledge processes. Achieving that is something that needs to be promoted at all education levels, including primary and secondary levels. And promoting that at all levels needs access to these contexts of application, the place where these problems emerge such as laboratories, workshops, clinics and care homes. Cooperation and coordination is necessary at all levels to develop these skills for collaboration and creativity.

The other key element of this is that achieving this human capital improvement places new demands on teachers. Teachers need to be comfortable with linking their teaching activities to these knowledge application contexts (laboratories, workshops, clinics and care homes) and in making use of project-based learning approaches in a constructive cycle with more abstract classroom based learning. The potential of

makerspaces and making activities in learning activities could be explored as a way of bringing different disciplines together or exploring links between education, innovation and industry, as well as real-world applications (Vuorikari et al., 2019). Teachers also need to be comfortable in working with teachers at other education levels to both assist students to progress through meaningful innovation learning journeys, and to maximise their exposure to knowledge application processes. Together this can ensure the production of the necessary human capital for effective regional innovation.

Higher education has a leading role to play in these processes of regional upgrading. HEIs have historically been linked with the traditional innovation professions and so their curricula are often attuned with the needs of knowledge deployment. The rise of the third mission for universities has meant that they may have many links with societal partners that provide access to the kinds of problems that can form the basis for creating knowledge application contexts. Universities as a terminal qualification already reach out in various ways to lower levels of education and may even teach those that work elsewhere in the education system so creating practical linkages between different levels and orientation of education. HEIs typically have the most advanced infrastructures that can support these human capital processes. The challenge for ensuring universities support human capital development is therefore in helping to provide coordination and leadership to build these skills for creativity and flexibility throughout education pathways.

6.2.2 Overview of the situation in the Northern Netherlands

The Netherlands education system supplies employees for a labour market which places a premium on qualification and accreditation, by streaming school pupils aged 12 and then channelling them into education pathways that produce terminal qualifications. There is a very strong division between vocational, higher professional and scientific education, and although it is possible to move between the levels, under the Dutch system, this can be time-consuming and demanding.

The Netherlands has also been criticised by the OECD for the relatively poor quality of its lifelong learning provision, in which individuals and companies are expected to bear the full costs of career based learning. Whilst this can work effectively at the top of the labour market, it creates a trap for those in low-skilled occupations in that there are no funding opportunities available nor an employer willing to fund retraining. Given that the Northern Netherlands is (in the Dutch context) a set of labour markets with relatively low-skill levels, this means that there is a particular problem of rigidity around human capital development and lifelong learning.

An additional rigidity for the Northern Netherlands has been introduced by a specific policy choice of the Dutch national government. In many regions, the European Social Fund is used to fund lifelong learning activities at a range of levels, including helping those in highly-skilled occupations to reskill, and therefore can help contribute to developing the necessary skills for innovation. In the Netherlands, the government has allocated all ESF funding to activities for people with a distance from the labour market, such as ex-prisoners, immigrants, homeless people and those without a qualification. This further exacerbates the problem for the Northern Netherlands on that there are not the resources to help provide the necessary flexibility for employees in sectors experiencing decline.

One area where the Northern Netherlands has been successful in to date is around the Dutch Government's Human Capital Agenda. Launched in 2010 as a skills counterpart to the Top Sector policy, the HCA sought to assist UASs and vocational colleges to improve the relative knowledge application content of their education programmes. UASs could apply for Centres of Expertise and vocational colleges could apply for Centres of Innovative Craftsmanship related to industry sectors in which they were specialised and which were important for their labour market provision.

In both cases, the funding paid for additional resources to increase the innovation content of education, developing better facilities to allow more project based learning better linked to applied research activities. The Northern Netherlands was very successful in terms of winning both CoEs and CoICs, and the UASs have in the Northern Netherlands have continued to receive an additional core allocation following the completion of the overall programme.

The Northern Netherlands's relative success in these programmes reflects the fact that UASs (and colleges) have very good links into local companies. These have built on the very rapid development of applied research capacity, something only permitted to UASs in 2002; all the regional UASs have "professors of applied science", lectoren, who carry out applied research, and make it available to local businesses including through their students. One characteristic of the Northern Netherlands has been that these changes have not

taken place exclusively at the level of the UAS, but have also involved building relationships with the university in Groningen.

There are a number of innovation workplaces where students from both RUG and UASs work together, with regional businesses, undertaken projects and interacting with students at different levels. There have also been some effective collaborations between the UAS and vocational college level linking students from different educational levels together to create enriched innovation learning experiences.

Given the problems that the Dutch education system experiences with segmentation between the levels, the Northern Netherlands is relatively effective in compensating for these problems and ensuring that there is meaningful progression pathways between different education levels, built on effective collaboration between staff (sometimes institutionalised in joint appointments). The North Training Alliance is a good example of a broad regional alliance between public administrations, education institutions, business, provinces and municipalities to provide flexible life-long learning to stimulate the labour market. The alliance is improving the accessibility of workers and job seekers to education, coaching joining efforts and funding, and sharing good experiences for more agile and dynamic job market.

The UASs in the Northern Netherlands produce graduates primarily for the Dutch labour market, and despite the fact that the region of Groningen does generally suffer from brain drain, their connections to local sectors means that they do effectively contribute to local labour markets. The RUG contributes in a slightly different way, because of its mix of Dutch and international students.

Retention of international students is rather tricky because there are relatively few employers in the Northern Netherlands with an international personnel, certainly in comparison to the larger cities in the west of the Netherlands. Interviewees and focus groups both reported that the potential of these international students to contribute to the region was not always fully exploited.

6.2.3 Analysis of the key processes at play in the Northern Netherlands

The labour market of the Northern Netherlands is undergoing a period of transition and the intention of regional partners is to ensure that those changes are accompanied with a more general upgrading of the labour market. The region was historically extremely poor and underdeveloped, with significant outmigration from the region in the 19th century; even in the post war period, the Northern Netherlands (initially South East Drenthe but later more generally) benefited from special government investment programmes to address its poverty. Philips established six large factories in the region, functioning primarily as branch plants employing large numbers of staff in routine occupations, and other investments reflected a similar pattern. The discovery of gas in Slochteren in 1959 transformed the regional fortunes, creating overnight huge investment in a technologically intensive sector. That served to ask a failure to update other regional sectors, and their structural vulnerability was highlighted from the 1990s as offshoring affected much of regional industry.

The economy of the Northern Netherlands remains dominated by sectors in which there have traditionally been large proportions of routine occupations with relatively few opportunities for innovation. The case of Philips in Drachten illustrates how top-down upgrading can work in practice; the site was opened in 1950 to make electric shavers, but that production had been offshored to China from 2003 onwards. The site now hosts their corporate Consumer Lifestyle R&D headquarters and around that there is also an Innovation Cluster with 21 companies employing 3,500 staff. The RUG has been involved in creating a mechatronics masters programme to support the wider innovation cluster, led by professor based in both Drachten and Groningen.

Alongside the technological innovation activities, there is an effective collaboration with other education levels to use placements and education to produce operators, technicians and engineers well-educated in mechatronics innovation.

A second key process of human capital upgrading in the Northern Netherlands is through bottom up upgrading in which small, novice businesses are able to absorb highly skilled staff into their businesses to improve their overall innovation potential. As noted in the previous section, there are relatively few companies in the Northern Netherlands who have the resources to immediately employ a new graduate for an innovation project. What these companies rely upon is building up connections into the higher education sector to access knowledge of use to them; this builds up through many relatively low-intensity interactions with researchers and teachers in knowledge institutions. This then in turn allows them to access the knowledge being created in research projects, for example by Ph.D. researchers who come to the Northern Netherlands because of sector-specific research expertises. The commitment of the region in supporting the development of highly skilled and human capital for the benefit of the innovation system is remarkable, with three different KEI

grant schemes launched by SNN⁴. One supporting the secondment of highly skilled personnel from SMEs, large companies or knowledge institutions to a knowledge institution to work on a technological, organizational or market innovation. The second one supporting the placement of higher education personnel in another EU organisation. Thirdly, support for the secondment or temporary employment of PhD students.

More generally, although there is some concern with poor graduate retention and “brain drain” in the Northern Netherlands, students who are temporarily in the region represent a temporary resource that can drive innovation even if they leave after graduation. The fieldwork suggested that students working on placements were an important pathway by which companies could get into contact with universities and begin to access knowledge through student projects, even if the quality of the knowledge produced in these projects could be more restricted. These provided opportunities for these companies to learn how to access university knowledge skills and work with HEIs which in turn provided a basis for some of these companies to become active innovators.

These activities are supported at two levels by HEIs in the Northern Netherlands. The first element is that there is a commitment amongst all universities to expose their students to problem based learning where appropriate. The most marked example of this was the Hanze UAS in Groningen which had committed institutionally to all of its graduates completing one semester of learning in what they called an “innovation workplace”. The consequence of this was that there were 5,000 students in the region at any one time working on external problems in knowledge application contexts. The other UASs in the Northern Netherlands also have similar projects to ensure activated learning; the RUG has invested in the VentureLab infrastructure to promote student entrepreneurship, but also provide an opportunity for all its students to learn in knowledge application contexts. Hanze makes use of 100 Innovation Hubs; although some of those are very small and virtual, some of those are much larger, embedded in physical spaces. It is those physical spaces that are the second kind of support provided by HEIs in the Northern Netherlands, large-scale infrastructures where the HEIs come together with large corporate innovators and create facilities for cooperation but also for engagement with less skilled innovative businesses. It is important to stress the importance of local public sector actors in these processes in helping to provide funding stability and in some cases to ensure that there is provision across the region (such as in the Westerkwartier in Groningen province). Several of these infrastructures are located on the Zernike Campus (including for energy, carbohydrates and genetics/ big data) but there are activities located across the region, including biobased in Emmen, materials in

Drachten, Water in Leeuwarden, Composites in Hogeveen and chemical processing in Delfzijl. This strong local political support and regional diffusion does create governance challenges as outlined in the previous chapter, but it does mean that there is a balance of innovation support activities across the region that are active in supporting regional upgrading.

