

Double stitching the triple helix

Connecting Logistics Hotspots and Regional Logistics Ecosystems to the Dutch Topsector Logistics 2050 ambition and 2020-2023 action agenda

A research- and position paper by
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Abstract

Purpose – The purpose of this research paper is 1) to analyze Logistics Hotspots and Regional Logistics Ecosystems in the Netherlands and 2) investigate how the Logistics Hotspot Port of Twente can double stitch the triple helix approach to 2a) develop its Regional Logistics Ecosystem and 2b) align its business plan with the 2050 ambition and the action agenda for 2020-2023 of the Dutch Topsector Logistics.

Design/methodology/approach – The methodological approach undertaken in this study is based on a literature review, desk research, data from the annual rankings of Dutch Logistics Hotspots, the framework for Regional Logistics Ecosystems, interviews with 12 board members and 33 members of Port of Twente and design workshops with 25 community members of Port of Twente.

Results/findings – Contrasting the extensive literature about business ecosystems, little scientific literature is available about Logistics Hotspots and Regional Logistics Ecosystems. Based on available data from the annual rankings of 28 Logistics Hotspots in the Netherlands, 27 Regional Logistics Ecosystems are identified, analyzed and classified as business-, innovation-, entrepreneurial- and/or knowledge ecosystem. More specific, Port of Twente is analyzed based on the framework for Regional Logistics Ecosystems and action agenda for 2020-2023 of the Topsector Logistics. The insights are embedded in the business development plan of Port of Twente and a technology roadmap is created based on the clustering of 17 innovation projects as a starting point to establish a learning community.

Research limitations/implications – The desk research is based on published rankings and available materials from websites. Due to the absence of public available research data and practical constraints, the classification of ecosystems is based on 4 main types of ecosystems. Further empirical research can be conducted based on the theoretical framework of Scaringella and Radziwon to map the logistics innovation system in the Netherlands.

Practical implications – The business development plan and technology roadmap provides Port of Twente a starting point for further development. In a broader sense, the results of this study provide important insights, recommendations and guidance to connect Logistics Hotspots and Regional Logistics Ecosystems to the Topsector Logistics 2050 ambition and action agenda for 2020-2023.

Originality/value – The study contributes to better understanding of Logistics Hotspots and Regional Logistics Ecosystems in the Netherlands. The work presented here provides one of the first investigations about the alignment of the Dutch Topsector Logistics 2050 ambition and action agenda for 2020-2023 with Logistics Hotspots and Regional Logistics Ecosystems utilizing insights from both science and industry. The contents of this work are considered valuable for policy makers, logistics entrepreneurs, researchers active in triple helix projects and professionals responsible for strategy and technology development in Logistics Hotspots and Regional Logistics Ecosystems.

Keywords – logistics hotspots, regional logistics ecosystems, topsector logistics, port of twente

1. Introduction

Logistics is an important facilitator for global trade and efficient logistics is a competitive advantage for both individual companies and countries to compete globally. The Netherlands is well-known for its international trade and logistics and it facilitates, with 0,25% of the world population and 1% of the global production, 3,7% of the global trade. The economic added value of logistics is €65 billion (9,4%) of the GDP and offers employment for 673.000 people in the Netherlands. In order to keep ahead of competition, the Dutch government develops policies and action agendas for prioritized Topsectors. On a local scale, logistics activities are clustered and organized in so-called Logistics Hotspots, which in some cases evolved to Regional Logistics Ecosystems. This paper examines these Logistics Hotspots and Regional Logistics Ecosystems in search for alignment with the Topsector Logistics 2050 ambition and action agenda for 2020-2023. This first chapter provides contextual background information, states the purpose of this paper and outlines its structure.

1.1. Dutch Topsector Logistics

In 2010, the Dutch government initiated its Topsector Policy. This policy is aimed at developing the nine sectors that internationally excel and therefore receive high priority by the government. The Topsector Logistics aims to improve the international competitiveness of the Netherlands and contribute to establish a leading position in 1) handling global supply chains, 2) as an orchestrator for (inter-)national logistics activities and 3) as a country provide attractive conditions for innovation and investment for companies. The following 12 action are defined to contribute to these results areas: 1) Neutral Logistics Information Platform, 2) Synchronodal Transport, 3) Trade Compliance and Border Management, 4) Urban Logistics, 5) Cross Chain Control Centers, 6) Service Logistics, 7) Foreign Promotion, 8) Simplification of Laws and Legislation, 9) Human Capital Agenda, 10) Supply Chain Finance, 11) Freight Corridors and 12) Sustainability. Taken together, the action agendas are the basis for the triple helix approach in which companies, researchers and governments collaborate and invest.

Based on the policies and funding from the Ministry of Infrastructure and Water and Economic Affairs, public private partnerships form the basis for roadmaps and research projects. These Topconsortia for Knowledge and Innovation (TKI) are united under the umbrella of the Dutch Institute for National Advanced Logistics (DINALOG). Together with Connekt, who is in charge of program management, TKI DINALOG is responsible for the roadmaps and research projects in the Topsector Logistics. Figure 1 depicts the dashboard with roadmaps and projects that are executed or in progress via TKI DINALOG.



Figure 1: dashboard with roadmaps and projects of TKI DINALOG, available online at <https://www.dinalog.nl/dashboard/>

To measure the impact of the Topsector Logistics, six Key Performance Indicators (KPIs) are defined. Goals are set to contribute to economic growth, but also address important societal and environmental issues. Table 1 describes the KPIs, their target values for 2020 and values from intermediate measurements.

KPI	Target value 2020	Status
Additional turn-over in orchestration activities	+ €17,3 billion	+ 18,6 billion (2016)
Reduce transportation over road	- 85 million kilometers	- 33 million kilometers (2016)
Reduce carbon emissions	- 73.700 ton CO ₂	- 43.000 ton CO ₂ (2016)
Attract new logistics companies to the Netherlands	50% increase; 100 landings	70 landings (2018)
Increase qualifications and skills of the workforce with logistics education and knowledge from the Topsector logistics	50% increase in students at Universities to 1.785	1.869 (2015)
Improve the ranking in the WLPI¹	Rank 1	Rank 6 (2018)

Table 1: KPIs and target values for 2020 of the Dutch Topsector Logistics

The intermediate results show that the target values of the first KPI are already achieved. The second and third KPIs concerning sustainability are lacking behind and will probably not be realized in the remainder of 2020. The fourth KPI is progressing accordingly. The fifth KPI is met in an early stage. Dissemination of knowledge from the Topsector Logistics is measured on project level. The sixth KPI shows a negative trend as the rank of the Netherlands is decreasing in the last three surveys. The intermediate KPI measurements and monitoring are used to adjust policies and led to additional programs like the Green Deal to meet the sustainability goals.

In 2019, a joint ambition for 2050 is presented by the Ministry of Infrastructure and Water, the Topsector Logistics and the Logistics Alliance. In 2050, the logistics system in the Netherlands is competitive, emission free and safe. The infrastructure, which includes hardware, software and so-called orgware, is robust for all transport modalities. The logistics system balances reduction costs and its carbon footprint whilst increasing quality. Optimal accessibility is combined with high sustainability norms. The network of water- and railways, roads and pipelines is optimally utilized and integrated. Cargo can be switched between modalities whilst ensuring low costs, timeliness and handling efforts. Required investments include public- and private partnerships and are based on innovative approaches. In the period towards 2050 the mind shift will take place from economic value add to a broader contribution in terms of livability and wellbeing. An integrated network of modalities is the foundation for a synchromodal logistics system that is adaptive, innovative and cost efficient to offer superior services. This joint ambition for 2050 is the basis for the action agenda for the period 2020-2023. In the next sections Logistics Hotspots and Regional Logistics Ecosystems are introduced.

1.2. Logistics Hotspots

In 2005, the Dutch magazine *Logistiek* published a map with Logistics Hotspots in the Netherlands. The aim was to assess the strengths and weaknesses of each Logistics Hotspot in regard logistics, distribution and related activities. A group of experts assessed 14 Logistics Hotspots based on 7 criteria using a plus-minus method. Based on the first edition, the criteria were slightly adapted and more logistics locations were included. The following criteria are assessed: 1) availability of personnel, 2) availability of space and real estate property, 3) cooperation of the local government and municipality,

¹ The World Logistics Performance Index (WLPI) of the World Bank, available online <https://lpi.worldbank.org/>

4) employability and motivation of employees, 5) presence of good infrastructure and 6) accessibility of the Logistics Hotspot. Criteria 1-3 are assessed by all experts and criteria 4-6 are based on preference voting. Since 2016, the Logistics Hotspots Map is used in a more standardized way for an annual assessment and ranking of the 28 Logistics Hotspots in the Netherlands. Next to the award for the number 1 ranking, awards are given to the best cross-border hotspot and e-fulfillment hotspot. In the 2019 and 2020 ranking, a runner-up position is awarded. The Logistics Hotspots Map is renown in the Dutch logistics industry and used by policy makers and network organizations for regional development and branding. Figure 2 depicts the first and most recent maps.



Figure 2: Logistics Hotspots Map from 2005 and 2020 (image sources: Logistiek.nl)

1.3. Regional Logistics Ecosystems

In 2019, Buck Consultants International presented a comprehensive framework to analyse Regional Logistics Ecosystems. Figure 3 depicts the framework for analysis of Regional Logistics Ecosystems.

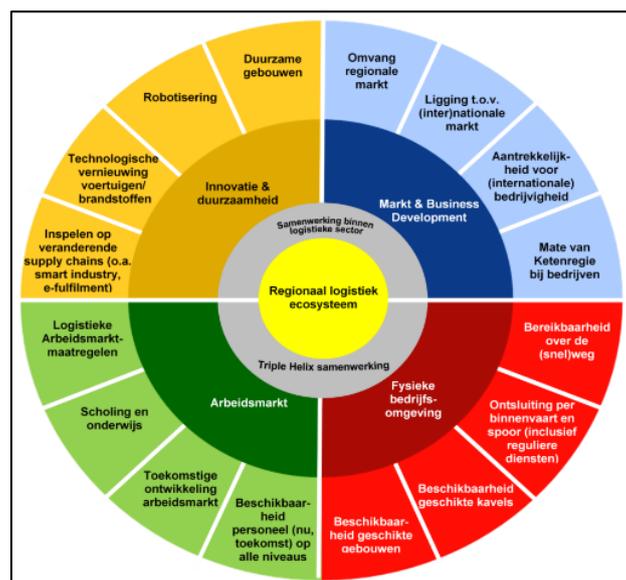


Figure 3: framework to analyse Regional Logistics Ecosystems (image source: BCI, 2019)

This framework is designed to assess 4 main categories, covering 16 factors and measuring 52 indicators. The authors state that 85% of the indicators are based on quantitative data and the remaining 15% based on expert opinion. The weights of the 16 factors is based on the experience of Buck Consultants International. The categories are 1) size of the surrounding market and opportunities for business development, 2) the physical infrastructure for logistics facilities, 3) the labour market for a distribution center and 4) the level of sustainability and innovation in logistics processes. In the hearth of the framework collaboration in the sector and triple helix collaborations are positioned. The authors argue that the region is a better unit of analysis for the assessment and improvement of logistics ecosystems, because the labour market, real estate market and multi-modal connections differentiate on this level. Taken together, the Regional Logistics Ecosystem framework provides an overall insight in the current and future potential of the 40 COROP regions in the Netherlands. Based on the context and background, the purpose of this position paper will be stated in the next section.

