Enhancing regional attractiveness through accessibility: An ex-post analysis of an intervention in a Dutch peripheral region

Author: Aagje Goselink
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Enhancing regional attractiveness through accessibility

An ex-post analysis of an intervention in Dutch peripheral regions

By

Aagje Goselink

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Supervisor:	dr. Jan Anne Annema	
Thesis committee:	dr. Jan Anne Annema,	TU Delft
	Geertje Bekebrede,	TU Delft
	Nicole van der Waart	Studio Bereikbaar

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TU Delft

Preface

This thesis was born from an ambition at Studio Bereikbaar in strengthening the long-term vitality of regions that lie beyond the Randstad. From the outset, our conversations revolved around a guiding thought, “regio’s met toekomstkracht”, regions with future strength and how concrete interventions might nurture that strength by making places more attractive to live, work and invest.

Early brainstorming sessions produced a long list of possibilities, from museums to flexible demand-responsive busses. Under the mentorship of my supervisors Jan Anne Annema and Geertje Bekebrede, and with the practical insight of my supervisor Nicole van der Waart at Studio Bereikbaar, I gradually realised that rail projects stood out: they promise lasting accessibility gains, signal public confidence and often anchor wider spatial development. Focusing on the Dutch context, where new rail lines are rare but politically salient, felt both manageable and policy relevant. That decision led me to the Hanzelijn and, by extension, to the larger question of how forthcoming lines such as the Lelylijn and Nedersaksenlijn might be planned for maximum regional benefit.

Throughout this journey, TU Delft provided the academic rigour, while Studio Bereikbaar ensured the work stayed grounded in real-world challenges faced by peripheral regions. I am grateful to both institutions for their guidance, critique and encouragement. I would especially like to thank Jan Anne Annema for his fast response on my many emails asking for feedback and Geertje Bekebrede for her constructive feedback during the meetings. And last Nicole van der Waart for the many valuable insights when I was a bit lost on the enhancement of attractiveness in peripheral regions. And the many thing I learned during my time at Studio Bereikbaar.

May the insights that follow contribute, even in a modest way, to building regions in the Netherlands that are not just connected, but convincingly future proof!

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Abstract

Peripheral regions in Europe face persistent demographic and economic challenges. Population decline, ageing, and limited job opportunities reduce the vitality of these regions, while shrinking public transport services further undermine accessibility and quality of life. In this context, public transport interventions, such as the development of new railways, are often presented as a strategic solution to enhance regional connectivity, improve economic prospects, and maintain the attractiveness of peripheral areas. Railways are seen not only as technical infrastructure but as catalysts for broader socio-economic renewal.

Yet, despite these high expectations, it remains difficult to determine whether such projects truly achieve their intended effects. A complication is the limited availability of ex-post evaluations. Large-scale infrastructure projects are typically judged by pre-opening forecasts, such as ridership projections or symbolic milestones, rather than by systematic ex-post, long-term analyses of social, economic, and spatial outcomes. Existing studies in Europe are relatively scarce. This lack of robust empirical evidence complicates the ability of policymakers to draw lessons for future projects such as the Lelylijn or the Nedersaksenlijn.

This research investigates whether public transport investments enhance the attractiveness of peripheral regions. Focusing on the Hanzelijn as a case study, it examines contextual conditions and mechanisms that shape regional development. The aim is to develop a conceptual model and identify the conditions under which such interventions succeed or fail, offering insights for policymakers and planners.

The method of this research contained a literature review in combination with a case study on the Hanzelijn, a railway connection between Lelystad and Zwolle that opened in 2012. The case study was conducted based on desk research and interviews.

First, theoretical insights were derived from the literature review resulting in a causal diagram showing the problems of peripheral regions. Based on this causal diagram a conceptual model by Pokharel et al. (2023) resulted from the literature review, resulting in an adapted conceptual model based on additional findings from scientific studies. Second, an in-depth case study of the Hanzelijn assessed whether the line met its original goals, including relieving congestion on other rail lines, improving regional accessibility, and stimulating economic development. Third, seven semi-structured interviews with experts and stakeholders were conducted to identify surrounding conditions that shape the effectiveness of public transport interventions. Fourth, insights from both the literature and the empirical study were combined to adapt the existing conceptual model of regional development (Pokharel et al., 2023), incorporating new variables and feedback loops that emerged from the case.