6.2.4 Key success factors in producing positive results

The interviews and focus groups were clear in indicating which characteristics were important in driving this positive upgrading. In a country with a national culture of constructive cooperation, the Northern Netherlands is typified by intense, constructive and productive relationships around innovation that support the upgrading of the labour market and stimulating innovation through human capital processes. Where that collaboration works effectively, there is a virtuous cycle of interaction between universities, firms, the public sector mediated through students who achieve activated learning and are absorbed by regional businesses to support innovation processes. There are five elements in place that contribute to these virtuous cycles, students on placements, subsidies for small interactions, academics engaging with firms, teaching linked with research, good collaboration between institutions and links to other education levels.

The first element is where the HEIs in the Northern Netherlands are able to create learning activities for their students that expose the students to activated learning in knowledge application contexts, and are able to invest in infrastructure and personnel to support those activities. The innovation hubs and innovation workplaces in the Northern Netherlands are a good example of how those can be built up around specific thematic focuses. This has the effect of mobilising large communities of student learners who have value in carrying out projects and placements for societal users, creating knowledge resources useful to (potentially) innovating companies at no cost to those companies. The researchers and infrastructure around these activities help to attract firms to participate in these communities.

⁴ <https://www.snn.nl/ondernemers/kennis-en-innovatie-kei-2019-detacheren> (secondment of higher educated personnel)
<https://www.snn.nl/ondernemers/kennis-en-innovatie-kei-2019-woningen-van-personeel> (placement of higher educated personnel)
<https://www.snn.nl/ondernemers/kennis-en-innovatie-kei-2019-promovendus> (PhD)

The second element is where there are subsidies readily freely available that can support many relatively light touch interactions between firms and HEIs. The firms who have the greatest opportunity to benefit from this human capital in the upgrading process are those that do not initially have the capacity to strategically seek out knowledge for innovation. Small interactions via innovation hubs provide a low cost, high payoff opportunity that encourages companies to come with problems and be exposed to human capital that may improve their overall innovation capacity. One important element is where the firms are able to build up their strategic management capacities, developing strategies for innovation and indeed for human resources management, to help ensure that they are sophisticated users of regional knowledge capital.

The third is where the HEIs find ways to anchor these learning communities within their institutions. The most successful examples of these have been with the lectoren in the UASs. What this does is it creates a knowledge community which firms can access by participating in the student learning activities. These student activities make these companies active community participants, which brings them into contact and conversation also with teachers and researchers at the UASs, and in more technical disciplines technicians.

The fourth is where the HEIs are able to link up their human capital creation processes to other knowledge processes within their institutions. Thus may be at the level of the institution, linking the teaching to research via applied research in the lectoraten, or it may be between institutions, with the RUG partnering with regional UASs. The effect this has is to ensure that students are supervised by teachers who are themselves research aware or research active, and can thereby ensure that their students' work does help to create solutions for businesses.

The fifth element is the emergence of collaborative linkages between the HEIs, and also between other levels of education. There are many examples of this that were mentioned as illustrative of effective collaborations which ensured that there was maximum interaction and spillover between the various activities within the region. One activity not mentioned to date are the shared activities organised between NHL Stenden and Van Hall Larenstein around Life Sciences and Technology Leeuwarden, together with a number of leading Dutch businesses around the agrofoods sector. There have also been benefits from linkages with the regional vocational colleges, when collaborations with UASs have been used to help the colleges develop their own applied research function (practoraten), for example around the biobased economy in Emmen; the Dairy Academy and Westus were two site visits that demonstrated that these collaborations can lead to effective collaboration for regional innovation upgrading.

6.2.5 Challenges undermining effective contributions

The human capital dimension for innovation is a challenging one to pursue, because a number of the effects are second order effects for innovation; building human capital does not in itself drive innovation, but leads to the development of capacities that are necessary for innovation. In the case of the Netherlands, there are a number of changes around human capital that are necessary to better connect SMEs, particularly those companies that are less experienced in innovation, including in their technological management capacities, their innovation planning skills, but also in helping those companies to understand the importance of skills to their business and increasing their demand. Because of the lack of a direct cause-effect relationship, these processes of developing human capital are prone to disruption, and the HEIs have been absolutely critical in providing a stability and continuity. But there are other challenges that need addressing to allow the HEIs to continue to play that role effectively.

The first issue is that there is a complete absence of long term perspective on the necessary skills and human capital for long term upgrading of innovation potential in the Northern Netherlands. There are sectoral lobbies but their primary concern is ensuring that short-term skills gaps are being filled, not that the future workforce is having an appropriate education. There is also a problem in articulating the needs for small businesses, because most small businesses in the Northern Netherlands are not managing their skills needs strategically. Thirdly, although the greatest returns for innovation will come from management training to help potentially innovative micro-businesses to improve their innovation processes, there are relatively few funds or subsidies available for that.

The second is that the experiments that led to the emergence of the centres of expertise and centres of innovative craftsmanship have concluded and are not being extended. Although there is continuation funding for those activities already underway, there are not the resources to expand these activities scope, nor to encourage collaborations with other elements of the human capital system. Although there is some support from local public sector partners for funding activities in these areas, this runs the risk of entrenching the

parochialism that we have seen undermines developing a more strategic regional perspective on human capital.

The third issue is that the previous Operational Programme did not foreground the issue of human capital development sufficiently clearly, with the result that it was not strategically managed. The Operational Programme did fund projects that were based around the development of knowledge application communities spanning business, HEIs and students, linking teaching, applied research and consultancy. Interviewees and focus groups reported that the ways that proposals were evaluated militated against those that had too strong an emphasis on the human capital dimension, and more on those that were able to immediately quantify the financial benefits of the new products that would be developed.

The fourth issue is the same issue that was evident in terms of Connecting SMEs and that is of the relative parochialism of the public sector and the way that this can potentially create barriers to collaboration around human capital for innovation. The relative invisibility of human capital in the regional policy agenda meant that these collaborative knowledge application community creation projects were heavily dependent on local political support; Dairy Campus, Wetsus, the Drachten Innovation Campus and Emmen's Biobased sector all were realised through substantial local (municipality/ provincial) additional investments. There is also an issue for the human capital agenda in that there are companies across the region who could benefit from being joined up with innovative students even if they do not immediately identify with the sectoral specialist of these local innovation hubs.

The fifth issue is that there is a risk in a split in the human capital agenda emerging as a result of internationalisation of higher education, and in particular in the way that Dutch universities have sought to compete for students by offering more courses in English. The Northern Netherlands is not as good as the west in integrating these international students into the local labour market as either employees or entrepreneurs. Without improving that graduate retention, there is a risk that political support for the HEIs might fall if their innovation support activities are not seen directly benefiting regional businesses.

The final issue is that there is no overall strategic agenda for human capital to which the regional HEIs can respond. No organisation has articulated a strategic vision for human capital in the region providing goals, targets and outcomes that the HEIs could clearly commit to. This has resulted in the regional HEIs undertaking activities on their own initiatives based on their existing knowledge and connections rather than a wider regional perspective. There does not appear to be a single organisation in the region able to provide that strategic integration, but without that coordination around a common agenda, regional HEIs will remain reactive to regional trends and needs rather than trying to strategically drive regional transformations.

6.2.6 Strategic and operational ways forward

The challenges that the Northern Netherlands faces in terms of human capital for innovation are intractable, but can be addressed through coordinated efforts at both the strategic and operational levels. In terms of the necessary strategic changes between partners in the Northern Netherlands, the following would appear to be the most relevant:

- There is a need for the understanding of innovation to be expanded from beyond technological innovation to encompassing the skills necessary for the application of knowledge in innovation contexts. This is necessary not only within the SNN but in all the different bodies who are creating strategies to stimulate regional innovation in the Northern Netherlands.
- There are clear gains to be made in investing in infrastructures that can support collaboration between different education levels (from secondary school to Ph.D. level), stimulating through flow but also in mobilising these extended knowledge application communities. There is a need for regional funds to ensure that they are supporting these activities to insulate them from disruption through dependence on short-term project based funding.
- There should be more flexibility within funding instruments to allow the development of the necessary skills within technological innovation projects including strategic skills within businesses around innovation management and human resource management.
- The role of the public sector in the region is often misunderstood; the public sector have considerable freedom to help raise their staff skill levels, and that can in turn help to contribute to creating a more highly-skilled and innovative workforce.

- There is a case to be made for developing a regional human capital agenda to provide coordination between universities and other education organisations. Effective steering requires that the HEIs commit to these strategic targets, goals and outcomes, and therefore the regional HEIs need to be at the forefront of its development.
- Finally to address parochialism there is a need to ensure that there are access points for potentially innovative microbusinesses across the whole of the region, to ensure that companies that do not immediately fit with the sectoral profile of their nearest innovation hub are not unnecessarily discouraged from engaging with regional HEIs.
- Strategic dialogue with regional public sector employees to help raise skill levels

There are also a number of more operational changes that could be implemented in the coming programming period that would make it possible to optimise the contributions that HEIs are able to improving innovation by addressing the region's human capital base.

- The UASs occupy a key position in the regional human capital ecosystem because of the extensive linkages they have to regional partners; there needs to be more leveraging and upgrading of those linkages so that UASs are stimulating employees with which they are in contact to more actively and strategically manage their human capital for innovation.
- There are clearly opportunities to help create more effective knowledge application contexts for innovation by shared appointments between institutions, both within single education levels, but also linking up between regional VET colleges, UASs and the RUG.
- There is a prima facie case to be made for more experiments to find different ways to link VET, UAS and universities in the region beyond the current joint appointments and colocations; in particular shared provision pathways (such as VET colleges being able to offer 1-2 UAS modules to enrich their course provision) has the potential to be managed strategically for regional benefit.
- There is a need to ensure that with the end of the Human Capital Agenda funding, the applied research professors in UASs do not become increasingly dominated by applied research losing their connections to the teaching activities that can link their students to innovation opportunities.
- The retention of international students is a wicked issue for which there is no immediately solution; there is a need to better understand the pathways by which international students in the Northern Netherlands are retained in the region and connected to regional organisations to improve innovation capacity.
- There are a range of firms in the region who have infrastructure that might serve as the basis for creating knowledge application communities, and there is a need to identify these companies and engage with them to make more use of their facilities for regional benefit.