1.4. Purpose of the paper

Based on the underlying documents and analysis of the dashboard of TKI DINALOG, there is no explicit link found between the 2050 ambition and the 2020-2023 action agenda of the Topsector Logistics and Logistics Hotspots and Regional Logistics Ecosystems. Logistics Hotspots and Regional Logistics Ecosystems seem to be Dutch terms and clear definitions are not provided. The purpose of this paper is to analyze the Logistics Hotspots and Regional Logistics Ecosystems in the Netherlands and investigate how triple helix collaboration can be aligned with the 2050 ambition of the Dutch Topsector Logistics and its action agenda for 2020-2023. More specific, the Logistics Hotspot and Regional Logistics Ecosystem of Port of Twente will be analyzed. The main research question is:

how can Port of Twente develop its Logistics Hotspot as a Regional Logistics Ecosystem and align its business development plan to contribute to the 2050 ambition and action agenda for 2020-2023 of the Dutch Topsector Logistics?

Following the contextual background information, purpose of the paper and main research question, the next and last section of this chapter provides an overview of structure and contents of the paper.

1.5. Structure of the paper

The remaining part of this paper proceeds as follows. The second chapter is concerned with the methodology that is used for this study and describes the methods and approaches taken. The third chapter lays out the theoretical dimensions of the research, and looks at the concepts and theories that can be used for the analysis of Logistics Hotspots and Regional Logistics Ecosystems. The fourth chapter presents the findings of the research. The first part focuses on the three research themes: Logistics Hotspots, Regional Logistics Ecosystems and alignment with the Topsector 2050 ambition and 2020-2023 action agenda. The second part highlights the results of the in-depth analysis of the Logistics Hotspot Port of Twente using the framework for Regional Logistics Ecosystems and presents the business development plan and technology roadmap. The fifth chapter will summarize and critically assess the findings, draw conclusions in regard the aim and main research question and discuss the implications and limitations of the study. The chapter concludes by providing recommendations for future research and advices for policy makers and practice.

2. Methodology

Following the purpose of the paper and the main research question described in the introduction, this chapter describes the research design and methods used to conduct research. In the first section the overview of the research design and its phases is provided. The methods used in each phase are subsequently explained briefly in separate sections. The second section describes how the analysis of Port of Twente is made. The third and final section addresses how this research concludes the course work for the PDEng course.

2.1. Research design

The methodological approach taken in this study is based on research design principles of (Verschuren & Doorewaard, 2007). Figure 4 depicts the research design and its phases.

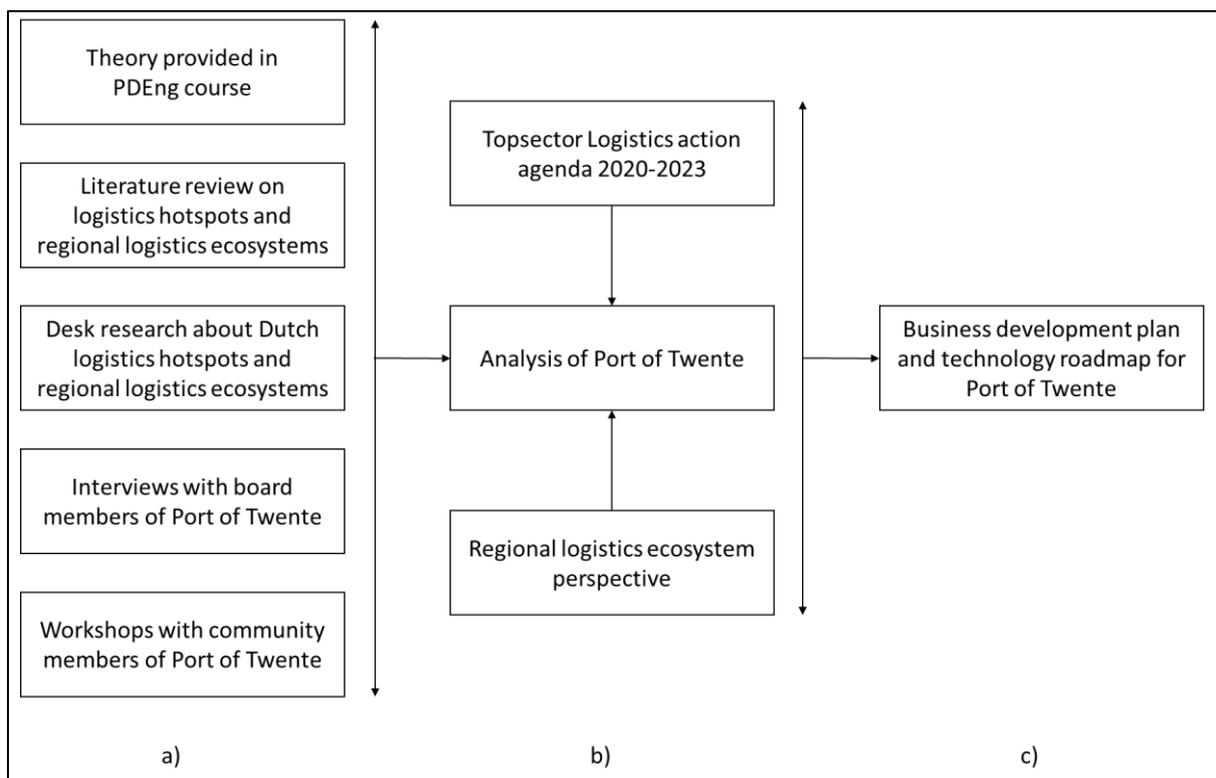


Figure 4: research design and phases, adapted from (Verschuren & Doorewaard, 2007)

The research design is split into three phases. Phase a) covers all research related activities. Research is conducted based on theory provided by experts, a literature review and desk research about Dutch Logistics Hotspots and Regional Logistics Ecosystems, interviews with board members of Port of Twente and workshops with community members of Port of Twente. Phase b) will use the results of the research activities of phase a) to analyze Port of Twente. This analysis will be done using both the perspective of the Regional Logistics Ecosystem framework and the Topsector logistics action agenda 2020-2023. Based on research and analysis in phase a) and b), a business development plan and technology roadmap have been developed for Port of Twente in phase c). The next section describes the methods used for each research activity.

2.2. Research methods

2.2.1. Theory provided from PDEng course

This paper concludes the course Technology Development and Management of the Professional Doctorate in Engineering program of the University of Twente. The course provides insights and

specific tools and techniques to identify emerging new technologies, analyze their potential value and develop roadmaps for implementing new technologies successful. The materials and literature provided by Prof. Dr. Ir. J.I.M. Halman are used as a starting point for this research.

2.2.2. Literature review

In order to lay a theoretical foundation for the analysis of Logistics Hotspots and Regional Logistics Ecosystems, additional literature is gathered. The literature review is based on the five-stage process based on grounded theory of (Wolfswinkel, Furtmueller, & Wilderom, 2013). This iterative approach is utilized to develop a theory-based and concept-centric review of literature in a specific area. The five stages are 1) define, 2) search, 3) select, 4) analyze and 5) present. The define stage contains tasks to define criteria for in- and exclusion, identifying fields of study, determining sources and defining search terms. The search stage is an interactive stage that is conducted based on the define stage and can be repeated based on refinement in the select stage. The results of the search and analysis are structured and coded in the analyze stage and represented in the present stage. The next chapter describes the application of the five-stage process and summarizes the results of related work.

2.2.3. Desk research

Secondary research data is collected and summarized about Logistics Hotspots and Regional Logistics Ecosystems. Desk research is selected over field research due to practical constraints. The aim of the desk research is to provide an overview of rankings of the 28 Logistics Hotspots in the period 2005-2020 and identify (related) Regional Logistics Ecosystems in the Netherlands. Online desk research is selected as the method to collect the rankings from the website of Logistiek.nl and the search engine of Google is used to search for (related) Regional Logistics Ecosystems. The websites of identified Regional Logistics Ecosystems are analyzed and available business plans and reports are retrieved for review. The website of the Topsector Logistics is consulted to gather contextual information and relevant documents describing the 2050 ambition and 2020-2023 action agenda. Internal desk research is conducted by reviewing the business plan of Port of Twente, the results of a survey among members and presentation of the annual membership meeting of 2018.

2.2.4. Interviews

Primary research data is collected using interviews with board members of Port of Twente. In the period June 2019 – September 2019, all 12 board members of the Logistic Association, the managers of XL Businesspark and Havenbedrijf Twente and 33 members of the logistics community are interviewed. Unstructured interview methods are applied to gather qualitative input for the analysis of Port of Twente. Intermediate results of the Regional Logistics Ecosystem are presented during the board meeting of the Logistic Association 14-10-2019. The input gathered during the interviews is used for the analysis of Port of Twente. Notes of the interviews can be made accessible upon request.

2.2.5. Workshops

Based on preliminary research, the concept of a learning community is considered an promising approach to connect triple helix projects of the Topsector Logistics to a broader audience. In order to explore the potential of a learning community, workshops were organized with board members of Port of Twente and its community members. The first workshop was held on 05-12-2019 with representatives of ROC van Twente, Saxion and University of Twente. The second workshop was held on 12-12-2019 with 25 community members. The input gathered during the workshops is used for the analysis of Port of Twente.

2.3. Analysis of Port of Twente

The results from interviews and internal desk research are used in phase b) to analyze Port of Twente based on the framework for Regional Logistics Ecosystems. Intermediate results are presented in a

board meeting for validation. For each category of the framework for Regional Logistics Ecosystems, a board member is appointed to craft a presentation for the annual new year's event. The results and findings are presented during the annual new year's event of Port of Twente 20-01-2020 to 75 participants. The presentation is included as appendix. The alignment with the 2050 ambition and 2020-2023 action agenda is investigated based on the results of the research activities. The results of the analysis will be presented to the board members of Port of Twente for validation and refinement.

2.4. Course work

The results of the research activities and analysis of Port of Twente are used in phase c) to create a business development plan and technology roadmap. This phase concludes the research and course work for Technology Development and Management of the PDEng program of the researcher. The results of the analysis will be presented to the board members of Port of Twente for validation and refinement and to Prof. Dr. J.I.M. Halman to assess the course work and provide feedback for further development.

3. Literature review

Ecosystems are widely studied by scholars from different disciplines and many research exist in regard business ecosystems. Studying the concepts and theories of business ecosystems contributes to better understanding of Logistics Hotspots and Regional Logistics Ecosystems. This chapter describes how the literature review is conducted and summarizes its results. In addition, selected literature from a literature review about business ecosystems is summarized. Taken together, this chapter provides the theoretical framework for analysis of Logistics Hotspots and Regional Logistics Ecosystems and development of the business development plan and technology roadmap.

3.1. Search process

3.1.1. Define

Based on the purpose described in the introduction, the scope of the literature review is related to the topics Logistics Hotspots and Regional Logistics Ecosystems. Due to the local origin of these terms, both Dutch and English variants are used as search terms for an initial search using FINDUT². The search terms are “logistieke hotspot”, “logistics hotspot”, “regionaal logistiek ecosysteem” and “regional logistics ecosystem”. Brownzine³ is used to find relevant journals. Ecosystems are studied in multiple disciplines, including biological-, earth-, environmental-, social sciences, business and economics. For the purpose of this study, the focus is on business and economics. The search term is “ecosystems”.

3.1.2. Search

Table 2 displays the results of the initial search in FINDUT.

Search term	Results UT library	Results world wide	Decision
“logistieke hotspot”	-	3.	All 3 results added to selection.
“logistics hotspot”	463. Limit to business and economics (1).	1.041. Limit to business and economics (3).	No selection made.
“regionaal logistiek ecosysteem”	-	-	-
“regional logistics ecosystem”	3.405. Limit to business and economics (-).	5.244. Limit to business and economics (13).	1 eBooks selected about supply chain ecosystems.