The findings indicate that the Hanzelijn clearly succeeded in its technical and network goals. The line filled a missing rail link, shortened travel times, and gave residents of Dronten, Kampen, and Lelystad more direct connections to the Randstad and beyond. However, the broader socio-economic impacts were modest. Employment levels in the Hanzelijn municipalities did not rise more than in comparable non-rail municipalities, though average wages in Dronten improved slightly. Importantly, accessibility gains were uneven. In Dronten, the withdrawal of regional bus services meant that some residents actually lost door-to-door accessibility, demonstrating that accessibility even worsened for some citizens. Similarly, station location and spatial development patterns played decisive roles: Kampen-Zuid, situated far from the city centre, underperformed in ridership.

The interviews reinforced these results, identifying several critical surrounding conditions that influence the success of public transport interventions: the availability of alternative modes (such as feeder buses), the degree of car ownership, the location and design of stations, spatial development around stations, awareness of public transport services, investment in the local economy, and the clarity of governance and policy objectives. Experts also drew attention to negative externalities, such as noise pollution, displacement, and shifting business activity, which are often overlooked in ex-ante evaluations.

Based on these findings, the adapted conceptual model presented in this thesis offers a more nuanced understanding of the final mechanisms linking public transport investment to regional

development. While the original model emphasized positive feedback loops between accessibility, attractiveness, and economic activity, the adapted version highlights that these loops are conditional on local circumstances and may be disrupted by negative effects. In particular, the study shows that accessibility improvements alone do not automatically lead to economic growth or population retention; these outcomes depend on complementary policies in land use, housing, economic development, and governance.

From this, several key recommendations emerge. This study generates both practical and academic recommendations. Practically, for public transport projects it would be recommendable to be embedded in broader system-based strategies, linking rail investment to spatial planning, housing development, and local economic measures, while clearly defining their purpose and anticipating negative side effects such as gentrification or feeder bus withdrawal. For future research, there is a need for rigorous ex-post evaluations that assess long-term socio-economic outcomes, as well as studies on emerging dynamics such as the housing crisis, the role of students and universities, and local perceptions of rail projects. Together, these insights can inform more inclusive and effective infrastructure planning.

In conclusion, the thesis demonstrates that public transport interventions in peripheral regions hold potential to enhance connectivity and attractiveness, but their success depends less on the infrastructure itself and more on the conditions in which it is embedded. Rail can be a catalyst for inclusive and sustainable development, but only if combined with proactive policies in land use, economic development, governance, and equity. Without this integrated approach, projects risk remaining symbolic gestures rather than engines of regional renewal.

1 Introduction

1.1 Context & background

In the European Union a demographic transition in the socio-economic landscape is occurring (Joint Research Centre, 2025). In the whole European Union, the population is declining and ageing, which ultimately affects economic growth, public services and social support systems. Particularly peripheral regions are facing the biggest impacts of this trend. Between 2012 and 2023 in the European member states the urban population grew by 4.2%, where peripheral regions declined by 3,9% (Eurostat, 2024). In these regions the population is shrinking and ageing as well, where they face a double challenge. The number of people needing is care is increasing, and less people are in the working age population. To top that, peripheral regions tend to have a lower economic growth, which makes it difficult to attract new working residents (younger people) (Lammarino et al., 2018).

One might wonder if a dense country like the Netherlands is also facing this problem. Nonetheless, in slightly less than half of the settlements (46%) of the population declined, especially in North-Holland (CBS, 2025). According to Jorritsma, Jonkeren, and Krabbenborg (2023), peripheral areas in the Netherlands are indeed facing multiple negative trends, such as population decline, shrinking employment opportunities, and a decreasing availability of essential services. These issues are particularly evident in regions outside of the Randstad (the western part of the Netherlands).

Reducing the development gap between cities and peripheral regions is essential for a balanced national welfare profile (OECD, 2025). To make these peripheral regions more attractive for people to settle, a crucial factor mentioned is the level of accessibility. Snellen et al. (2021) showed that accessibility is pivotal in the quality of life for people. It ensures people's health, safety, social connections and employment.