6.3 Innovation Ecosystem/ Governance

6.3.1 Introduction to the key drivers and trends around innovation ecosystem

The notion of an innovation ecosystem has become a very fashionable way of thinking about the way that innovation actors work together in stimulating place-based innovation. The original notion of innovation systems emerged in the 1980s to describe the ways that regular interactions between innovation actors gave places specific advantages in particular kinds of innovation activities. But systemic models were criticised for being very static and a poor way of explaining how places can change their innovation performance. The idea of the Triple Helix emerged in the late 2000s into policy discourses as a way of making prescriptions about what places can do to improve their performance. The innovation ecosystem approach is a similarly fashionable approach from the late 2010s, which has the added attraction of sounding organic, nourishing and growth focused.

The ecosystem model is based around the idea that innovators are trying to create their innovations in incredibly resource-constrained environments. Those resources may be financial, but at the same time, innovators may not have people with the necessary skills or complementary knowledges to successfully complete an innovation. What ecosystems do is support innovation by making it easier for innovators to find and secure access to those resources. Innovation ecosystems provide access to various different kinds of positive spillovers that support innovation; the fact that particular kinds of activities happen make it easier for

innovators to access those resources. The fact that universities have research projects around a particular topic makes it easier for innovative companies in those locations to access knowledge about that topic.

Good innovation ecosystems are those that support innovative companies to grow. Innovation is not an end in itself, but rather a means to an end, the end being a high quality kind of economic growth that supports living standards and environmental protection. Innovation ecosystem approaches are also rooted in evolutionary economic geography in which there is a path dependency in innovation activity. Successful innovative businesses become themselves a source of positive knowledge spillovers that other companies can access, helping to support the region along new innovative growth paths that ideally will acquire a self-reinforcing dynamic. Along the way, companies build linkages with other actors, and these linkages themselves become part of the innovation ecosystem.

The quality of an innovation ecosystem relies on its “density”, the intensity of the innovators and their activities, the quality of the knowledge resources they are linked to, and the linkages connecting innovators to knowledge resources. The highest quality innovation ecosystems are those in which there is a self-reinforcing dynamic between knowledge producers and innovators – innovative companies may work closely with universities and research organisations to develop new knowledge specialities. The universities and research organisations may develop research projects that advance specialist knowledge in the area, the universities may educate new workers, and the innovative firms might generate new problems and questions for the research organisations. In this kind of dense innovation ecosystem, it is relatively easy to become involved in the innovative knowledge activities because there are so many activities going on.

But the reason that policy-makers have become interested in innovation ecosystems in recent years is because they provide a diagnosis and a prescription for regions whose innovation performance is less impressive. Poor innovation performance is a result of sparseness of the innovation ecosystem, in this diagnosis, and less successful regions can find themselves trapped in situations where there is insufficient critical mass amongst innovators and knowledge institutions to create their own dynamic interaction. Under such circumstances there is a need for more active intervention by policy makers to make the ecosystem more dense, supporting innovation activity, connecting it to knowledge providers, supporting the knowledge providers to strengthen their own knowledge base, and helping it to spill over in various kinds of ways to other (potential) regional innovators.

Modern regional innovation policy is therefore premised upon the idea of good ecosystem governance, that has the capacity to respond dispassionately to circumstances, identify weaknesses and encourage the building of networks and interactions to develop critical mass from which spillovers can emerge. Good innovation ecosystem governance is able to deal with the essentially serendipitous nature of knowledge spill-over, understanding that the best that can be achieved is to improve potential and opportunity for knowledge exchange. In parallel with that, rich ecosystems require higher levels of different kinds of knowledge activities, and there is a clear role in good innovation governance in supporting different kinds of knowledge exchange that start to build connections and interactions. Good governance is premised upon flexibility, creativity, dynamism and objectivity, to react to changing circumstances to try to shape a building up of the density of innovation networks in ways that enrich the overall fertility of the innovation ecosystem.

6.3.2 Overview of the situation in the Northern Netherlands

The Northern Netherlands has a relatively strong innovation ecosystem in the European context as indicated by the Regional Innovation Scoreboard. However, in the Dutch context it is regarded as one of the weaker innovation environments. Part of this reflects the long-standing Dutch belief in the Mainport Brainport strategies. This was premised upon the notion that Dutch prosperity was delivered by the roles of Amsterdam and Rotterdam as world business cities, and the role of

Eindhoven as the technological centre of the country, with public sector investments reflecting those desired roles. The Northern Netherlands is a relatively remote region in that Dutch context, and there are a relatively limited number of genuine ‘hotspots’ where knowledge spillovers act as the basis for autonomous innovation-based regional growth.

The Northern Netherlands does have a strong innovation ecosystem around a number of established sectors where there are strong relationships between HEIs and large companies with innovative infrastructure. The most obvious of these is in the Energy sector, related to the gas industry, and increasingly into renewable energy and the hydrogen economy. Other strong innovative sectors are the healthy ageing, water sector, agro-food/ dairy and high-technology manufacturing. Each of these sectors has a relatively well organised

innovation infrastructure with innovation campuses involving universities, corporate research, innovation and entrepreneurship. However, these established sectors and their shared knowledge resources are relatively inaccessible for the vast majority of the Northern Netherlands' firms including those less experienced and potential innovators.

The most consistent element of the Northern Netherlands innovation ecosystem is provided by the higher education sector, the university and the UASs. The HEIS cover a full range of academic disciplines, and it is only those areas that are restricted to a single national centre (such as aerospace, architecture or veterinary medicine) that are absent in the region; this means that there is access to a full range of knowledge resources for innovation in the region. The HEI sector has served as the focus for much investment in infrastructure; the previous Operational Programme was able to fund large infrastructures and the Zernike campus has hosted a number of large research and innovation infrastructures in a range of sectors and involving a range of partners. They have also become a focus point for corporate investments, such as the ACEDE Carbohydrate research centre. The HEI sector has invested also in off campus activities (even where they are near to campus such as Wetsus or the Dairy Campus), in particular in the living laboratories and the innovation workplaces that are spread across the region.

A key issue for Innovation ecosystem governance in the Northern Netherlands is the long history of economic governance that the region has had, as highlighted in previous sections of this report.

In 1957, the first cooperative organisation was created between the provinces of the Northern Netherlands, BCN, and in 1972 the Northern Netherlands received its first national Structure Plan for regional economic development. In 1985 a replacement body was created, the BON, which laid the grounds for the creation of the SEAN, which itself is the predecessor of the SERNN, now exclusively funded by Groningen Province. SNN itself was created in 1992 by the Northern provinces to take advantage of the opportunities of the Single European Market and to administer European structural funds.

The innovation governance of the Northern Netherlands has to be seen against the backdrop of a deep seated and longstanding intergovernmental discussions in the north about policies for regional economic development.

This highlights the greatest governance challenge facing the north of the Netherlands, in getting the necessary flexibility, creativity and dynamism amongst policy-makers and innovation agents in an extremely mature innovation ecosystem. Part of the rigidity arises in part from the general sparseness of the ecosystem – the reality is that the people with the time to deliberate on possible strategic developments are those that come from the most successful elements of the ecosystem rather than those with the greatest potential. This is reinforced by the fact that a programming mentality in which the delivery of KPIs is used as a management tool, building up small interactions does not produce the necessary outputs to indicate success. Finally, there is a strong segmentation in the innovation governance, as individual clusters and networks are primarily concerned with their own survival and sustainability locally rather than delivering abstract improvements at a regional level.

6.3.3 Analysis of the key processes at play in the Northern Netherlands

There is no single direction of travel in the innovation ecosystem in the Northern Netherlands, but where it is becoming more dense, then what is evident is a process of coherence, where isolated innovation networks are becoming better connected and institutionalised, linked to more actors and creating a regional critical mass. This is a relatively slow process of gradual evolution; the emergence of energy has taken decades to build up, involving the creation of the Energy Valley organisation in 2003, the recognition of energy as a Top Sector in 2010 and the institutionalisation of the New Energy Coalition in 2017. Higher Education has also been involved in these developments with the development of the Energy Academy Europe and its special purpose building on Zernike as an anchor point for the knowledge application community around energy transitions, offering the Entrance open innovation testing facility.

The knowledge institutes in the Northern Netherlands, and particularly the HEIs are at the centre of a range of initiatives, experiments and activities that are helping support that cohering of the ecosystem. The HEI participations in living laboratories has involved the creation of five infrastructures in the region that support open innovation communities focused around knowledge application and innovation, linked back to regional HEIs. Likewise, the innovation workplaces and hubs across the region operate in the opposite direction, bringing together relatively informal networks of firms, teachers and researchers around business problems seeing to build these up into larger specialisations of more general applicability. The HEIs clearly have a key

role to play in building up innovation ecosystems by intensifying contacts between innovators and knowledge producers, and building up new connections.

There are also a number of processes which undermine this building up of coherence. Innovation is itself a process of shifting winners and losers: not for nothing did Joseph Schumpeter describe it as a process of “creative destruction”. Those winners and losers are not just individual companies but also sectors, clusters and networks. In the Northern Netherlands, the sparsity of the innovation ecosystem has given these sectors, clusters and networks a strong responsibility for the welfare of the network as a whole. These groupings have been struggling to survive and there has been a blurring in some network areas of the needs of the sector, and the region. It is not an uncommon problem that clusters in lagging Europe regions rolled themselves forward into smart specialisations, because of their political power. Groningen has demonstrated that these groupings can show incremental change, with the gas cluster reorienting itself towards sustainability energy transitions; nevertheless, the sparseness does result in ecosystem governance being conservative and incremental rather than creative and radical.

That is not exclusively the fault of these groupings, because they are primarily concerned with their members and their own survival, and reflect wider industry developments and trends. However, the interviews and focus groups did reveal that there was a problem of persistent industrial frames, in which the key political players tended to have an invariable understanding of industrial sectors, their dynamics and their importance to particular places. This led to them to use innovation investments and funding to steer industries in the Northern Netherlands based on rather outdated ideas of what those industries are. This has the unwelcome effect of reinforcing the lock-in, and making it harder for interesting ideas to emerge and grow at the margins of those groupings. The innovation ecosystem is in all likelihood more rapidly and positively than the governance arrangements, predicated on stability and balance between the provinces, can adapt to.