Table 2: initial search results in FINDUT

The 3 results from the search on “logistieke hotspot” are directly relevant for the research and added to the selection. Search results on the keywords “logistics hotspot” and “regional logistics ecosystem” lead to 6.285 results. Limiting the search with filters for disciplines business and economics reduced the results to 16 articles of which 1 eBook is considered relevant. Based on these initial results, the databases of Scopus, Web of Science and Google Scholar are selected to do a second, more specific, search. Table 3-5 displays the search results of searches in Scopus, Web of Science and Google Scholar.

Search term	Results	Decision
“logistieke hotspot”	-	-
“logistics hotspot”	339. Limit to business and economics (22).	Nothing selected.

² The search engine of the University of Twente, accessible via <https://www.utwente.nl/en/lisa/library/>

³ The journal finder provided by the University of Twente, accessible via <https://browzine.com/>

“regionaal logistiek ecosysteem”	-	-
“regional logistics ecosystem”	203. Limit to business and economics (13).	Nothing selected.

Table 3: search results in Scopus

Search term	Results	Decision
“logistieke hotspot”	-	-
“logistics hotspot”	299. Limit to business and economics (9).	Nothing selected.
“regionaal logistiek ecosysteem”	-	-
“regional logistics ecosystem”	155. Limit to business and economics (5).	1 journal paper selected.

Table 4: search results in Web of Science

Search term	Results	Decision
“logistieke hotspot”	33.	9 research items are added to selection.
“logistics hotspot”	14.	1 Research paper added to selection.
“regionaal logistiek ecosysteem”	-	-
“regional logistics ecosystem”	8.	1 Journal article added to selection.

Table 5: search results in Google Scholar

Table 6 depicts the results of the search in Brownzine for relevant journals. Based on the scope of the search and selected disciplines, 1 journal is included for further search.

Search term	Journal	Decision
“ecosystems”	Ecosystem health and sustainability	Excluded based on discipline
	Ecosystem services	Excluded based on discipline
	Aquatic ecosystem health and management	Excluded based on discipline
	International journal of biodiversity science, ecosystem services and management	Excluded based on discipline
	One ecosystem	Excluded based on discipline
	Ecosystems	Excluded based on discipline
	Agriculture, Ecosystems & Environment	Excluded based on discipline
	Aquatic Conservation: Marine and Freshwater Ecosystems	Excluded based on discipline
	Aquatic Ecology and Ecosystems	Excluded based on discipline
	Arid Ecosystems	Excluded based on discipline
	Forest Ecosystems	Excluded based on discipline
	Urban Ecosystems	Excluded based on discipline
	Nutrient Cycling in Agroecosystems	Excluded based on discipline
	Environment and ecosystem science	Excluded based on discipline

	Journal of aquatic ecosystem health	Excluded based on discipline
	Russion journal of ecosystem ecology	Excluded based on discipline
	Water quality and ecosystem modeling	Excluded based on discipline
	Ecosystems and People	Excluded based on discipline
	Agro-Ecosystems	Excluded based on discipline
	Forest Ecosystems (via ProQuest)	Excluded based on discipline
	Journal of Innovation in Digital Ecosystems	Included based on discipline
	Knowledge and Management of Aquatic Ecosystems	Excluded based on discipline
	Tropical and subtropical agroecosystems	Excluded based on discipline

Table 6: search results in Brownzine

The Journal of Innovation in Digital Ecosystems published 3 volumes and is not active anymore. Based on the titles, abstract and keyword, none of the published articles are considered relevant.

3.1.3. Select

16 research items are collected and their contents are assessed. 3 Duplicates were removed. Table 7 displays the selected 13 research items and reasons for in- or excluding the item for further analysis.

Year	Author(s)	Type	Title	Reason in- /excluding
2016	Raimbault, N., Jacobs, W., & Van Dongen, F.	Journal paper	Port regionalisation from a relational perspective: the rise of Venlo as Dutch international logistics hub	Regional perspective on one of the Logistics Hotspots in the Netherlands. Included.
2016	Onstein, A. T. C., Visser, J. G. S. N., van Ham, J. C., & Tavasszy, L. A.	Research paper	Trends in distribution centres and their locations	Research related to Logistics Hotspots. Included.
2015	Looman, J. Canisius, P., Smaal, P., Kleijne, P., Overbeeke, N., Blansjaar, M., Zwart, M., Scheer, F.P. & Snels, J.C.M.A.	Report	Strategische visie Logistieke Hotspot Rivierenland	One of the Logistics Hotspots in the Netherlands. Included.
2013	Knibbe, R.	Master thesis	Logistieke clustering in de regio West-Brabant.	Regional perspective on one of the Logistics Hotspots in the Netherlands. Included.
2013	de Werd, R., Schuur, L., Kloos, W. & Pinxterhuis, B.	Report	'MeerWaarde uit Innoveren' Kennis & Innovatieagenda Betuwse Bloem '13-'15	Regional perspective. Included. Included.
2012	Visser, J., Francke, J., Gordijn H.	Report	Multimodale achterlandknooppunten in Nederland.	National perspective on inland terminals. Included.
2012	Basten, R.	Master thesis	Kiezen voor een regionaal profiel. Een onderzoek naar	Regional study from the perspective of

			de potentie van de regio Venlo op het gebied van regiomarketing en -branding.	marketing and branding. Included.
2011	Fang, Y.H, Xu, J.	Journal article	Dynamic model of collaborative evolution of industrial cluster.	Research about evolution of industrial cluster from a logistics perspective. Not available for download.
2011	Kok, G.J.	Report	Onderzoek Logistieke draaischijf Twente de regio als concurrerende hotspot.	Regional perspective on one of the Logistics Hotspots in the Netherlands. Included.
2010	Boeve, R. & Hospers, G.J.	News item	Hotspot Noord-Limburg vecht tegen de krimp.	Opinion article related to Logistics Hotspots. Subjective. Excluded.
2010	Hofstra, L.	Bachelor Thesis	Spreading achterlandknooppunten.	National perspective on inland terminals for multimodal connections. Included.
2008	van Westerop, W. & Clanzett T.	Bachelor thesis	Eenheid in verscheidenheid? Een onderzoek naar de mogelijkheden voor het uitvoeren van een studie naar de concurrentiekracht van de agrobusiness in de grensregio Venlo / Niederrhein.	Regional study from the perspective of marketing and branding. Included.
2005	Millar, M.	eBook	Global supply chain ecosystems: strategies for competitive advantage in a complex, connected world.	Partly available in Google Books. Not available for download.

Table 7: selected research items

3.1.4. Analyze

10 research items are included for analysis based on the defined scope and search results in the selected databases. Very few scientific research items are found in regard Logistics Hotspots and Regional Logistics Ecosystems. Despite the limited amount, the research items provide relevant theory and in-depth insights for this research. The Bachelor- and Master theses and Reports provide in-depth insights and data about several Logistics Hotspots and Regional Logistics Ecosystems. Additional literature about business ecosystems is obtained via an additional search on “business ecosystems”, limiting the search results on review articles and filtering based on highest amount of citations. Due to practical constraints the top 10 results were analyzed and a the systematic literature review of (Scaringella & Radziwon, 2018) is added to this research.

3.1.5. Present

The results of the literature review and analysis of collected research items and insights from review articles about business ecosystems are presented in the next section.

3.2. Related work

3.2.1. Logistics Hotspots and Regional Logistics Ecosystems

The journal article of (Raimbault, Jacobs, & van Dongen, 2016) about port regionalisation contains relevant scientific work and backgrounds that can be linked to the origin and development of Logistics Hotspots and Regional Logistics Ecosystems. The authors use a relational perspective to analyse how several actors, connected to local governments, collaborate together in actor-networks based on an institutionalized structure to enable growth of logistics activities. The work provides in-depth observation of one of the leading Logistics Hotspots and its governance model. Unfortunately, the journal article of Fang, Y.H, Xu, J. (2011) could not be retrieved. This article was expected to contain additional, detailed theory and research insights about the evolution of industrial clusters from a logistics perspective. The research paper of (Onstein, Visser, van Ham, 2016) provides interesting insights in trends and developments in distribution centers and their location. The study illustrates polarization in the periphery of the Netherlands, also including areas as Venlo and Tilburg, and elaborates how surrounding regions have been forming new logistics clusters. Another phenomenon that is observed, is the growing demand for large distribution centers, in specific for e-commerce operations. The authors relate this phenomenon to the concept of logistics sprawl, which is defined as “the spatial deconcentration of logistics facilities and distribution centers in metropolitan areas” and refer to studies of Dablanc (2014) and Visser and Francke (2015) that studied sprawl of Dutch Logistics Hotspots and their relation with container transshipment by rail and inland waterways. The authors relate to these studies and state that “regions containing a large amount of logistics real estate also exhibit a large amount of container transshipment via rail and inland waterways”. The report of (Visser, Francke, & Gordijn, 2012) and Bachelor thesis of (Hofstra, 2010) provide in-depth data about the regional presence and spread of both inland terminals and rail terminals.

3.2.2. Theoretical framework for business ecosystems

Based on the systematic literature review of (Scaringella & Radziwon, 2018), the field of ecosystems is mapped and structured. Figure 5 depicts the theoretical framework for business ecosystems.

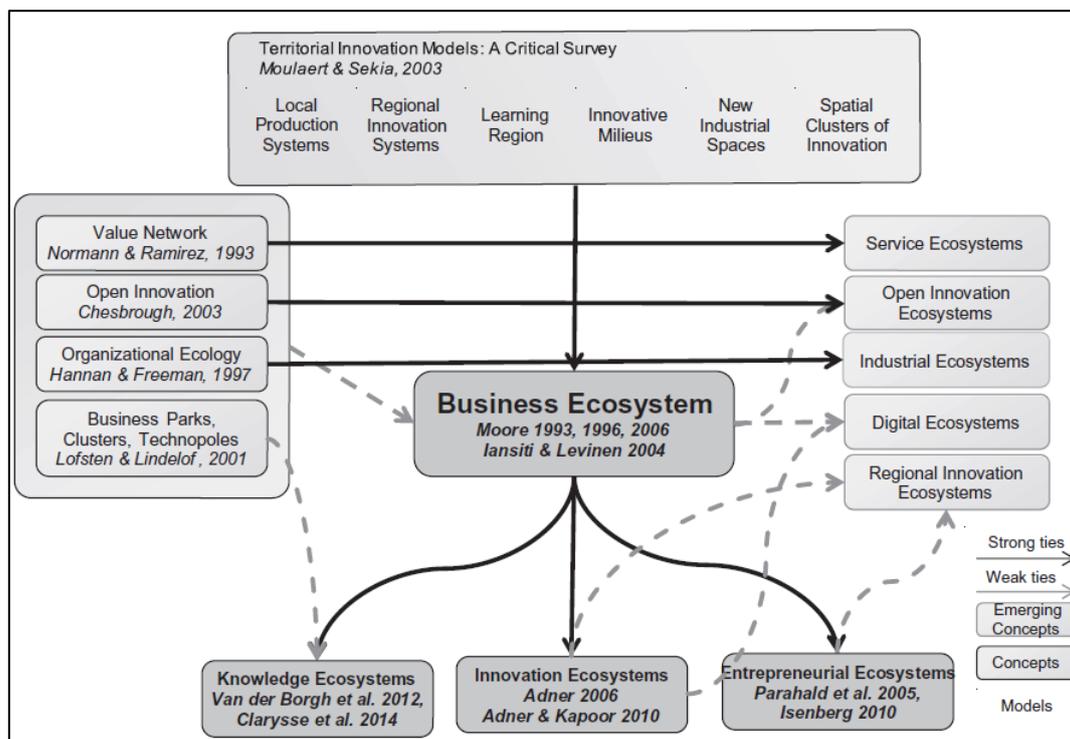


Figure 5: overview of key ecosystem concepts (image source: Scaringella & Radziwon, 2018)

The authors identified and discuss four main types of ecosystems: business-, innovation-, entrepreneurial- and knowledge ecosystems and related concepts. Based on the territorial approach, the authors provide an overview of theories, archetypes and invariants. Based on their findings, the authors present a taxonomy of ecosystems, containing business (62 articles), innovation (25 articles), entrepreneurial (9 articles) and knowledge ecosystems (3 articles).