Nonetheless, the level of accessibility declined in last years in the Netherlands. Bastiaanssen et al. (2024) conducted a study on the changes in accessibility between the years 2012 and 2022 in the Netherlands. Between 2012 and 2022, the already significant accessibility gap between individuals with and without access to a car widened even further. Due to a reduction in the availability of public transport in the last ten years. Especially in peripheral regions the level of public transport has decreased significantly. Bastiaanssen et al. (2022) illustrated that due to an increase in car use, a lot of jobs and services moved close to highways. Furthermore, a combination of reduction in travellers, savings by the government and the need for profitability in public transport, the deployment of public transport has concentrated around bigger cities, resulting in less availability of public transport in less dense areas.

Bastiaanssen et al. (2013) showed with his study the impact of limited mobility options. It illustrated that the lack of a car or non-sufficient public transport, can lead to limited access to work, health care, education and friends and family. Which possibly results in unemployment, a reduction in health and social isolation. And ultimately lead to a reduction in full participation in society, especially among citizens with low-education and low incomes. Developments during the period 2012–2022 have thus further weakened the position of the most vulnerable groups in society.

To enhance the accessibility for citizens in peripheral regions, investment in transport infrastructure is argued as pivotal (OECD, 2020). As it would help in bridging economic and social divides between urban and peripheral regions and thus make peripheral regions more attractive. Especially rail investments are mentioned to enhance peripheral economic development. Argumentation is that they increase the accessibility for people with low mobility, connects businesses and people with each other and enhances the overall attractiveness of a region. Furthermore, railways are less polluting than the use of cars, hence, they support the sustainability goals.

Nevertheless, despite these theoretical benefits, empirical research that measures the actual long-term effects of new public transport infrastructure in such regions remains scarce. As a result, much of the debate relies on assumptions and projections, with relatively few studies evaluating whether the anticipated accessibility and socio-economic gains are fully realised in practice.

The only research on a concrete impact of a railway on the surrounding region in the Netherlands is a case study on the Hanzelijn (Weterings et al., 2025). This is a railway track which opened in 2012 and is positioned between Lelystad and Zwolle. New stations were opened in Dronten and in Kampen. The most important finding was that the number of jobs able to access due to railway increased. Nevertheless, the proportion of people in paid employment did not increase.

1.2 Research problem

This research is being conducted in collaboration with Studio Bereikbaar. Studio Bereikbaar is a consultancy firm specializing in strategic solutions at the intersection of accessibility and spatial planning. They focus on projects such as urbanization strategies, mobility visions, and area development plans. Where they have various projects on making regional areas more accessible and attractive.

The context in chapter 1.1 illustrates that peripheral regions are facing several challenges. It is crucial for national welfare that disparities between urban areas and peripheral areas will stabilize and will eventually narrow in the upcoming years. A critical factor for reducing disparities between peripheral regions and urban regions is to ensure a high level of accessibility. Accessibility is of importance for the quality of life for people, it safeguards access to social connections, job market and essential services.

To enhance accessibility, one of the options is investments in transport infrastructure. Roads for cars and public transport infrastructure such as bus lanes and railway immediately come to mind. Nonetheless, chapter 1.1 shows that car use has increased over the years where public transport has actually decreased over the years in peripheral regions. On top of that essential services in have also declined in peripheral regions in the Netherlands. Ultimately this is giving challenges for people with low mobility who do not have a driver's license, are not able to drive or are not able to afford a car. It also creates less attraction for people to start living or work there, which is a crucial problem for peripheral regions.

Importantly, accessibility and peripheral regions creates a reinforcing loop: when accessibility is poor, peripheral regions become less attractive for people to live, work, or study. As a result, fewer job and education opportunities emerge, which reduces the demand for public transport services. This reduced demand can lead to essential service reductions, further weakening accessibility and making the region even less attractive. To reverse this loop, public transport infrastructure investments are mentioned.

In theory, public transport development is considered vital for the well-being and economic growth of citizens, particularly in peripheral regions. Yet, little is known about the actual effects of specific infrastructure projects in such contexts. This raises the question of what impacts a concrete railway investment has had, and which factors determine whether peripheral regions benefit—or fail to benefit—from it. Understanding these dynamics is essential for providing targeted policy advice aimed at enhancing the attractiveness and vitality of peripheral areas.