A final issue worth emphasising here is the persistent problem of parochialism in the Northern Provinces. Here the term applies in its strict meaning, not as a general narrow-mindedness or rejection of outside ideas, but as a dominant concern with local conditions and outcomes. The Northern Netherlands has the potential to function as a knowledge economy more efficiently at the level of the North than as three separate provincial knowledge economies. Groningen is the primary core and with the correct infrastructures (such as the University College in Leeuwarden or teaching activities in the Drachten innovation cluster) the whole North can benefit from its urban strengths. But this is undermined by policies which seem to reflect a deep seated belief that each province has its own sectoral strengths, and all the activities in the north in that sector should be clustered in that province.

6.3.4 Key success factors in producing positive results

Those factors where there has been a densification of the innovation system, and in which the governance networks have helped support those improvements, have been characterised by five kinds of positive features.

The first of these is that there is an appetite amongst regional companies to be more innovative. There are innovative small and micro-businesses who do collaborate closely with other firms and knowledge providers. There are intermediaries that are successful in trying to encourage more firms to innovate, and to aggregate individual company problems into issues that can be addressed more directly by innovation policy measures. There are companies who are not yet innovating who are interested in cooperating with knowledge providers around activities like student placements or in equipment sharing. There is a fertile substrata of business that can could potentially be activated to raise the density of the regional innovation ecosystem.

The second is that there is a culture of openness and interaction at the operational level that supports the creation of shared and collective assets to facilitate spill-overs. The number of these large scale collaborative infrastructures is genuinely impressive at a European comparative dimension, particularly those that appear to have achieved medium-term (post-project) sustainability. These innovation activities are anchored in the region but not bounded by the region, as illustrated by Wetsus, where their project portfolio is global, and 70% of Ph.D. students are international, but the knowledge activities are located primarily in Leeuwarden. There are external university partners involved in strategic projects such as the living laboratories (such as the Technical University of Delft) and this contributes to supporting this strong core spine of innovation activities.

The third strength is that there genuinely seems to be an acceptance in the region of the shift towards a challenge driven approach to regional innovation. The interviews and focus groups indicated that the choice of

societal challenges as a focus in the RIS3 was something that fitted with their individual institutional interests, and did not seem to be something purely superficial.

There remain questions about the extent to which this involves path-breaking and disruptive technologies but in the energy cluster the sectoral partnership did appear to be evolving towards the needs of the energy transition. Related to this is the fact that the HEIs appear to have a robust understanding of the applicability of their knowledge resources to the societal challenges.

The fourth strength is the absence of a lot of ex officio involvement in regional innovation discussions. The fieldwork suggested that when there were events and consultations organised then it was subject experts who participated in those rather than institutional representatives. There was a negative aspect to that in that there was no single overall coordination of HEI involvement in the strategies. But this reflected a reality that the universities were not intimately aware of the details of the knowledge partnership activities of their employees and around their campuses, and although undermining coordination did serve a practical purpose of grounding strategies in innovators' expertises and capacities.

The final element was that there were a number of what could be called "institutional entrepreneurs" who understood the way that funding instruments worked, who understood the political and policy context and who understood their own institutions. They were the individuals who were proposing experiments that were creating the basis for improved cohesion. These individuals were not associated with particular institutions or job titles but rather were trying to create new collective innovation infrastructures as a means of supporting their own individual goals. They were also skilled at bringing together a broader coalition of similar individuals in other partner organisations to realise the necessary support and investment to achieve those outcomes.

6.3.5 Challenges undermining effective contributions

The build-up of coherence in the Northern Netherlands' innovation ecosystem is negatively affected by a number of challenges facing the region in which fragmentation in a variety of different arenas underpins these processes by which institutional entrepreneurs build up effective knowledge application contexts.

The first of these is that the regional funding environment is extremely fragmented. We were struck in our fieldwork by the number of interviewees that noted not only that the funding environment was extremely fragmented but could also sketch out a map of the different innovation funders in the Northern Netherlands. This suggested to us that this was a topic at the forefront of respondents' considerations: the main criticisms here related to the fact that each of these funds had their own requirements, definitions, community and this was undermining the build-up of coherence; projects expired and then sought funding, sometimes having to reorient themselves not towards the operational needs of innovators but the demands and politics of different funders.

The second of these was an exacerbation of the parochialism between the provinces through the lack of a political centre for the Northern Netherlands. This political fracture was less important where there were no strong intra-regional tensions, but they undermined the development of the Northern Netherlands as an integrated innovation space; one focus group referred to it as a failure of regional leadership. The failure to build on the urban strengths of Groningen have already been highlighted, but the most pernicious effect was the discouragement of potential and novice innovators that could benefit from knowledge resources in other regions. This is not a trivial issue nor is it easily overcome, but it nevertheless does play a role in undermining the strengthening of the innovation ecosystem, and there are governance solutions that could potentially address it.

The third issue was the difference in the degree of organisation of firms in terms of the RIS3 and critically the Operational Programme processes in that a segment of innovative firms was having difficulties in having its voice heard and acknowledged. Established clusters were well-organised and capable of expressing their needs in a relatively clear way and ensuring the strategies offered instruments that they could exploit. But there was a problem in hearing the voices of less expert and organised innovative SMEs in the Northern Netherlands, in terms of what their needs and interests were. This meant that their interests were represented by interlocutors – including universities – who did not just have those SMEs interests at heart but also those of their own organisation or cluster.

The final issue was that there were a set of governance issues and tensions that arose because of the relatively small innovation ecosystem with a limited number of actors each with their own interests and funds. There was a strong reliance on bureaucracy to drive the system, but this favours ideas that fit with

bureaucratic criteria rather than those which are best oriented towards solving regional needs. Secondly, there was a lot of competition between different sectors because parochialism prevented the regional scale from providing positive sum outcomes; one sector's gain was always a loss for another sector. Thirdly, it was reported by some actors that there was a lack of transparency in resource allocation decisions that had allowed a number of politically popular flagship activities to receive funding at the expense of other activities. Together this again emphasises the absence of strong regional leadership creating a single decision-making space where activities could be constructed to maximise the benefits they offered for innovation across the Northern Netherlands.

6.3.6 Strategic and operational ways forward

On the basis of these success factors and challenges, it is possible to identify a number of potential ways forward to strengthen the overall contributions made by higher education to innovation at the Northern Netherlands, improving the overall quality and governance of the region's innovation ecosystem. There are several strategic changes that could improve the quality of this contribution.

- There is a need to create a body that exerts genuine regional leadership and constructs a set of regional priorities around which positive sum benefits can be built; since the BON in 1985 there have been administrative coordinating bodies, but strong regional leadership is urgently demanded.
- This leadership is in part necessary to integrate a wide range of funds that apply to different geographies in the north, whether the Operational Programme for the north, the provincial or municipality funds, and funds associated with earthquake damage and the energy transition. Without this integration there will be a substantive underperformance of regional innovation policy in the Northern Netherlands.
- There is a parallel need for a more synoptic and strategic reflection on RIS3 processes before, during and after its drafting; although dependent on uncertain external timetables, the region would benefit from reflecting on how innovation strategy could strengthen the region. There may also be a parallel need for the collection of strategic intelligence to inform those reflection processes although it is not clear whether that is feasible in the current institutional landscape.
- There are a number of emerging innovation activities that may in the future be sufficiently developed to form the focus of development, but these are largely invisible to strategy-makers; there is a need to better understand the range of innovation communities in the Northern Netherlands and their opportunities for future expansion.
- There is no strategic vision of or leadership by HEIs in the Northern Netherlands; there is a prima facie case to investigate creating a strategic partnership body between regional HEIs and to use that to influence and improve the quality of regional innovation governance, without this simply becoming an HEI lobby for structural funds.
- There is a need to acknowledge and prioritise the many small innovation interactions (e.g. around student placements, informal consultations) that are necessary to build effective ecosystems by encouraging potential and novice innovators to engage with knowledge partners to develop new innovations and ensure that resources are used to strengthen them.

There are also a series of operational improvements that could be made in the coming period to support the contribution that the RIS3 process makes to regional innovation and to enhance the role of regional HEIs in strengthening the innovation ecosystem and innovation governance.

- There is a need to find a way to express the region's direction of travel in terms of programme goals and targets that map across to what individual institutions are seeking to achieve; that will make it easier to identify owners for particular elements of the strategy and in turn facilitate a shift towards a more dynamic form of regional leadership.
- The other element of leadership necessary in the region is in enabling the change agents who deliver the experimental improvements at an operational level, sometimes through activities that are not eye-catching. There is need to identify and understand these change agents and ensure that changes to operational procedures do in fact make it easier for them to propose and implement activities that improve regional innovation ecosystem coherence.
- The region does face the challenge of timely and accurate information for operational decision making, and that is not that can simply be provided by a reporting system; there remains a need for an organisation to

take responsibility for developing understanding of the diverse elements of the regional knowledge economy and using that to raise the level of informed decision making.

- There is a need to improve decision-making around the Operational Programme allocations to ensure that projects that are funded are contributing to the full range of activities necessary to strengthen the regional innovation ecosystem.
- We were struck by the absence of formative post hoc evaluation and learning between regional partners; given the general lack of strategic understanding of where emerging and promising areas might be around regional innovation, there is a need for evaluation to go beyond KPI driven & financial auditing and learn about what does and does not work in stimulating regional innovation in the Northern Netherlands.
- As a final aside, this report is part of an international peer learning activity led by SNN seeking to draw on international expertise and experience to improve its own performance; regional partners more generally could benefit from engaging more systematically with this or similar kinds of international learning activities.