Selected definitions for the business ecosystem are based on Iansiti and Levien (2004), Li (2009), Moore (1993), Moore (1996), Zhang and Liang (2011).

“Loose networks – of suppliers, distributors, outsourcing firms, makers of related products or services, technology providers, and a host of other organizations – affect, and are affected by, the creation and delivery of a company's own offerings. Like an individual species in a biological ecosystem, each member of a business ecosystem ultimately shares the fate of the network as a whole, regardless of that member's apparent strength.”

“An economic community supported by a foundation of interacting organizations and individuals [...] produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. Over time, they coevolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies.”

Selected definitions for the Innovation ecosystem are based on Gastaldi et al. (2015), Leten et al., (2013), Li and Garnsey, 2014, Nambisan and Baron, 2013.

“The collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution. Enabled by information technologies that have drastically reduced the costs of coordination, innovation ecosystems have become a core element in the growth strategies of firms in a wide range of industries.”

Selected definitions for the Entrepreneurial/entrepreneurship ecosystem are based on Prahalad (2005), Isenberg (2010), Spigel (2015), Autio et al. (2014), Suresh and Ramraj (2012).

“The entrepreneurship ecosystem consists of a set of individual elements – such as leadership, culture, capital markets, and open-minded customers – that combine in complex ways.”

“The market-based ecosystem allows private sector and social actors, often with different traditions and motivations, and of different sizes and areas of influence, to act together and create wealth in symbiotic relationship. Such an ecosystem consists of wide variety of institutions coexisting and complementing each other.”

Selected definitions for the Knowledge ecosystems are based on Clarysse et al. (2014), van der Borgh et al. (2012).

“The flow of tacit knowledge between companies and the mobility of personnel have been advanced as the main advantages of geographic colocation which characterize these hotspots. Such hotspots have been characterized as knowledge ecosystems where local universities and public research organizations play a central role in advancing technological innovation within the system.”

The authors identified seven streams of literature related to 1) Industrial Districts, 2) Marshallian Districts, 3) Innovative Milieus, 4) Regional Innovation Systems, 5) New Industrial Spaces, 6) Localized Learning, and 7) Regional Clusters and propose a research framework which can serve as a foundation for future empirical research (Scaringella & Radziwon, 2018).

4. Research results

This chapter describes the results of desk research that is carried based on the annual rankings of the Logistics Hotspots in the Netherlands and the report about Regional Logistics Ecosystems. First, the collected research data of the annual rankings of 28 Logistics Hotspots and the framework for analysis of Regional Logistics Ecosystems are presented. Next, 27 identified Regional Logistics Ecosystems are classified based on the taxonomy for ecosystems. Subsequently, alignment with the Topsector Logistics 2050 ambition and 2020-2023 agenda are investigated and the framework for Regional Logistics Ecosystems is applied to analyze Port of Twente. This chapter concludes with the deliverables of the course work and presents a business development plan and technology roadmap.

4.1. Desk research

4.1.1. Logistics Hotspots Rankings 2016-2020

Based on desk research, the first Logistics Map and all rankings of the Logistics Hotspots in the period 2006-2020 are collected. Not all maps are available in high resolution formats and the names of hotspots are not congruent in the period 2006-2015. Therefore, a comparison of rankings is made based on rankings in the period between 2016-2020. Table 8 presents the rankings in this period.

Logistics Hotspot	2016	2017	2018	2019	2020
Tilburg-Waalwijk	3	3	2	1	1
Venlo-Venray	1	2	3	2	4
West-Brabant (Oosterhout-Breda-Roosendaal-BergenopZoom-Moerdijk)	2	1	1	3	2
Almere-Lelystad-Zeewolde	18	21	12	4	3
Rivierenland (Tiel-Geldermalsen-Zaltbommel)	8	4	4	5	7
Oss-Veghel-'s Hertogenbosch	4	5	7	6	8
A12 corridor (Lansingerland-Zoetermeer-Zuidplas-Waddinxveen)	19	14	14	7	5
Twente (Almelo-Hengelo-Enschede)	10	10	9	8	6
Utrecht (Lage Weide) -Nieuwegein-Vianen	11	6	5	9	11
Arnhem-Nijmegen	7	11	13	10	14
Zuid-Limburg (Maastricht-Heerlen-Sittard-Geleen)	9	13	11	11	9
Eindhoven-Helmond	5	8	8	12	13
Keyport Midden Limburg (Roermond-Weert)	14	7	10	13	10
Liemers (Duiven-Westervoort-Zevenaar-'s Heerenberg)	16	15	16	14	16
Schiphol	6	9	6	15	17
Drechtsteden	21	26	21	16	12
Hoogeveen	27	24	28	17	18
Rotterdam-Nieuw Reijerwaard	13	12	15	18	22
Maasvlakte I en II	12	16	18	19	20
Vlissingen-Terneuzen	20	18	23	20	21
Stedendriehoek (Apeldoorn-Deventer-Zutphen)	23	20	20	21	23
IJsseldelta (Zwolle-Kampen-Meppel-Hasselt-Nieuwleusen)	15	19	19	22	15
Dryport Emmen-Coevorden	26	22	25	23	28
Noordzeekanaalgebied (Havengebied Amsterdam-Westas)	17	17	17	24	24
Emmeloord	24	27	22	25	25
Delfzijl-Eemshaven	25	23	27	26	19
Heerenveen-Drachten	22	25	24	27	26
Alkmaar-Enkhuizen	28	28	26	28	27

Table 8: overview of the Logistics Hotspots rankings in the period 2016-2020

4.1.2. Regional Logistics Ecosystems 2019

Based on data of the 40 COROP regions in the Netherlands, a national ranking of Regional Logistics Ecosystems is published. Figure 6 depicts the 40 COROP regions on the map.

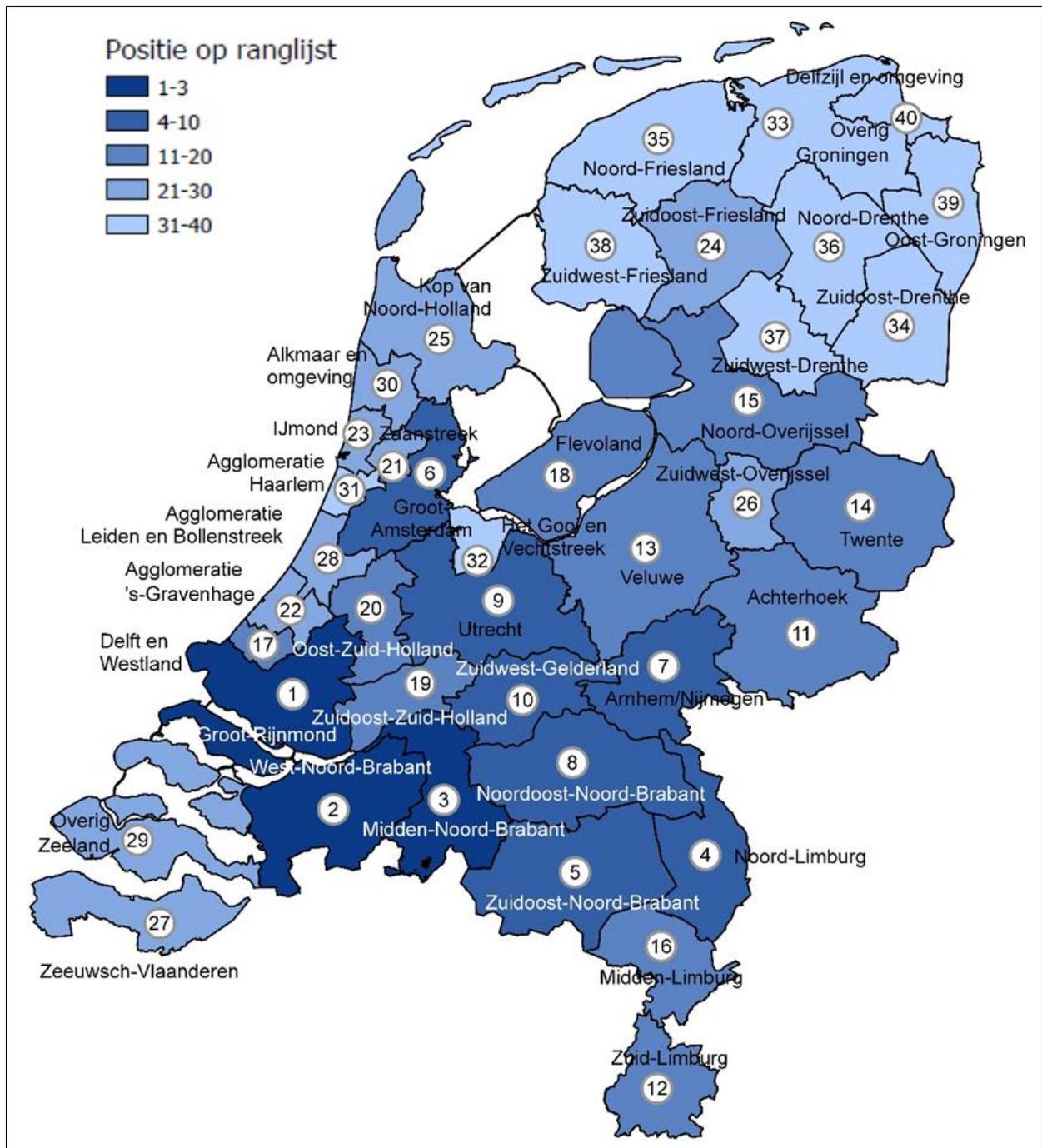


Figure 6: ranking of the 40 regions in the Netherlands (image source: BCI, 2019)

The legend on the map illustrates the clustering of logistics activities around the periphery in the Netherlands. Most logistics activities are clustered around the main port areas near Rotterdam and Amsterdam. The hinterland connection via Noord-Brabant and Limburg are also clearly visible. Figure 7 on the next page depicts the scores of the 40 COROP regions as Regional Logistics Ecosystems.