7 Conclusions and policy implications

7.1 Connecting SMEs

A key challenge facing the Northern Netherlands is improving the connectedness of SMEs into regional innovation networks and activities. The key issue here is that there is not a natural “innovation escalator” by which individual connections with SMEs then grow, become networks and eventually may evolve into key regional strengths. What requires addressing here is the management of that “innovation escalator”, and in particular the fact that the current organisation of the process creates “micro-discouragements”, individual disincentives to SMEs to be connected that together add up to create a substantive drag in the evolution of the regional innovation ecosystem. Concerted action is required to identify, isolate and eliminate these micro-discouragements, and ensure that innovation support activities both connect individual SMEs, but also encourage SMEs to stay connected to regional innovation networks. This can be supported by actions from regional partners but also from HEIs at various different levels. In this sense, the conclusions of the recent HEInnovate Country Review in The Netherlands show that HEIs can do more in embedding into their regional entrepreneurial ecosystems, understanding its dynamics and looking for new ways of interacting with students, business and civil society (OECD/EU, 2018).

7.1.1 Actions and initiatives for administrative authorities

Take the hard decisions to develop true regional strengths. The most important limitation to connecting SMEs is the politico-administrative fragmentation in the Northern Netherlands between the three provinces, the main cities and municipalities and the lead sectors. This fragmentation provides a “least-worst” form of governance which allows consensus to emerge by not requiring partners to take hard decisions or to align different funding streams. The “gunfactor” seems notably absent amongst public authorities, whilst other Quadruple Helix actors seem much more comfortable with a more positive-sum approach based on goodwill. Consistent investment coordinated across regional funds to develop stronger regional nodes, a clear regional innovation spine, connected to local environments is essential. This will ensure that there is an opportunity to create win-win situations in a stronger focus on regional innovation strengths.

Build on what you have, not what you want. There is a disconnect between regional innovation assets and funding programmes, with “assets” being required to reinvent themselves after every project. This creates a huge set of disruptions in which effort that could usefully be placed in upscaling projects is devoted to keeping them going between funding rounds. This also undermines the emergence of partners with a good mutual understanding and cooperation culture. Addressing this problem demands a stronger learning culture within regional partners; evaluation needs to be formative and constructive, seeking to move projects forward and support longevity and evolution towards a more dynamic, dense regional innovation ecosystem.

Technological innovation alone will not solve the societal challenges. It is clear that a much broader set of activities need mobilising to produce integrated responses to societal challenges. The majority of changes require shifts in behaviours and belief systems, and are supported by public acceptance and sympathy for these goals. Social innovation is a vital component of creating strong demand for new technological innovations and yet it is currently almost entirely ignored in the Northern Netherlands. There is a need to configure programmes and funding opportunities to stimulate social innovation, and enable HEIs non-technological researchers to also contribute to strengthening the innovation ecosystem.

Every funding programme deserves a human capital dimension. A final element is that there is a strong human dimension to connecting SMEs into innovation networks. It is not a lack of technology or the availability of technical employees that is constraining innovation performance in SMEs. The greatest constraint is the lack of management and organisational skills related to innovation in its broadest sense. A micro-business will be unable to free up one FTE to participate in an innovation project; its managers need to understand how to configure offline innovation alongside ongoing order fulfilment activities to permit the development and exploitation of new knowledge activities. HEIs and VET colleges can be well-placed to help firms to learn and improve their innovation performance as they progress up the innovation escalator.

7.1.2 Actions and initiatives for HEIs

The key issue for HEIs is in creating strategic frameworks that empower their staff to build and upscale connections with SMEs. The problem of connecting SMEs can only be solved by encouraging more SMEs to

experiment with innovation in association with HEIs and then building up those relationships to create more collective benefits. It is not possible to direct HEI researchers and teachers to work more and with a higher quality with SMEs. Rather, university managers should seek to understand what capacities their staff offer and how they can support their initiatives at an institutional level. This leads to the following recommendations at two levels.

7.1.2.1 Senior managers

Create a common regional agenda for the Northern Netherlands' HEIs. The Northern Netherlands needs to develop a stronger common agenda, and this has to be rooted in a greater self of self-awareness and self-confidence by regional partners. The Northern Netherlands' HEIs have their own role to play in that by setting out a stronger regional platform that makes it clear what they can collectively offer to developing a denser and more dynamic regional innovation system. This in turn requires the four HEIs to build mutual trust and collaboration and eschew using this new regional platform to advance individual institutional interests.

Develop new kinds of connective knowledge infrastructures. Where regional HEIs have been at their most creative then they have been successful in creating and supporting infrastructures that benefit the entire Northern Netherlands, such as the proeftuinen or the Centers of Expertise. It is not the solutions that are themselves impressive – it is the flexibility that these solutions have offered to link the key knowledge constituents, teachers, researchers, students and companies. HEIs should be active in reflecting on the ways that they can encourage their staff to work creatively with regional partners towards innovation.

Take a broad view of their own institutional strengths. Institutional Netherlands has a strong Calimero complex where the Netherlands' small size justified concentrating and focusing on a limited number of areas. Dutch HEIs have not been immune from this, and following the profiling exercises and the Top Sector policy, have projected institutional narratives based on a very limited number of technological strengths. But they are full of diverse innovators active across a range of areas who succeed often despite institutional policies, and this is true in the Northern Netherlands. Universities need to develop institutional policies that recognise and reward the range of diverse engagement efforts that contribute to a broader based approach to building Northern Netherlands regional innovation ecosystem. The incipient "University of the North" initiative can be extremely interesting in coordinating and pooling together the capabilities of the rich higher education system in the Northern Netherlands, with a common long-term vision and strategy to contribute to the innovation ecosystem. The momentum created by the HESS case study can help in continuing the reflections on the interest of such an ambitious initiative and the balanced involvement of higher education institutions. The higher education coordination efforts have primarily focused in Groningen area, limiting the impact on the S3 and the region as a whole. The initiative should carefully consider the governance model, with a balanced participation across all higher education institutions, through strong leadership of higher education managers but also an open bottom up process involving broadly the academic community.

7.1.2.2 Academics & Researchers

The Northern Netherlands needs an innovation training academy. Raising the innovation management skills of potentially innovative SMEs is critical and this can be supported by regional teachers and researchers. The challenge here is in striking the correct level and dealing with the challenges and uncertainties inherent to innovation management. Student placements have an important role to play in this process, helping these firms to access HEI knowledge. The role of HEIs in continuing professional development raising teacher skill levels in other educational forms can also play a role here.

Create open innovation environments hosting regional knowledge communities. There are a large number of underserved sectors and localities in the Northern Netherlands with relatively limited access to HEI knowledge. There is a need for experimentation in developing new kinds of cooperative relationship – e.g. with schools – in using HEIs to transpose real world problems into learning opportunities, and coupling learners and problem-owners into shared communities.

Making HEI research and teaching accessible to regional teaching. Part of connecting SMEs to regional knowledge institutions comes in creating linkages from firms to all levels of teaching. HEIs can play a strong leadership role in this, in part drawing on open innovation environments and create synergies between different activities and different education levels, including using students to connect to schools and firms.

7.1.2.3 Recommendations for other levels in universities

Create regional capacity for educating SME entrepreneurs in innovation. The primary reason that there is not more interaction between SMEs and HEIs in the Northern Netherlands is that innovation is approached by most businesses as something implicitly embedded in other business processes. Improving innovation management in SMEs improves the demand-side for HEIs and in turn provides well-structured partners for the HEIs to work with and to help them learn how better to support innovation outside the HE sector.

Build on existing links throughout education into SMEs. Many innovative SMEs do have links to education institutions often related to recruitment and lower-level skills. The Practoraten in the regional VET colleges are a promising initiative that could help provide a pathway into innovative SMEs. More systematic collaborations between VET and HEIs could help both upgrade the quality of support provided by the practoraten (and also the knowledge intensity of VET education in the Northern Netherlands) as well as helping to condition SMEs to be better at knowledge absorption from the HEI sector.

Use students more systematically to drive open innovation. There has been some interesting and creative use of open innovation practices in the Northern Netherlands but at the moment these initiatives have not been joined up to create operational open innovation environments. There is the opportunity to create financial incentives to support that upgrading, to help firms signal to students which of their projects have potential financial value, and to assist firms to reabsorb the knowledge from those open innovation activities.

7.2 Human Capital

There is clearly an intense human capital challenge facing for the Netherlands. The issue of “brain drain” was something that was widely identified as a problem for the region. At the same time, it is not easy to see how that problem can be addressed. Students come to the Northern Netherlands to study because they wish to acquire a high-quality, good value and prestigious education. For the majority of those students, the Dutch HE qualification provides them with a significant labour market advantage in their home country or indeed access to labour markets in advanced economies. There are no inexpensive interventions to address these issues of brain drain that do not rely on a substantial transformation of the Northern Netherlands that is unrealistic in the timeframe of the coming programme period.

However, what these students can serve to do is provide “temporary-permanent” connections between HEIs and regional innovators – there might be a different cohort of students active in innovation activities, but the persistence of these activities – such as open innovation environments – creates a virtuous cycle which upgrades demand, increases firm innovation, and indirectly also increases student retention in participating businesses. Earlier in the report, we identified that there were six elements that contribute to these virtuous cycles, namely (a) students on placements, (b) subsidies for small interactions, (c) academics engaging with firms, (d) teaching linked with research, (e) good collaboration between institutions and (f) links to other education levels. This forms the basis for the recommendations that we make here for administrative authorities and HEIs.

7.2.1 Actions and initiatives for administrative authorities

Maintain the focus on a broad labour market upgrading with innovative skills. The framework of the smart specialisation strategy process emphasises exclusivity and focus around technological innovation projects as a policy artefact. The fundamental challenge for the Northern Netherlands remains in encouraging all organisations to become more innovative and absorb more knowledge and the RIS3 strategy can play a critical role in delivering this if this exclusivity and technological focus is not allowed to dominate the process.

Develop a clear vision within the Operational Programme for human capital. The previous recommendation depends on having a clear vision within the Operational Programme for Human Capital. It is necessary to retain exclusivity and focus on funding only those Human Capital activities that build absorption capacity in regional organisations and support appropriate skills development. This requires a clear vision for how Human Capital can be supported through a RIS3 and Operational Programme.