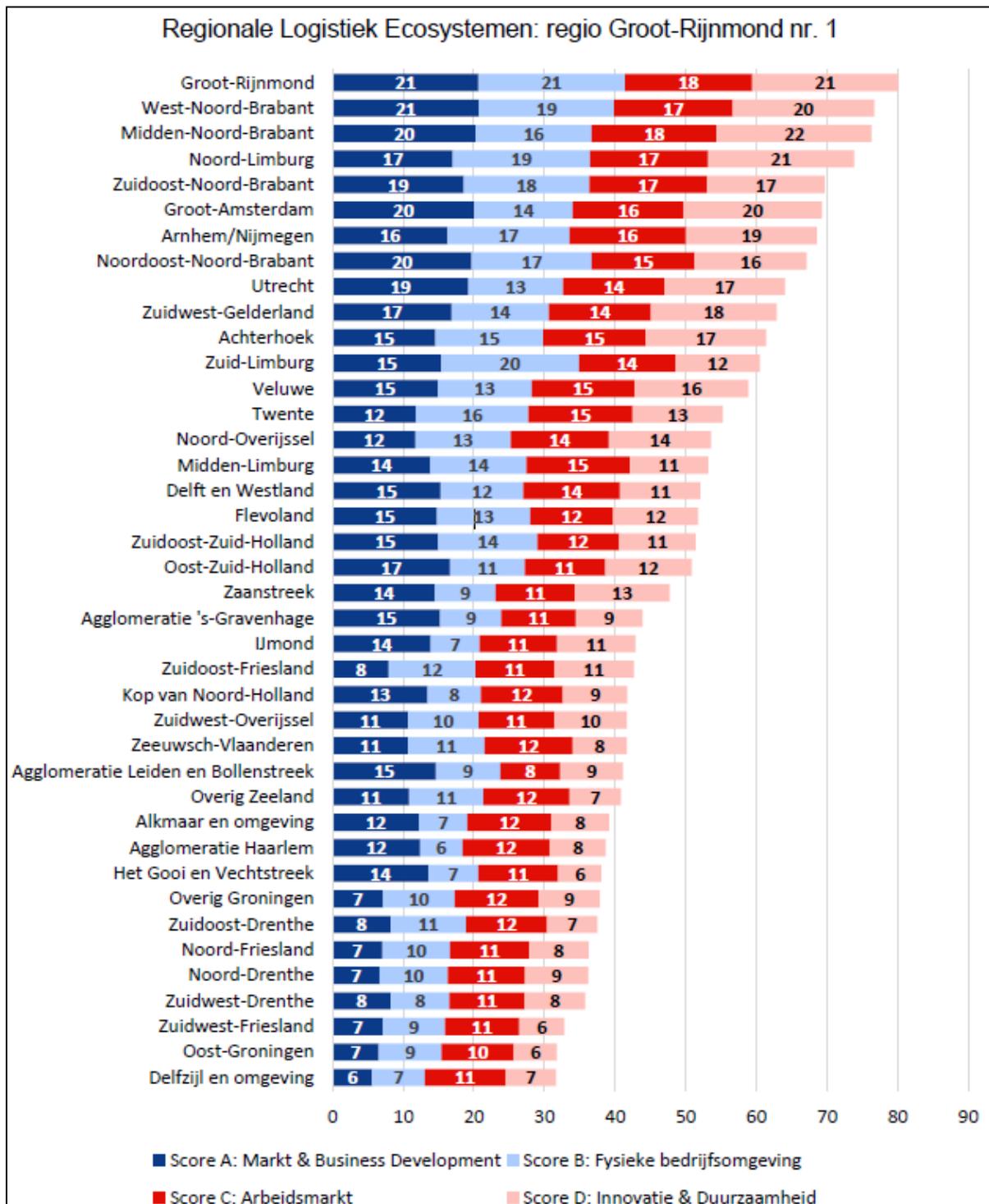


Figure 7: scores Regional Logistics Ecosystems (image source: BCI, 2019)

In their report, the authors describe the categories, factors and weights. The study provides a snapshot of the 40 COROP regions and score per category. Unfortunately, the detailed research data is not published. The authors state that the weights are based on the extensive experience in location studies and that the factors can be used for qualitative assessment of the Regional Logistics Ecosystem to determine its strengths, weaknesses, opportunities and threats.

4.1.3. Identification and classification of ecosystems

Based on the desk research, 27 Regional Logistics Ecosystems are identified and classified using the taxonomy presented in the theoretical framework as shown in table 9.

Identified Regional Logistics Ecosystem	Business	Innovation	Entrepreneurial	Knowledge
Cleantech Regio https://www.cleantechregio.nl/		X	X	X
Connected West-Brabant https://www.connected-westbrabant.nl/			X	X
DeltaLinqs https://www.deltalinqs.nl/homepage		X	X	X
Distripark Dordrecht https://distriparkdordrecht.nl/			X	
ELC Limburg https://www.elc-limburg.nl/		X	X	X
Greenport Venlo https://www.greenportvenlo.nl/			X	
Greenport West Holland https://greenportwestholland.nl/		X	X	X
Keyport https://www.keyport.nl/nl		X	X	X
Lageweide https://lageweide.nl/			X	
Logistics Valley https://www.logisticsvalley.nl/nl/platform/hotspots		X	X	X
Logistiek Cluster Flevoland https://lcflevoland.nl/			X	X
Logistiek Platform Noord-Oost Brabant https://www.logistiekplatformnoordoostbrabant.nl/			X	X
Logistiek Platform Oss https://logistiekplatformoss.nl/			X	
Logistiek Platform Roosendaal https://www.logistiekplatformroosendaal.nl/			X	X
Logistiek Platform 's Hertogenbosch http://www.logistiekplatformshertogenbosch.nl/		X	X	
Logistieke Community Brabant https://lcb.nu/		X	X	X
Midpoint Brabant https://www.midpointbrabant.nl/		X	X	X
Port of Amsterdam https://www.portofamsterdam.com/		X	X	
Port of Deventer http://www.portofdeventer.nl/			X	
Port of Logistics Overijssel https://portoflogisticsoverijssel.nl/		X	X	X
Port of Moerdijk https://www.portofmoerdijk.nl/			X	
Port of Rotterdam https://www.portofrotterdam.com/nl		X	X	X
Port of Twente https://www.portoftwente.com/			X	X
Port of Zwolle https://portofzwolle.nl/			X	
Schiphol Area Development Company https://www.sadc.nl/		X	X	
Vijfsterren Logistiek https://www.vijfsterrenlogistiek.nl/		X	X	X
Zeeland Connect https://www.zeeland-connect.nl/		X	X	X

Table 9: identified and classified Regional Logistics Ecosystems

Based on the provided definitions, classification rules are defined to analyse the identified Regional Logistics Ecosystems. A business ecosystem is classified based on clustering of actors with direct dependencies. An innovation ecosystem is classified based on clustering of actors to combine offerings into an integrated solution or proposition. An entrepreneurial ecosystem is classified when clustering is based on a variety of institutions with complementing solutions or propositions. A knowledge ecosystem is classified when clustering is based on the presence of local universities and public research organizations. Due to practical limitations and the lack of public available research data and complementary reports, the ecosystems invariants approach and conceptual framework are not applied to analyse all 27 Regional Logistics Ecosystems in-depth.

4.1.4. Alignment with the Topsector Logistics

The ambition of the Topsector Logistics for 2050 is to develop a competitive, sustainable and safe logistics system. In their policy document, the objectives and conditions are described. Concerning the activities related to chain management activities, including flows that do not pass through the Netherlands, the goal is to have an economic added value of at least € 29 billion by 2050. In regard the international competitive position, the Netherlands ranks number 1 in a number of international rankings related to logistics performance, including the WLPI. Stakeholders will jointly and in close consultation determine which sustainability-related indexes will be used, and from which year such a top position must be a fact. In this context, it is important to let the realization of quality objectives weigh more heavily than maximization on volume. The mobility sector in the Netherlands will achieve at least a 49% emission reduction in 2030 compared to 1990, which is approximately 7.3 Mton less CO₂ emissions, of which logistics and freight transport make an important contribution. By 2050, logistics and freight transport will be virtually emission-free, with the emission reduction compared to 1990 being at least 95%. In regard safety, the Netherlands has the most secure logistics system in the world and strives for 0 incidents for both internal and external logistics activities. Revisiting the goals, KPIs and norm values described in the introduction, most of the existing focus areas and KPIs remain in place. Attracting new logistics companies to the Netherlands is however not part of the KPIs, as well as increasing qualifications and skills of the workforce with logistics education and knowledge from the Topsector logistics. The latter is address in the pre-conditions outlined in the policy document.

The targets set for 2030 and 2050 require concrete guidelines. In order to create an action perspective for companies, citizens, researchers and governments, the ambitions and long-term objectives will therefore have to be translated into the short term (2-5 years). This will be done via so-called action agendas and execution programs. These agendas and programs are aimed at clarification for companies and meet issues such as investment security and the harmonization of emission zones. The outlined goals will have to go hand in hand with the maintenance of good international accessibility and a coherent development of the various modes of transport (water, road, rail, air, pipelines). A lot is also expected of companies in transportation and logistics in the coming years. For example, they will not only have to make their business activities 'smarter', but also have to make them more sustainable. When introducing innovative logistics concepts aimed at economies of scale and greater transparency, it is important to have an eye for the connection of small and medium-sized enterprises (SMEs). Specific adaptations and support will have to be arranged for SMEs, so that they too can make the transformation to (e.g. economically) sustainable revenue models. In the short term, all kinds of innovative logistics concepts in our country will be tested, implemented and scaled up as widely as possible. However, the long term should not be overlooked. Research and knowledge development aimed at achieving the goals set for 2030 and 2050 will therefore have to continue to take place.

For the period 2020-2023, the action agenda has been made. The scope and contents are defined in 3 priority themes, 3 application areas and 5 cross cutting themes are outlined. Figure 8 presents an overview of the priority themes, application areas and cross cutting themes.



Figure 8: overview of priority themes, application areas and cross cutting themes (image source: TKI DINALOG, 2019)

The policy makers already formed a steering committee and the program organization is also in place. For each priority theme, a figure head is appointed to create a roadmap as a basis for triple helix collaborations. Flexible networks of experts offer opportunities to connect Logistics Hotspots and Regional Logistics Ecosystems to the 2020-2023 action agenda via tenders and research grants.

4.2. Analysis of Port of Twente

4.2.1. Regional Logistics Ecosystem

This chapter is structured according the framework for Regional Logistics Ecosystems and contain results of the conducted interviews with all 12 board members of the Logistic Association, the managers of XL Businesspark and Havenbedrijf Twente and 33 members of the logistics community. Interview results and highlights from presentations are provided to develop a comprehensive view on the Regional Logistics Ecosystem of Twente. The Regional Logistics Ecosystem of Port of Twente is classified as an entrepreneurial and knowledge ecosystem based on the taxonomy for business ecosystem. The presentations are included in the appendices.

Port of Twente is founded in 2012 by a consortium of transportation companies and logistics services providers to jointly address regional problems and promote logistics in the Twente region. Today, the Logistics Association of Port of Twente unites more than 80 organizations with a diversity of activities and industry segments. The presence and involvement of local Universities, knowledge and research institutes is clearly observable. ROC van Twente, Saxion University of Applied Sciences and the University of Twente are partners of Port of Twente and collaborating intensively. In regard collaboration with governments, Port of Twente is closely cooperating with XL Businesspark and Havenbedrijf Twente. In 2018, the Logistic Association, Havenbedrijf Twente and XL Businesspark decided to join their forces in regard communication and regional development. The organization structure is shown in figure 9 from the perspective of Havenbedrijf Twente. In its currently form, Port of Twente is financed by membership fees and funds of the Region Twente and Provincie Overijssel.