Develop a single long-term (meta-) agenda for regional innovation in>NNL. The absence of a single long-term agenda for regional innovation in the Northern Netherlands hinders foregrounding Human Capital in

the smart specialisation strategy. This fragmentation reinforces the accidental marginalisation of human capital and made it almost entirely invisible in the previous programming period. There is a need for a long-term commitment to building capacity to support human capital for innovation to ensure that the current smart specialisation strategy builds the requisite foundations.

Set out clear expectations on how HEIs will contribute to Human Capital regionally. There is currently no clear expectations on how HEIs will contribute regionally to improving human capital levels. There are general expectations that they will meet regional need and there are some local expectations related to specialisations in the three Provinces. There should be a clear articulation of what the HEIs will deliver in the coming programming period, beyond an aggregation of operational targets, which will allow HEIs to account for and improve their contributions in the longer term.

Develop an agenda for public sector innovation to raise demand for innovation skills. The smart specialisation strategy has activated a participatory process of key stakeholders of the innovation ecosystem, which has operationalise with a stronger focus on the private sector innovation than the public one. Yet, the public sector remains an important employer in the Northern Netherlands. In the context of a weak aggregate demand for innovation skills for the HE sector to respond to, the single greatest contribution the public sector could make would be in demanding that its employees and new recruits had the skills to contribute to public sector innovation. That requires action within sectoral organisations to build political will for this change at the national level.

7.2.2 Actions and initiatives for HEIs

The recommendations for the authorities require that HEIs in the Northern Netherlands are responding to the new opportunities that emerge in the new programming period, and that they can be held to account for their responses. Regional HEIs have the strongest understanding of all of the potential elements necessary to foreground human capital in the RIS3 strategy from the political will necessary for collaboration to extensive experience in working with regional organisations to stimulate innovation. It is necessary for concerted action across HEIS and at all levels to ensure that they use this opportunity to raise the overall quality of innovation and knowledge absorption in the Northern Netherlands in the coming six years. More detail is provided below.

7.2.2.1 Senior managers

Create a shared human capital agenda for the Northern Netherlands. The intimate knowledge of how HEIs can contribute to developing a shared regional human capital agenda lies within the universities, although the experience of the RIS3 consultations has demonstrated that knowledge is not always known to senior managers. HEIs should therefore identify internally and collectively what capacities they have to contribute to regional innovation skills and align that with the RIS3 and Operational Programme.

Set out clearly how higher education in Northern Netherlands can upgrade innovation. A model for how HE in NNL can contribute to upgrading innovation became visible since 2014, using RTDI infrastructures, knowledge-based learning and demand stimulation to assist more regional partners to become better at working with HEIs on innovation. This model has been partially formalised in the open innovation workplaces and the living laboratories, but at the same time it remains an implicit way of working. It is necessary for teachers and researchers to identify how they can teach their partners to become better at innovation, and that in turn requires an institutional commitment to developing innovation knowledge as part of their teaching and research activities.

Systematically co-ordinate the co-operation between different education levels. One of the most impressive outcomes in the Northern Netherlands has been joint collaboration activity between universities, UASs and VET colleges: the use of shared locations has created good connections between these levels. The open innovation workplaces have been valuable, and there is the opportunity to expand this cooperation in different ways. The HEIs in NNL should therefore identify education and research innovations (such as shared/jointly accredited teaching) that enriches their core activities whilst deepening connections to regional partners.

Let a thousand flowers bloom. The challenge of upgrading the regional labour market is not something that can be driven by top-down strategies alone. It depends on the efforts of creative and innovative teachers and researchers who identify and implement mechanisms to add value by connecting their teaching and research to regional partners. Heavy-handed management can very quickly stifle creativity and innovation in the HE sector and creating strategic frameworks should not create obstacles for future collaborations.

7.2.2.2 Academics & Researchers

Develop innovation as a transversal skill at all education levels. There is an increasing pressure on all levels of education to increase the intensity of knowledge transferred to pupils and students. There are clear opportunities to create better partnerships between secondary and tertiary education, and to increase the knowledge content of education for traditionally less-knowledge intensive occupations. Innovation skills involve activating knowledge in real contexts and are therefore applicable across the labour market, and regional educational partners should promote innovation education as a transversal skill to promote knowledge application.

Create a regional knowledge platform for advanced innovation skills. A key barrier to upgrading the regional labour market is the poor absorptive capacity of the vast majority of regional organisations, and the absence of current demand for high-level innovation skills. There are many examples of successful regional collaborations and there is a good understanding in regional HEIs of how to assist regional firms and NGOs to absorb university knowledge more effectively. Regional HEIs should codify those experiences and knowledge to create suitable tools to assist more regional partners to effectively acquire knowledge for innovation from regional HEIs.

Maintain the educational embedding of the lectoren. Higher professional education across the Netherlands has been increasing its knowledge intensity since 2003 with the introduction and mainstreaming of Professors of Applied Science and their associated knowledge groups. The Northern Netherlands has managed to avoid these becoming primarily research focused and uses their links to build connections into businesses that can support skills development. The higher prestige of research as an academic activity creates pressure for these lectoraten to evolve into applied research centres, and that should be resisted and not encouraged by partners in the Northern Netherlands.

7.2.2.3 Recommendations for other levels in universities

A key issue around human capital is that under the current programming period it was considered important for the region, but treated separately from the SMEs policies and innovation ecosystem challenges. In addition the ERDF Operational programme presented a mismatch between the needs towards and actions and support instruments detected, and the possibilities offered by the current regulations. There are therefore a set of parallel changes that can assist HEIs in contributing to systematically improving innovation demand in the regional labour market.

Create clear support structures to assist with human capital absorption. UASs in the Northern Netherlands should consider developing mechanisms to assist SMEs to improve their human capital in order to better absorb HEI knowledge. Innovation vouchers have been a popular instrument in smart regional innovation policy mixes but they have tended to focus on paying for the knowledge rather than its absorption. Experimenting in approaches to assist on the user side would assist regional policy-makers in understanding where there is scope for measures to directly raise local partners' knowledge absorption capacity. The introduction of demonstration and testing living labs could be an interesting measure to involve applied sciences universities in demonstration projects with SMEs in key priority areas for the region, with successful examples in the region.

Encourage diversity of provision and access to student-led innovation support activities. There is a need for a plurality of approaches to interaction between HEIs and regional partners recognising the range of innovation approaches and the diversity of HEI knowledge relevant to innovation. There is a need to continually develop new approaches for supporting student-led innovation activities that deliver constructive HEI-partner interactions, both in terms of identify new domains and partners but also relevant HEI knowledge bases.

Identify an agenda for making student-led innovation more deliverable. The Northern Netherlands has a successful approach for making student-led innovation more deliverable. This approach could potentially be led by other partners who are seeking their own access to knowledge – this would increase the scalability of the idea. Regional HEIs should develop and publish a set of standards defining the practices and processes of these open innovation environments, and the RIS3 should consider finding mechanisms to allow non-HEI partners to propose new open innovation environments.

Creating infrastructures for educational collaborations around knowledge flow. There are clear gains to be made in investing in infrastructures that can support collaboration between different education

levels (from secondary school to Ph.D. level), stimulating through flow between levels but also in mobilising these extended knowledge application communities around particular practical areas.

7.3 Governance & Innovation Ecosystem

A recurrent theme in this review has been the fragmentation within innovation policy in the Northern Netherlands, fragmentation between different provinces, between different sectors, between different instruments and different boards concerned with innovation support instruments. It is extremely challenging to use voluntary collaborative arrangements that have the strength and authority of a formal tier of government. Nevertheless the key challenge for the Northern Netherlands in the coming period is achieving a higher degree of integration, and in particular ensuring that regional innovation strategies stimulate positive synergies across the region.

The role for HEIs within this is less as a leader, and more in contributing to these collective activities in stimulating regional cooperation. HEIs do occupy a strong position in the existing regional innovation ecosystem, as a site for much experimentation and reflection, and it is key that they are encouraged to continue that work. They are sites of expertise about the regional innovation environment and wider global trends that can be useful in helping to stimulate regional sense-making activities that support regional innovation. But the extent of their contributions remains limited by the regional partners' commitment to create a strong regional power centre, and put an end to fragmented regional innovation practices.

7.3.1 Actions and initiatives for administrative authorities

Unify three moderately innovative provinces to a strongly innovative region. The key governance challenge for the Northern Netherlands is creating a structure that allows NNL to function as a single innovation governance space. This is not trivial given that the three provinces each have their own regional governments, and there is little space to delegate their authority away from regional representatives. Strong political will is required to create a single vision for innovation in the Northern Netherlands that exploits all innovation resources to create a dense innovation ecosystem, for the benefit of all three provinces.

Address innovation policy overgrowth in the Northern Netherlands. The RIS3 process is based upon a sense of focus and strategic orientation to produce a single innovation strategy that unifies other innovation approaches. The Northern Netherlands has a range of innovation forums and funds that have proven extremely difficult to align with each other. This hinders creating a strategic centre for regional innovation policy, diffuses concentration and undermines effective signalling of priorities. Pruning back this innovation policy overgrowth is a necessary condition of achieving coherent regional innovation governance in the forthcoming RIS3. The EBNN could play a central role in the governance structure of the new RIS3, which should be accompanied by a broad political consensus to provide strategic directions to the strategy, and with a stronger focus on implementation rather than mainly on flagship initiatives.

Evolve the defensive mentality into a path-creating mentality. The Northern Netherlands has developed a set of clusters and sectors as the basis for its regional innovation policy that also reflect political interests. This has undermined the region's capacity to identify emerging sectors and opportunities with potential transformative capacity that could be incorporated into the RIS3 process. The NNL should therefore put emphasis on bringing emerging actors into innovation policy processes, using continuous discovery to ensure that innovation policy does not become locked-into supporting historically innovative sectors.

Create a regional capacity for innovation understanding. Much of the regional innovation strategy preparation and integration work in the last decade has been driven by the SERNNL, a body whose role is being downgraded. This risks undermining the region's capacity to think critically about its regional innovation situation, and to reflect and learn from past experiences to improve future performance. The role of the SERNNL could be considered within the new RIS3 governance structure, rooting its capacity in a research/audit framework with independent capacity to gather and process strategic intelligence, as well as international peer learning.