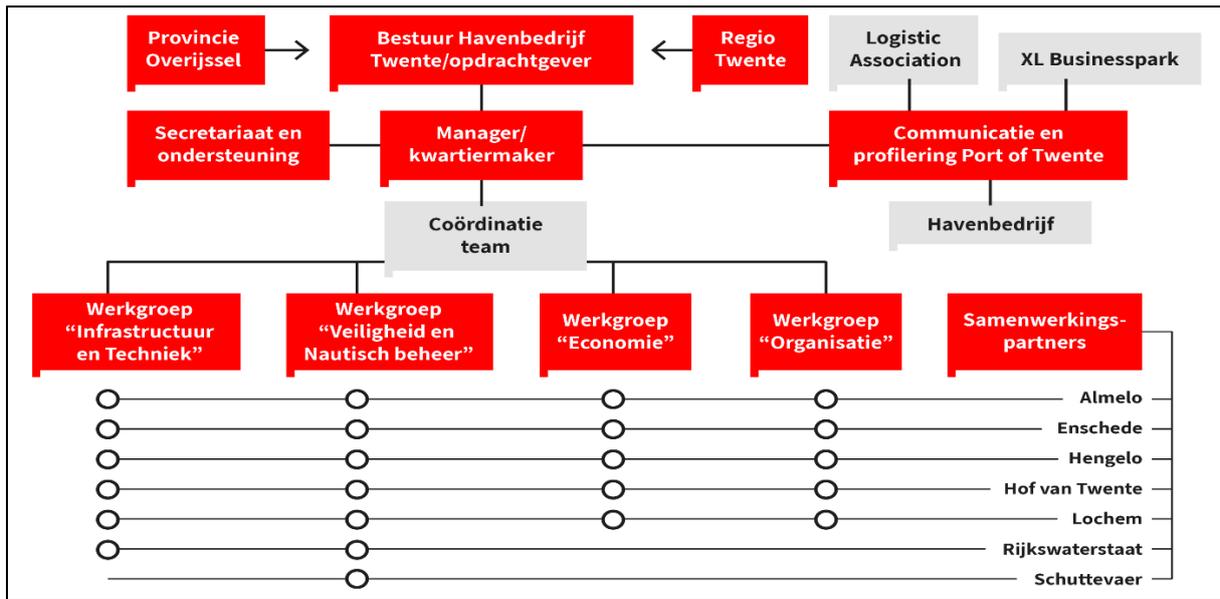


Figure 9: organization structure of Port of Twente

Port of Twente has direct connections with the 5 inland ports in the Twente region, the related municipalities, Rijkswaterstaat and Schuttevaer. In addition, Port of Twente is active member of Port of Logistics Overijssel (POLO), connecting the 3 Logistics Hotspots in Overijssel. Furthermore, Port of Twente is collaborating with Industrial- and Trade clusters in the Twente region and in the EU-Region with the German KNI cluster. Given its position and collaborations, Twente can be seen as a multi-modal cross-border hotspot.

4.2.2. Market and business development

The regional development agency OostNL is responsible for acquisition of new companies and closely collaborates with NDL/NFIA on a National level. Promotion is actively done via trade fairs, but also the organization of events like the National Distribution Day at Airport Twente and the annual Logistics Hotspots Summit at XL Businesspark in Almelo. NDL/NFIA, OostNL, POLO and others, created a so-called bid-book to promote the Eastern part of the Netherlands during a large trade fair in München. The North Sea – Baltic Corridor and unique selling points are displayed in figure 10.



Figure 10: overview of unique selling points in the bid-book of POLO, available at <https://oostnl.nl/nl/BidbookPortsofOverijssel>

Hallmarks in the area of business development are the establishment of the European Distribution Center of Timberland and the landing of Heylen Warehouses to establish T-Port Logistics Campus, a multi-user warehouse facility of 180.000 square meter. The collaboration with Airport Twente and the other 3 co-called top locations offers growth potential. This former military airport offers opportunities for the region to develop maintenance, repair and overhaul activities. The Region Twente promotes the following 4 top locations: High-tech Systems Campus in Hengelo, XL Businesspark in Almelo, Kennispark in Enschede and Technology Base at Twente Airport. OostNL is actively stimulating the development of such a cluster, because it connects the regional high-tech- and logistics industry, knowledge institutes and boosts the regional economy and labour market.

4.2.3. Physical infrastructure

The A1 highway connects the region of Twente to the periphery of the Netherlands and the German hinterland. The A35 is an important connection to the economic region around Zwolle. The inland waterways of the Twentekanaal connect the Twente region to the mainport of Rotterdam. Combi Terminal Twente is one of the largest inland terminal in the Netherlands with locations in Hengelo, Almelo and Rotterdam. As a result of years of lobbying, major infrastructure projects have been attracted to deepen and broaden the Twentekanaal to increase its capacity and contribute to a modal-shift. Also the A1 is currently being broadened as a result of lobby activities and the next focus is on the A35. The main logistics areas in Twente lack quick access to a good rail terminal when compared to other regions. The rail terminals in Coevorden and Bad Benteim are relatively far from logistic clusters. This makes rail transport less attractive. Unique in Twente is the presence of Twente Airport. Figure 11 shows the main connections in the physical infrastructure of the Twente region.

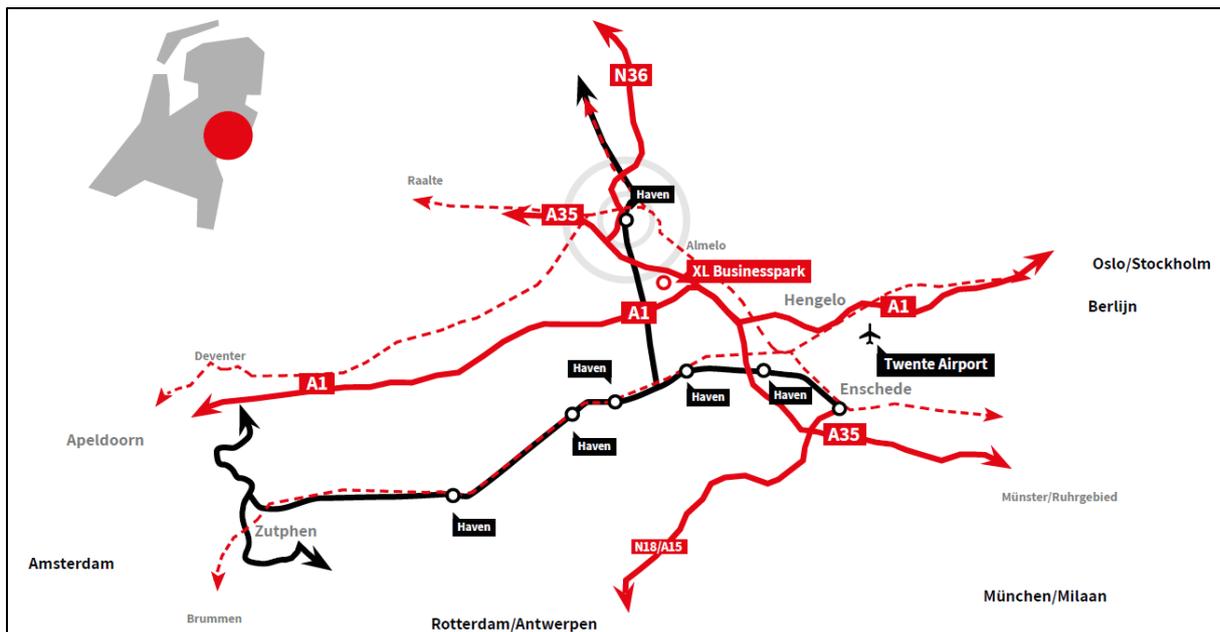


Figure 11: physical infrastructure of the Twente region

4.2.4. Labour market and education

The Twents Huis van de Logistiek is a public-private collaboration between municipalities, social services and companies to promote the logistics industry and guide people (back) to work. This collaboration started on a local level in Almelo, but received additional funding from the Regio Deal to further exploit its success on a regional level. The Twents Fonds voor Vakmanschap offers financial support for people that would like or need to switch careers and facilitates additional education in the form of vouchers. ROC van Twente, Saxion University of Applied Sciences and private educators are

involved to develop tailor-made solutions. The Twents Huis van de Logistiek is initiator of the Week van de Logistiek, an annual event to promote working in the logistics industry and connect talent to businesses. In order to fill the increasing talent gap in the upcoming years, the platform indelogistiek.nl is created as a starting point for a learning community. A learning community is a public-private collaboration that is aimed at creating synergy between learning, working and innovating. Based on the workshop a visualization of the learning community is made and displayed in figure 12.



Figure 12: visualization of the ideas to create a learning community at the T-Port Logistics Campus

Based on interviews with stakeholders of the part-time school of Saxion University of Applied Sciences and ROC van Twente, the idea was raised to develop an associate degree for logistics as a next step for MBO level 4 graduates. The Professional Learning and Development department of the University of Twente can also offer part-time studies, executive education and support the development of tailor-made programs for community members of Port of Twente. The University of Twente is not yet member of the Twents Huis van de Logistiek.

4.2.5. Knowledge and innovation

The TKI DIALOG dashboard indicates the involvement of the University of Twente in 26 research projects. Most projects are related to the 4C theme, followed by service logistics, synchromodality, ICT and human capital. These projects are linked to several community members of Port of Twente and provide a good starting point to map triple helix collaborations. Based on the BMS Smart Industry Research Roadmap, illustrated in figure 13 on the next page, the expertise of eight research groups can be connected to the community members of Port of Twente for structured knowledge exchange and initiation of research projects. Connections with other faculties and departments with transport-related studies, including Civil Engineering, are considered relevant to strengthen and deepen the relation. In addition, connections with the Fraunhofer Project Center and TNO can be explored to connect with relevant project organizations and expertise. On a national level, connections can be established with knowledge ecosystems of the Topsector Logistics, more specifically the KennisDC and Holland Logistics Library, and programs of Connekt like Lean & Green.

4.3. Course work

4.3.1. Business development plan

Port of Twente developed a business development plan for the period 2019-2021. The goals and activities are outlined in a strategy document. Based on interviews and workshops, the framework for Regional Logistics Ecosystems is used as a starting point to explore opportunities for further development of Port of Twente. Responsible managers and board members were asked to prepare short presentations about the current state, goals and development plans for 2020. Prof. Dr. J. van Hilleberg and Dr. Ir. M.R.K. Mes were asked to present their vision about the future of logistics and relevant research projects. During the annual new years event of Port of Twente, a first knowledge exchange session took place to present the business development plan based on the framework for Regional Logistics Ecosystems and connect experts from the scientific community to community members. The presentations are included as appendices. Table 10 presents an overview of the current innovation projects using the innovation funnel model of (Wheelwright, S. C., & Clark, 1992).

Priority theme	#	Project idea or name	Application area			(Potential) Partners	Stage		
			SC	H&C	C		1	2	3
Sustainable logistics	1	CEF – Verruiming twentekanalen		X		EU, Rijkswaterstaat, provincie Overijssel, Port of Twente, KNI Osnabrück, Rokramix, gemeenten Hengelo/Almelo			X
	2	Lean & Green Off-Road Overijssel		X		Overijssel, Topsector Logistiek, RailCargo, the Blue Road, TLN, KennisDC			X
	3	Alternative fuels	X	X		Havenbedrijf, CTT, BVB, BTG	X		
	4	Alternative modalities	X	X	X	Airport Twente, Space53, UT	X		
	5	Sustainable energy		X		XL Businesspark	X		
Data driven logistics	6	Virtual harbour master (conversional AI chatbots)		X		Havenbedrijf, UT			X
	7	Haven asset management system		X		Havenbedrijf			X
	8	ANyPLACE: Autonomous Pickup and Delivery as an Anticipatory Service			X	UT, ~30 interested partners	X		
	9	CATALYST	X	X		TNO, UT, 60 partners			X
	10	Unmanned container transport		X		CTT, Bolk, XL Businesspark, Port of Twente, Regio Twente, Overijssel		X	
	11	DataRel: big data for resilient logistics	X			NWO, UT, CAPE Groep, Locus positioning, Ahrma, Innovadis, Datacadabra, Ovis telematics			X
	12	Autonomous Logistics Miners for SMEs	X			TKI DINALOG, UT, Albert Heijn, CAPE Groep, Deltago, Kien Logistics Management			X
	13	ADAPTATION: ADaptive Planning wiTh Advanced Traffic InformatiON	X	X	X	TKI DINALOG, UT, Erasmus, Simacan, AH Online, DPD			X
	14	Trucks and Barges	X	X		TKI DINALOG, UT, Pineapple Studios, Rotra, Deltago, Emons, CTT, eXomodal			X

	15	IDS Connector Store and Interoperability Simulator	X	X	X	TKI DINALOG, UT, CAPE Groep, TLN, Evofenedex, TNO			X
Supply chain orchestration	16	Blauwe Golf Twente	X	X		EU, Overijssel, Friesland, Vlaanderen, Rijkswaterstaat, BLN-Schuttevaer, Port of Twente, 4Shipping, Panteia			X
	17	Industry 4.0 driven supply chain coordinator for SMEs	X			TKI DINALOG, UT, Emons, King Nederland, LOGAPS, Districon, Veenman, Deltago			X

Table 10: overview of the 17 identified innovation projects

The 17 innovation projects are clustered using the priority themes and application domains of the 2020-2023 action agenda of the Topsector Logistics. The application domains are supply chains (SC), hubs and corridors (H&C) and cities (C). Stage 1 includes 4 projects that are currently in the ideation phase. Stage 2 currently includes 1 project that is being detailed in a project proposal. Stage 3 contains 12 projects that are in development. All 17 projects are initiated, detailed and developed by different project consortia. There is no central program management in place at the level of Port of Twente.

4.3.2. Technology roadmap

The market-technology matrix is used as a starting point to develop a technology roadmap. Based on the overview of the 17 innovation projects, this matrix is utilized to map the expected impact of each project. Figure 15 positions the 17 innovation projects in the market-technology matrix.

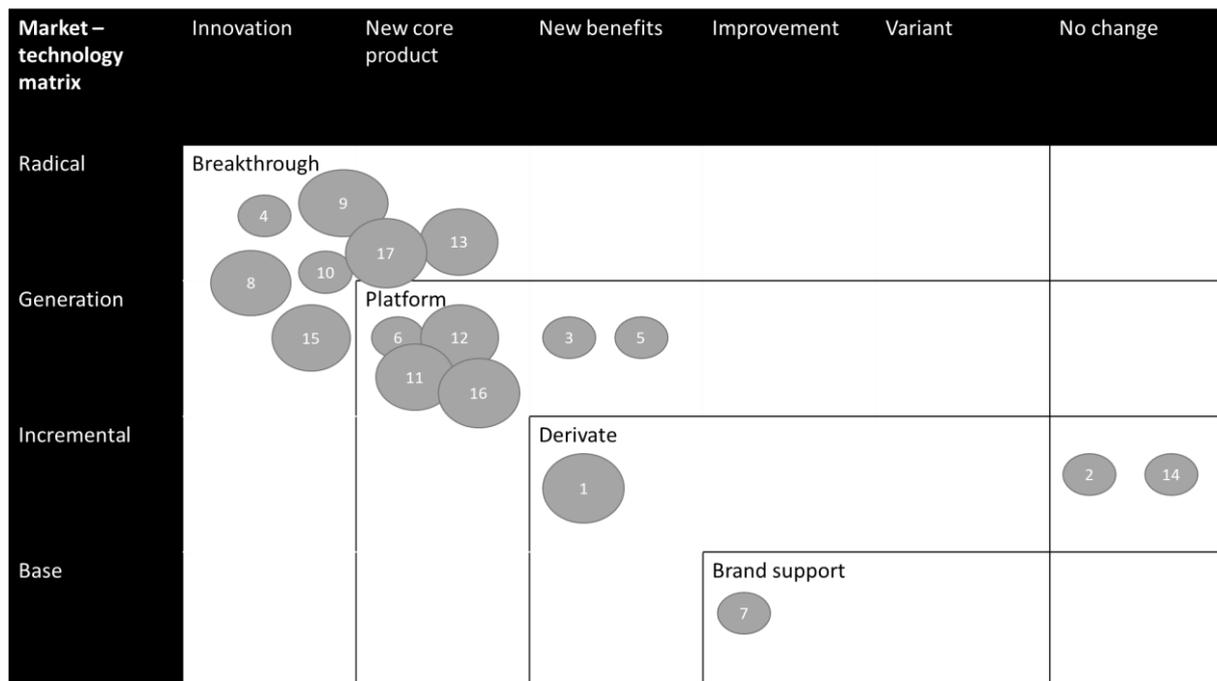


Figure 15: market-technology matrix with the 17 innovation projects

The market-technology matrix positions projects in terms of market and technology impact. Some projects lead to changes in technology, but have no market impact. Projects in the area of brand support lead to new variants or improvements to a base technology. Derivates are incremental technological advances that, additionally to brand support, create new benefits. Platforms are considered as a new generation of technology that enables the creation of new core products. Breakthroughs lead to radical changes and can be seen as pure innovation. Since the 2020-2023 action

agenda of the Topsector Logistics is yet to be translated into a planning, a high-level technology roadmap is created. The technology roadmap is a visual tool to explain the strategic vision and develop a strategy for (new) product-market-technology combinations. Figure 16 presents the technology roadmap that is developed based on this research.

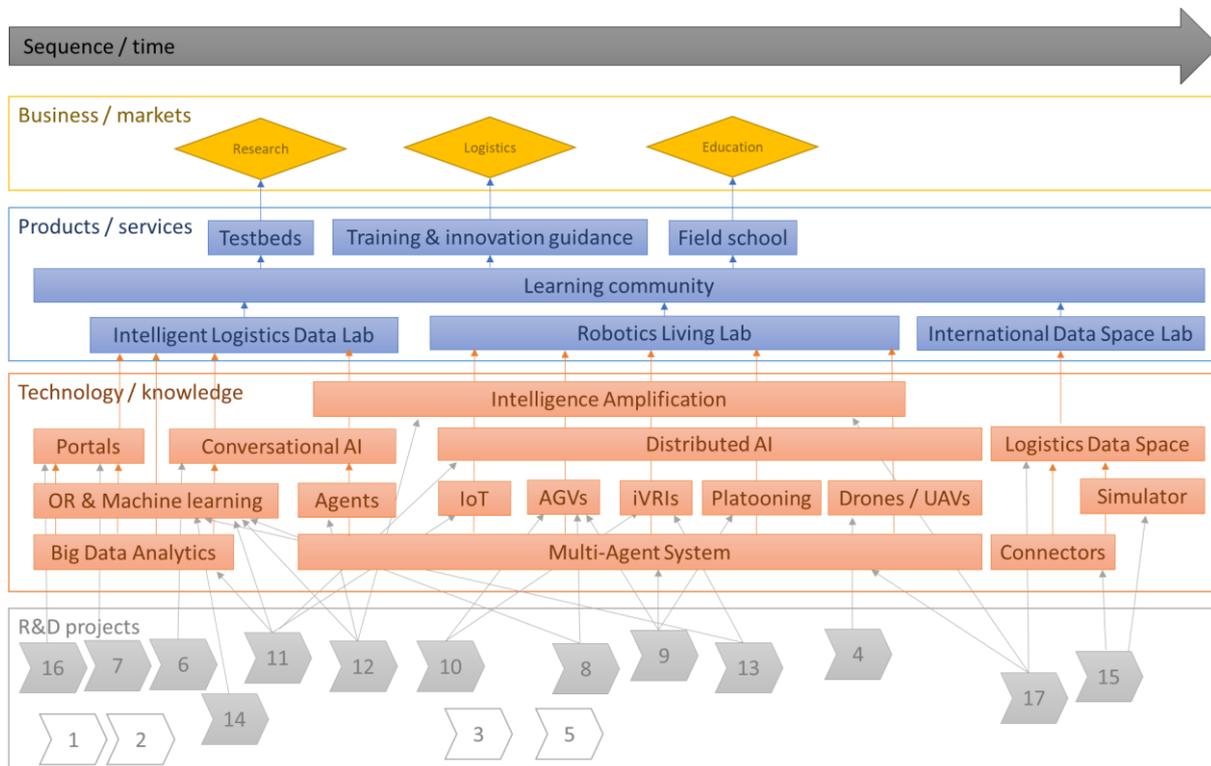


Figure 16: technology roadmap to cluster 17 innovation projects in a learning community

The technology roadmap is created based on the identified 17 innovation projects. Each innovation project is related to new or existing technology and knowledge. The market-technology matrix is used to identify similarities and explore the possibilities to cluster projects. Most innovation projects can be related to technology development in the area of artificial intelligence and robotics. Projects can be clustered based on a data driven approach or cyber physical approach. A third cluster can be formed in the area of data sharing based on the international data spaces initiative. The concept of the learning community is positioned on-top of the technology and knowledge layer to explore which products and services can be offered by Port of Twente. The concept of the learning community connects Port of Twente to Research, Logistics and Education. The connection with Governments is yet to be determined. The technology roadmap enables further development of the existing knowledge ecosystem and the opportunity to establish an innovation ecosystem. Clustering R&D projects and their related technology- and knowledge development in labs offers researchers testbeds for industrial research and conduct experiments in (operational) logistics environments to eventually develop and demonstrate new technology. The lab environments and research activities are rich sources of knowledge and inspiration for the logistics industry. Port of Twente can create value together with project partners by offering training and innovation guidance. Initially this can start by asking project partners to organize meet-ups for the community members of Port of Twente and present their research, showcase technology (in development) and share expertise. In addition, innovation guidance can be facilitated by the learning community. Ultimately, a Field School can be established by ROC van Twente, Saxion University of Applied Sciences and the University of Twente to embed educational programs in the learning community and develop tailor-made courses.

5. Conclusion

This final chapter concludes this paper by connecting the previous chapters to answer the main research question. First, the main results and findings of the research are summarized. Then, the results and findings will be discussed by comparing, contrasting and critically reflecting on the literature review results with the research results and findings. Next, the main research question is answered and conclusions are drawn up in regard the purpose of the paper. Subsequently, the implications and limitations of this research will be discussed. This research paper concludes with future research directions for scholars and recommendations for practice.

5.1. Summary of main results and findings

The purpose of this study was to analyze the Logistics Hotspots and Regional Logistics Ecosystems in the Netherlands and investigate how triple helix collaboration can be aligned with the 2050 ambition of the Dutch Topsector Logistics and its action agenda for 2020-2023. More specific, the Logistics Hotspot and Regional Logistics Ecosystem of Port of Twente was analyzed in search for alignment of its business development plan to contribute to the 2020-2023 action agenda and 2050 ambition.

Based on the research design, a literature review is carried out based on the five-stage process based on grounded theory of (Wolfswinkel et al., 2013). Very few scientific literature is found in business and economics about Logistics Hotspots and Regional Logistics Ecosystems. 11 research items were analyzed in-depth. The journal article of (Raimbault et al., 2016) about port regionalisation contains relevant scientific work and backgrounds that can be linked to the origin and development of Logistics Hotspots and Regional Logistics Ecosystems. The research paper of (Onstein, Visser, van Ham, 2016) provides interesting insights in trends and developments in Dutch distribution centers and their location. The report of (Visser et al., 2012) and Bachelor thesis of (Hofstra, 2010) provide in-depth data about the regional presence and spread of both inland terminals and rail terminals. Broadening the search to business ecosystems lead to a much larger body of knowledge. The systematic literature review of (Scaringella & Radziwon, 2018) mapped and structured the field of ecosystems and is included in the literature review. The taxonomy for business ecosystems is used for the analysis of Logistics Hotspots and classification of Regional Logistics Ecosystems.