Create a regional learning culture around innovation policy. The learning around innovation policy has gradually increased, with an impact evaluation of the ERDF OP 2018 highlighted as good practice by the DG REGIO Evaluation network. In addition, the region has put in place the innovation monitor within the RIS3, which has been highlighted as a good practice and has raised interest in many other regions, which has helped understand the SMEs innovation performance in the region.

The progress made in the region should be followed in the next programming period. A mixed approach of quantitative and qualitative methods for process analysis could provide real time feedback allowing learning and adjusting of RIS3 key components, addressing real time implementation difficulties.

Ensuring the monitoring of the regional innovation system is well integrated in the S3 governance, and it helps in the decision making process throughout the implementation of the envisaged instruments and taking corrective measures would be an excellent continuation.

7.3.2 Actions and initiatives for HEIs

The Northern Netherlands' HEIs are trapped in a vicious governance circle given its underlying fragmentation. There are many things that HEIs could do to support governance and building effective ecosystems in the NNL. The HEIs are well positioned for example to act as a kind of antenna for weak signals relating to new sectors, through the experiments they have with local partners. They can create a common agenda for higher education in the region to make their assets more widely available. They can provide champions and institutional innovators to help create networks in emerging regional sectors. In the absence of a strong decision-making centre, there is no demand or users for those activities and therefore no reason for HEIs to engage with improving regional governance arrangements. These recommendations therefore presume that there is action amongst regional political authorities to create a stronger regional innovation policy space in which these contributions may operate.

7.3.2.1 Senior managers

Create a strong leadership voice for HE in NNL. In the absence of a strong demand for regional leadership, HEIs in NNL have been adept at forging local political coalitions to support their own plans, and also to responding to local demands for support. This has exacerbated the fragmentation in the region, and given the absence of regional critical mass, needs urgent rectification. A strong unified leadership voice for HE in the NNL is absolutely necessary to create meaningful political leadership and avoid replicating local fiefdoms. The steps taking by HE in the creation of EBNN, University of the North initiative, could be further strengthened through a balanced involvement of institutions, setting a governance body to decide a strategic direction and mission.

Build a culture of regional learning in NNL's HEIs. It is very difficult for HEIs to systematically support regional innovation because university contributions are in the main second order: HEIs participate in these activities because they support teaching or research activities. The projects that university senior managers are aware of tend to be capital-intensive flagship projects; university managers are less systematically aware of the smaller innovative experiments by which regional contributions are being made. Efforts within HEIs are vital to understand these engagement experiments and to ensure that they are supported by institutional rules.

Ensure innovation networks remain open to newcomers. The NNL has successfully developed a set of innovation networks, underpinned by Operational Programme funding, that create innovative capacities for the region. However, these networks are largely inaccessible for newcomers and reduce the potential knowledge spill-overs that could the region could benefit from. Universities have the opportunity to ensure that these networks and infrastructures function as more than cosy technology clubs but rather provide innovation services for new and potential innovators in the Northern Netherlands.

Showcase HE's ordinary, everyday and hidden innovation contributions. The NNL's HEIs make an incredible diversity of contributions to innovation by regional partners, and only a tiny proportion of these activities fall within the purview of regional innovation policy. Many of these activities are embedded in other activities such as teaching (student placements, problem-based learning) or research (joint research projects, Ph.D. placements) or involve informal interactions and consultations. The NNL's HEIs should promote the range of these activities, explain their value to the region in terms of stimulating regional innovation, and assist regional policy-makers and local partners to develop instruments more supporting of those contributions.

Support institutional entrepreneurs who use strategies to build capacity. The HEI sector in NNL is home to a number of institutional entrepreneurs who have built up impressive infrastructures in a few sectoral areas assisting HEIs to work with regional partners and students, to create a unified knowledge community and improve regional innovation outputs. These positions have been formalised in a number of

cases by these individuals taking research leadership roles in their institutions, and being involved in the preparation of the 2020 RIS3. There are other HEI-centred networks mobilised by other university institutional entrepreneurs who could create added-value for the 2020 RIS3 if they are successfully identified and supported.

7.3.2.2 Academics & Researchers

Develop the flexible mindset necessary for continuous discovery. The new RIS3 document presents the continuous discovery at the heart of implementation. Whilst that is a welcome sign, there are operational challenges to successfully delivering it, given the relative sparsity of the innovation ecosystem, and the need for a capacity to process weak signals from networks with future innovation potential. One role for engaged academics is in helping to support the necessary policy flexibility and translating regional innovators' specific needs and demands into potential emerging sectors.

Make transformative contributions to regional innovation policy. The other area where academics and researchers can contribute to improving innovation governance in the North of the Netherlands is in contributing to regional innovation learning processing capacity. There is a tendency in the policy process to use academic contributions in an unreflective way, transposing academic concepts uncritically to the Northern Netherlands context. There is a role for academics in the Northern Netherlands to take a more active public role, to improve the way in which external advice is implemented in the region.

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Glossary

BON	Besturen Overleg Noord	BON Besturen Overleg Noord Organisation supporting dialogue between social partners in Northern Netherlands (1985-2003)
EBNN	Economic Board of Northern Netherlands	Governance body set up in 2018 merging the Northern Innovation Board and the Economic Affairs Board Committee, as a decision of the business community, knowledge institutions and governments from provinces of Groningen, Fryslân and Drenthe.
ERDF	European Regional Development Funds	https://ec.europa.eu/regional_policy/en/funding/erdf/
ESIF	European Structural and Investment Funds	European funds for territorial development: in NNL RIS3 ERDF/ EAGGF/
HEI	Higher Education Institution	Includes both universities and universities of applied science (qv)
HBO	Institutions for higher professional education	https://www.government.nl/topics/secondary-vocational-education-mbo-and-higher-education/higher-education
JRC	Joint Research Centre	The science and research service of the European Commission
NIA	Northern Innovation Agenda	Working document seeking to retain the currency of the RIS3 2014-20
NNL	The Northern Netherlands	The territory comprising the provinces Groningen, Fryslân, Drenthe.
NOM	Noordelijke Ontwikkelingsmaatschappij	The regional development agency for the Northern Netherlands.
NWO	Dutch Research Council	https://www.nwo.nl/en
ROC	Regionale opleidingscentra	Further (vocational) education colleges
RTDI	Research, Technological Development & Innovation	The knowledge production activities that contribute to innovation.
S3	Smart specialisation strategy	A territorial innovation strategy underpinned by an entrepreneurial discovery process
SEAN	Sociaal-Economische Adviesraad Noord-Nederland	The socio-economic advice council of the Northern Netherlands (forerunner of SERNN)
SERNN	Sociaal Economisch Raad voor Noord Nederland	The Social Economic Council of the Northern Netherlands, a tripartite advice body for the region
SIA	National Governing Body for Applied Research	https://regieorgaan-sia.nl/taskforce-applied-research-sia/
SME	Small and Medium Sized Enterprises	Businesses with 50-250 employees (also a translation of Dutch MKB).
TVC	Taakverdeling en concentratie.	Task Reallocation and Concentration operation,

		1981, structurally managing the Dutch universities as a single system
SNN	Samenwerkingsverband Noord Nederland	Regional interprovincial authority for the Northern Netherlands.
UAS	University of Applied Science	A higher education primarily oriented to higher professional education
WHM	Higher Education and Research Act	1992 Law on higher education and research https://wetten.overheid.nl/BWBR0005682/2013-10-17#Opschrift
WO	Academic University	https://www.government.nl/topics/secondary-vocational-education-mbo-and-higher-education/higher-education
	Practoraten	Knowledge platforms for applied innovation in vocational education (MBO)
	Lectoraten	Professorships in University of Applied Sciences
	Proeftuinen	Testing Living Laboratories
	Gunfactor	The goodwill that you attract from others working around you
	Lectoren	Professors of applied sciences who carry out applied research and make it available to local businesses

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Annexes

Annex 1. Participants of the exploratory meeting and Shadow Group members

Name participant	Organisation	Position
Eskame Arregui	European Commission Joint Research Centre	Scientific officer
Paul Benneworth	European Commission expert	
Sander Bos	Province of Fryslan	Program Coordinator
Harm-Jan Bouwers	NHL Stenden Polymer Research & Education University of Applied Sciences	Program Manager of the Academy for Technology & Innovation
Pieter de Jong	EU Representative	WaterCampus / Wetsus
Thom Duijvené de Wit	City of Groningen	Senior advisor knowledge economy and innovation
Frank Gort	NHL Stenden University of Applied Sciences	Program Manager Smart Sustainable Industries
Jolanda Hekman	Hanze University of Applied Sciences	Strategic Advisor & Lobbyist EU Liaison Officer Public Affairs
Joep Hoveling	The Northern Netherlands Alliance (SNN)	Project Manager
Luc Hulsman	The Northern Netherlands Alliance (SNN)	Program Manager
Sierdjan Koster	RUG (University of Groningen)	Professor Economic Geography
Anu Manickam	Hanze University	Professor at the International Business School & Centre of Expertise
Jenny Otten	Province of Groningen	Coordinator EU affairs Northern Netherlands
Maike Swart	Province of Drenthe / E&E Advies	Consultant
Jouke Van Dijk	RUG (University of Groningen)	Prof. Regional Labour Market Analysis / Director Waddenacademie
Saskia van Gend	Van Hall Larenstein University of Applied Sciences	Program Manager Research
Peter van Kampen	RUG (University of Groningen)	Deputy director University of Groningen North West Germany @Papenburg & Project Manager Economic Geography
Joyce Walstra	Oranjewoud Export Academy	Director

Annex 2. List of interviewees

Contact	Position	Organisation type
Jan Jaap Aué	Director Centre of Expertise	Hanze University of Applied Sciences.
Johannes Boonstra	Executive board member	Wetsus
Harm-Jan Bouwers	Program Manager of the Academy for Technology & Innovation	NHL Stenden University of Applied Sciences. -Emmen
Pieter de Jong	EU representative Wetsus & WaterCampus	WaterCampus / Wetsus
Kees de Koning	General Manage	Dairy Campus / Wageningen University
Jouke de Vries	President of the Board	RUG University of Groningen
Rik Eweg	Lector Sustainable Agribusiness in Metropolitan Areas & Leading lector Applied Research Centre Food and Dairy	Van Hall Larenstein University of Applied Sciences.
Annemieke Galema	Chairman Programme Board & Director Northern Knowledge	RUG University of Groningen
Gerry Geitz	Director R&D Education and Research & Lector Sustainable Educational Concepts in Higher Education	NHL Stenden University of Applied Sciences. - Leeuwarden
Aard Groen	Dean Centre of Entrepreneurship	RUG University of Groningen
Jolanda Hekman	Strategic Advisor & Lobbyist & EU Liaison Officer Public Affairs	Hanze University of Applied Sciences.
Leendert Klaassen	Former President of the Board of Stenden University	NHL Stenden University of Applied Sciences - Leeuwarden
Jasper Knoester	Dean of the Faculty of Science and Engineering	RUG University of Groningen
Sierdjan Koster	Associate Professor Economic Geography	RUG University of Groningen
Soon-Hee Santema	Director R&D & Contract activities	NHL Stenden University of Applied Sciences - Leeuwarden
Martin Scholten	General Director Animal Sciences Group & Chairman Advisory Board Dairy Campus	Wageningen University (as part of the Dairy Campus)
Jan Sikkema	Director Business Development	University Medical Center Groningen
Martin Smit	Director Graduate School of Medical Sciences	University Medical Center Groningen

Jantienne van der Meij-Kranendonk	Liaison Officer	Wetsus
Jouke van Dijk	Professor of Regional Labour Market Analysis & President of the European Regional Science Association (ERSA) 2014-2018	RUG University of Groningen / SER N-NL
Saskia van Gend	Program Manager Research	Van Hall Larenstein University of Applied Sciences
Peter van Kampen	Deputy director University of Groningen North West Germany @ Papenburg & Project Manager Economic Geography & Manager Northern Knowledge	RUG University of Groningen
Hugo Velthuis	Director Marian van Os Centre for Entrepreneurship,	Hanze University of Applied Sciences
Annette Verhoef	Location manager	NHL Stenden University of Applied Sciences -Emmen
Rob Verhofstad	Member of the Board & Director Education and Research	Hanze University of Applied Sciences
Joyce Walstra	Strategic advisor & Director Oranjewoud Export Academy	NHL Stenden University of Applied Sciences - Leeuwarden

Annex 3. Focus Groups participants

Focus Group 1 - Regional Innovation Governance and stakeholders engagement
<p>Eskarne Arregui (European Commission, Joint Research Centre)</p> <p>Paul Benneworth (European Commission expert)</p> <p>Joep Hoveling (Project Manager at The Northern Netherlands Alliance (SNN))</p> <p>Marcel Koenis</p> <p>Anu Manickam (Professor at International Business School & Centre of Expertise Hanze University)</p> <p>Peter van Kampen</p> <p>Maarten Goddijn (Business developer green chemistry)</p> <p>Sander Troost (Secretary of Innovation Pact Fryslân)</p> <p>Allard van Dijk (Senior Advisor Ministry of Economic Affairs)</p> <p>Matthijs Vonder (Senior Research Scientist at TNO)</p> <p>Ronald Wielinga (Manager Entrepreneurship at WaterCampus)</p> <p>Annelies Wolters (Manager Business Development Lode Holding B.V.)</p> <p>Ingrid Zeegers (Program Director Circulair Fryslan cluster)</p>
Focus Group 2- Strengthening SMEs engagement in S3 and potential partnerships with HEI
<p>Eskarne Arregui (European Commission Joint Research Centre)</p> <p>Paul Benneworth (European Commission expert)</p> <p>Jehannes Bottema (CEO Spinder Dairy Housing Concepts)</p> <p>Dennis Carton (Director Ynbusiness)Ton Vries</p> <p>Joep Hoveling. Project Manager at The Northern Netherlands Alliance (SNN)</p> <p>Anne Jan Zwart (Member / Chair of external committee of experts ERDF)</p> <p>Joost Krebbekx (Program manager Innovation Cluster Drachten) or Kor Visscher (Monitoring committee ERDF and former CEO Philips Drachten)</p> <p>Anu Manickam (Professor at International Business School & Centre of Expertise Hanze University)</p> <p>Jenny Otten (Policy Coordinator European Programs Province of Groningen)</p> <p>Johan Pragt (Competence Group Leader Mechanical R&D ASTRON) or Jan Geerts (Director Getech)</p> <p>Bart Scheerder (International Strategy & Relations at UMCG and Director at dHealth Lab)</p> <p>Saskia van Gend (Program Manager Research at VHL University of Applied Sciences)</p>
Focus Group 3- Human capital: Addressing skills and jobs mismatch and the integration of the attraction of talent in the R&I system
<p>Eskarne Arregui (European Commission Joint Research Centre)</p> <p>Bas Baalmans (Director Groningen Digital Business Centre) or Nick Stevens (Chief Digital Officer City of Groningen)</p> <p>Paul Benneworth (European Commission expert)</p> <p>Aleid Brouwer (Professor NHL Stenden)</p> <p>Harm-Jan Bouwers (Program Manager of the Academy for Technology & Innovation NHL Stenden)</p>

Thom Duijvené de Wit (Senior advisor knowledge economy and innovation)

Bas Fokkens (Senior Project Leader Economy / Labor Market and Cohesion Policy EU at Province of Groningen)

Pieter Hoekstra (Programme manager Civ Water)

Roeland Hogt (Practor Automotive and coordinator hydrogen education Noorderpoort)

Joep Hoveling. Project Manager at The Northern Netherlands Alliance (SNN)

Dirk Jan Hummel (Project Manager TCNN)

Sterre Koops. Programme management collaborator at The Northern Netherlands Alliance (SNN)

Tanja Sextro (Province Drenthe, human capital coordinator)

Jouke van Dijk (Prof. Regional Labour Market Analysis / Director Waddenacademie University of Groningen)

Henk ten Brinke (Advisor CMO STAMM)

Nora van Kooten. Programme management collaborator at The Northern Netherlands Alliance (SNN)

Annex 4. Interview questions

Overall project questions

1. How to reinforce the R&I ecosystem governance and stakeholders' co-leadership of S3, supported by HEIs capacities and strategic role in building regional networks
 - How to improve coordination and continuous interaction between initiatives and actors in the innovation ecosystem, strengthening synergies
 - The role HEIs play in connecting SME's to collaborative innovation processes
 - How to strategically benefit from the presence of international students and the worldwide network potential this entails
2. How could HEIs in Northern Netherlands use their prominent role in the innovation ecosystem to create a stronger partnership with regional decision makers, taking a more strategic role and vision working in the implementation of RIS3?
 - Which type of actions/programmes could facilitate HEIs to maximize their potential to build innovation capabilities?
 - Which actions/programmes HEIs can take to better meet the changing labour market demand and enable a successful RIS3-implementation

GENERAL STRUCTURE

3. Very brief background of career of individual and how they ended up in their current position
4. Very brief overview of their current position
5. Outline their organisation, its structure and its overarching missions
6. Deeper probe on their regional innovation mission: what does their organisation seek to do, and how important is regional innovation to them:
 - Are there one or more of the four societal challenges that are more important for them than others?
 - How has Human Capital been integrated?
 - How do they relate to the grand challenges that are at the heart of the RIS3 approach?
 - Do regional partners do everything they can to ensure that they make a good contribution to regional innovation?
 - From your perspective, how engaged are regional HEIs in supporting regional innovation in general in the RIS3 in particular?
7. Brief sketch of how they or their organisation – as far as they know - was involved in:
 - The background discussions prior to the RIS3 for Northern Netherlands
 - The strategic development of the RIS3 for the Northern Netherlands.
 - The implementation of the Northern Netherlands RIS3
 - Evaluation and retrospective consideration of the RIS3 2014-2020
 - Preparations for the RIS3 post 2020
 - Partnerships with other organisations at different stages of this process
 - From your perspective, how well were you able to work with regional HEIs in realising your institutional goals through participating in the RIS3.
8. Vision on S3 governance, policy mix and stakeholders engagement:
 - What is your vision on the S3 governance structures set up? And the role of your institution and other HEIs in it?
 - Has the EDP helped stronger interactions between regional actors for strategic vision of innovation? Challenges/improvements?

- Has S3 helped build stronger partnerships with regional decision makers? In which sense?
 - Is this governance helping the decision making process and HEIs co-leadership in shaping the strategic vision of innovation in the region?
 - Is the S3 policy mix/funding scheme helping strengthen interactions with business and SMEs? With other stakeholders? How?
9. Possible probes at the different stages for the kinds of problems or issues that emerged at the different stages, what solutions were sought, how they reacted and how it affected their ability to contribute
- The background discussions prior to the RIS3 for Northern Netherlands
 - The strategic development of the RIS3 for the Northern Netherlands
 - Implementation of RIS3 in Northern Netherlands
 - What is your opinion on how the processes and engagement of stakeholders worked?
 - How was the contact with the HEIs, and were there problems or issues that arose specifically in dealing with universities?
10. Detailed questions about one of two strategic projects that their organisation was involved in:
- How much prior work and preparation they had to do to secure it
 - How the implementation of the funding scheme worked
 - What the outcomes were for the organisation
 - Which of the RIS3 areas were being developed (Food, Efficient Energy, Water technology and Healthy Ageing)
 - What contact they had with regional partners/ how that developed and improved over the course of the project
 - What kind of basis that gives for additional activity in the future
 - Things that went wrong in the process and things that could be improved in future programming rounds
11. Take a step back and look at the process as a whole (these are starting to be the last questions)
- Which parts of the RIS3 experience worked well from your perspective? It might be in terms of what was good for your organisation, effective relationships with other partners, potential problems that just vanished ...
 - Which parts of the RIS3 experience did not work well from your perspective? It might be mistakes that you made, capacities that you lack, or problems that emerged from outside
 - What concrete proposals would you have to improve the RIS3 process in the 2020 period? That can be things you would do differently yourself, or recommendations for other regional partners or partnerships.
 - What did the universities do well, do badly and what could they do better next time?

GETTING IN TOUCH WITH THE EU

In person

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