In addition to the literature review, desk research is conducted to gather research data from the annual rankings of Logistics Hotspots. All published rankings are retrieved over the period 2006-2020. Due to changes in the methodology and inconsistency in the naming, the rankings of 28 Logistics Hotspots over the last 5 years are included for comparison and analysis. Analysing the rankings in the period 2016-2020, there are three main findings. The first finding is that the Logistics Hotspots have a stable top 3 in the last 5 rankings and also over the longer period of time between 2006-2020. The second finding is the declining position of main ports in the Amsterdam areas Schiphol and Noordzeekanaalgebied and Rotterdam. The third finding is the increasing competition of Logistics Hotspots that are located near the periphery in the Netherlands. The rankings of Almere-Lelystad-Zeewolde, A12 Corridor, Rivierenland and Twente are steadily improving over the last 5 years. Comparing the rankings with the data from 2006-present, two phenomena can be observed. The first is the phenomena of clustering of hotspots on a larger scale with examples of cities joining forces and regional clustering. The second phenomena is the branding of hotspots on regional level and as label.

The framework for Regional Logistics Ecosystems provides a ranking of the 40 COROP regions in the Netherlands. This study provides a comprehensive, more quantitative, snapshot of the Netherlands based on different data sources in the year 2019. The rankings of the 28 Logistics Hotspots and the overview of the 40 COROP regions are used as a starting point for desk research about Regional Logistics Ecosystems. The websites of 27 Regional Logistics Ecosystems are consulted and available

business plans and strategy documents are downloaded for analysis. Due to practical limitations and lack of publicly available research data, the 27 Regional Logistics Ecosystems are classified based on the 4 types of ecosystems as described by (Scaringella & Radziwon, 2018). All 27 Regional Logistics Ecosystems are classified as entrepreneurial ecosystems, because of the broad diversity of collaborations between different stakeholders with complementary goals and propositions instead of tight dependencies in business ecosystems. 17 of the 27 Regional Logistics Ecosystems are classified as knowledge ecosystems based on clear partnerships and collaborations with research-, technology- and/or knowledge institutes. 15 of the 27 Regional Logistics Ecosystems are classified as innovation ecosystems based on the presence of innovation projects, research themes and collaborations between different stakeholders to create specific propositions.

The Dutch Topsector Logistics its ambition for 2050 is to develop a competitive, sustainable and safe logistics system. The targets set for 2030 and 2050 require concrete guidelines. For the period 2020-2023, the action agenda has been made. The scope and contents are defined in 3 priority themes, 3 application areas and 5 cross cutting themes are outlined. The policy makers already formed a steering committee and the program organization is also in place. For each priority theme, a figure head is appointed to create a roadmap as a basis for triple helix collaborations. Regions are seen as a scale-up channel, but clear connections with the 28 Logistics Hotspots and 27 Regional Logistics Ecosystems are not observed based on the desk research. Flexible networks of experts offer opportunities to connect Logistics Hotspots and Regional Logistics Ecosystems to the 2020-2023 action agenda via tenders and research grants.

The Logistics Hotspot and Regional Logistics Ecosystem of Port of Twente are analyzed based on collected strategy documents, business plans and interviews with all 12 board members and 33 members of the regional logistics community. The preliminary and intermediate results are presented in board meetings and resulted in an extensive qualitative analysis of Port of Twente. In addition, workshops are organized to explore the concept of the learning community as an extension to the Twentse Huis van de Logistiek. Together with responsible managers, board members and experts, the results of the analysis are presented during the annual new years event of Port of Twente. The findings are mapped to the current business development plan of Port of Twente. The innovation funnel model of (Wheelwright, S. C., & Clark, 1992) is used to map the innovation projects by stage. 17 innovation projects are clustered using the priority themes and application domains of the 2020-2023 action agenda of the Topsector Logistics. The market-technology matrix is used as a starting point to develop a technology roadmap. Based on the overview of the 17 innovation projects, this matrix is utilized to map the expected impact of each project, identify similarities and explore the possibilities to cluster projects. A technology roadmap is created to connect innovation projects to new or existing technology and knowledge. The concept of the learning community is positioned on-top of the technology and knowledge layer to explore which products and services can be offered by Port of Twente. The concept of the learning community connects Port of Twente to Research, Logistics and Education. This enables further developing its existing knowledge ecosystem and the opportunity to establish an innovation ecosystem.

5.2. Discussion

Despite the limited availability of scientific literature, relevant research items were found to describe and classify Logistics Hotspots and Regional Logistics Ecosystems. In the paper of (Raimbault et al., 2016), the authors use a relational perspective to analyse how several actors, connected to local governments, collaborate together in actor-networks based on an institutionalized structure to enable growth of logistics activities. The importance of relations with local- and regional terminal operators is also observed in multiple reports and the qualitative analysis of Port of Twente. The study of (Onstein,

Visser, van Ham, 2016) illustrates polarization in the periphery of the Netherlands, also including areas as Venlo and Tilburg, and elaborates how surrounding regions have been forming new logistics clusters. The map with 40 COROP regions illustrates the clustering of logistics activities around the periphery in the Netherlands. Most logistics activities are clustered around the main port areas near Rotterdam and Amsterdam. The hinterland connection via Noord-Brabant and Limburg are also clearly visible. The main findings from the analysis of the 28 Logistics Hotspots in the period 2015-2020 provide further support and illustrate the increase of competition.

Due to the limited availability of public research data caution is required. The method behind the ranking is based on expert opinion and qualitative methods. The expert group of the most recent ranking consists of 33 experts from different industry segments. No questionnaire and research data are available online for review and validation. From a methodological perspective, the ranking is considered subjective. However there is limited empirical evidence, the ranking is assumed to contribute to clustering of logistics activities and collaboration between companies and municipalities as it is widely known and referred to in interviews. The methods used for the Regional Logistics Ecosystems are mainly based quantitative criteria and is considered less subjective. However, the weights are determined based on experience and there is only one edition. Therefore the study provides only a snapshot. Unfortunately, no research data is available online for review and validation.

5.3. Conclusion

Logistics Hotspots and Regional Logistics Ecosystems tend to be rather Dutch terms. These terms can be related to literature about ecosystems using the theoretical framework of (Scaringella & Radziwon, 2018). The concept of Logistics Hotspots focuses on a limited set of actors in the logistics chain, the physical presence of real-estate and facilities and collaboration with municipalities and local governments. This form of public-private collaboration does not mention or include research-, technology-, or knowledge institutes and has no clear link to the triple helix approach of the Topsector Logistics. Based on the analysis in this paper, Logistics Hotspots are considered to be business ecosystems or entrepreneurial ecosystems related to business parks, clusters or technopoles. There is no research data found to determine the tightness of collaborations to classify as either a business ecosystem or an entrepreneurial ecosystem. The concept of Regional Logistics Ecosystems involves a much broader set of actors in the logistics chain or related industries and includes collaborations with research-, technology-, or knowledge institutes. Based on the classification of 27 Regional Logistics Ecosystems, all can clearly be seen as entrepreneurial ecosystems based on the diversity of collaborations between different actors and pursuit of complementary goals. The majority of Regional Logistics Ecosystems have features of knowledge- and innovation ecosystems and can therefore be related to territorial innovation models. In addition to Logistics Hotspots, Regional Logistics Ecosystems have propositions and research projects that are either already based on or can be linked to the triple helix approach of the Topsector Logistics. So-called flexible networks of experts offer opportunities to connect to the 2020-2023 action agenda via tenders and research grants.

The Logistics Hotspot Twente is, together with Almere-Lelystad-Zeewolde, A12 Corridor and Rivierenland, benefitting from the polarization in the periphery of the Netherlands. The increasing demand for large facilities and spatial deconcentrating in metropolitan areas, together with the strong connections of the Twente region via inland waterways and highways, provide a foundation for further growth. The relation with container transshipment by rail and inland waterways therefore is of high importance. The accessibility of the Logistics Hotspot via waterways is well developed with the presence of Combi Terminal Twente. The accessibility of the Logistics Hotspot via rail is a rather weak point. Exploiting the facilities of Airport Twente and connections between the 4 so-called top locations in the region offers room for further development and improvement. Port of Twente can further

develop its existing entrepreneurial- and knowledge ecosystem to an innovation ecosystem. The concept of the learning community can be utilized by Port of Twente to create new value for Research, Logistics and Education and intensify existing collaborations with research-, technology- and knowledge institutes. The identified 17 innovation projects are linked to the priority themes and application areas of the 2020-2023 action agenda of the Topsector Logistics. The technology roadmap, together with the track record of community members of Port of Twente and existing triple helix collaborations, provide a competitive edge for Port of Twente to acquired new research projects and further develops its position on the Logistics Hotspot ranking while contributing to the goals and KPIs of the Topsector Logistics. The framework for Regional Logistics Ecosystems can be double stitched to the triple helix approach by forming flexible networks of experts and apply for grants and tenders.

5.4. Implications and limitations

Aligning the Topsector Logistics 2050 ambition and 2020-2023 action agenda requires additional work and has many uncertainties. The analysis of the Logistics Hotspot and Regional Logistics Ecosystem of Port of Twente provides a starting point and guidance in the form of the innovation funnel model with 17 projects and the technology roadmap to develop the concept of the learning community in new value, products and services. All 17 projects are initiated, detailed and developed by different project consortia. There is no central program management in place at the level of Port of Twente. In order to connect to the 2020-2023 action agenda and steering groups of the Topsector Logistics, resources are to be assigned to create a more detailed action plan. This requires adjustment and enhancement of the current business development plan of Port of Twente and approval by the board. The readers of this paper should bear in mind that this research is mainly based on qualitative methods. The author included all collected materials for validation. Desk research is limited to published rankings and available materials from websites. Due to practical limitations and the lack of public available research data, the ecosystems invariants approach and conceptual framework are not applied. The results of the classification require further validation. Taken together, the results of this study provide important insights, recommendations and guidance to connect Logistics Hotspots and Regional Logistics Ecosystems to the Dutch Topsector Logistics 2050 ambition and action agenda for 2020-2023.

5.5. Future research

The study contributes to better understanding of Logistics Hotspots and Regional Logistics Ecosystems in the Netherlands. The work presented in this paper provides one of the first investigations into the alignment of the Dutch Topsector Logistics 2050 ambition and action agenda for 2020-2023 with those of a Logistics Hotspot and related Regional Logistics Ecosystem utilizing insights from both science and industry. The contents of this work are considered valuable for policy makers, logistics entrepreneurs, researchers active in triple helix projects and professionals responsible for strategy and technology development in Logistics Hotspots and Regional Logistics Ecosystems. Further empirical research can be conducted based on the theoretical framework of (Scaringella & Radziwon, 2018) to map the logistics innovation system in the Netherlands.

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Appendices

Business development plan Logistic Association 2019-2021:



Port of Twente -
doelstellingen 2019-21

Presentation of intermediate results to the board members of the Logistic Association:



23102019 LA -
Update bestuursverg:

Analysis of Port of Twente using the framework for Regional Logistics Ecosystems:



Analyse PoT -
Regionaal Logistiek E

Presentations of the New Year's event Future Logistics:



Nieuwjaarsbijeenkom
st Port of Twente - Fu