This disconnect gives rise to the central research problem of this thesis: What have been the concrete socio-economic and accessibility effects of a single, real-world rail project on its surrounding peripheral region. And under which contextual conditions do such projects succeed or fail to enhance peripheral attractiveness.

1.3 Research objective

This research aims to critically examine the assumed link between public transport infrastructure and the attractiveness of peripheral regions. While theory often frames such investments as pivotal for accessibility, well-being, and economic growth, concrete evidence from real-world projects remains limited. To address this gap, the study combines a detailed case study of the Hanzelijn with a broader evaluation that incorporates multiple variables influencing peripheral attractiveness. This dual approach not only assesses the outcomes of the Hanzelijn itself but also draws wider lessons on the factors that determine whether peripheral regions benefit from railway investments.

This study therefore pursues three goals: first, to provide a conceptual model on the impact of public transport on the accessibility of peripheral regions and to identify several ex-post evaluations of public transport interventions. Second, to conduct an in-depth case study on the Hanzelijn-railway in the Netherlands. In order to assess its concrete effects on accessibility and regional development in surrounding peripheral areas. The choice was made for a case study since it illustrates real-life effects of public transport intervention in theory. Third, to assess the overall conditions and factors which cause the success or failure of a public transport intervention in the Netherlands. By identifying the contextual conditions and mechanisms that determine the success or limitations of such investments, the research aims to inform future infrastructure decisions. This is particularly relevant for policymakers and planners striving to design effective transport strategies that promote long-term vitality, inclusiveness, and competitiveness of peripheral regions.

This study combined quantitative and qualitative research aspects. On the quantitative side, factual data in the case study such as projected versus actual passenger numbers and changes in travel times have been examined. The qualitative side, interpretations of trends and interviews with experts are presented in chapter 5. The combination of qualitative and quantitative results will ensure a comprehensive understanding of the link between public transport and peripheral attractiveness.

1.4 Scope

For this study the case study will be focused on Dutch territory, the Hanzelijn, this limits the analysis to national context and avoids cross-country institutional noise, differences in planning law, fiscal regimes, and rail governance, that can obscure causal signals. It also ensures direct relevance for Dutch spatial-economic policy and for Studio Bereikbaar's advisory practice.

The analysis is set on municipalities located outside the Randstad. These areas are likely to experience population loss or slow growth, below-average employment densities, and comparatively sparse public-transport timetables.

Last, the study focuses on the implementation of public transport interventions. For the case study the focus is on railways. However, from the literature review, other types of public transport such a new metro line also emerge. Therefore, the term public transport is used instead of only the focus on railways.

1.5 Research questions

To close the knowledge gap, a main research question was defined. This question has been answered based on 3 different sub questions. As can be seen below.

Main question: "Which contextual factors and general lessons can be identified in previous studies and in the case of the Hanzelijn as contributing to the success or limitations of public transport interventions to make peripheral regions more attractive?"

Sub questions

1. "What key mechanisms and variables are identified in the literature as influencing the impact of public transport infrastructure on the accessibility and development of peripheral regions?"

2. “What explains ex-post the success or failure of the Hanzelijn in the Netherlands?”
3. “Which surrounding conditions have been identified as influencing the development and effectiveness of public-transport interventions?”

1.6 Thesis outline

In chapter 2 a Methodology chapter explaining the mixed methods: a systematic literature review, an ex-post Hanzelijn case study focused on Dronten and semi-structured expert interviews. The Literature Review in chapter 3 then illustrates what scientific literature states on rail, accessibility and regional development, highlighting the key mechanisms and the shortage of ex-post evidence. Next in chapter 4 the case study on the effects of the Hanzelijn are demonstrated. Followed by semi - structured interviews in chapter 5. After these methods have been conducted, the results will be brought together in chapter 6, using a conceptual model. Finally, a discussion links the findings to the broader policy debate acknowledges study limitations, and a conclusion & recommendations answers the research questions and sets out practical guidance, above all the need for systematic ex-post evaluations and integrated, multi-modal planning.

2 Methodology

This chapter outlines the research design and methods used to answer the study's three sub-questions. Because each sub-question targets a different dimension of the problem, different methods are being use. A case study analysis will be conducted to estimate what explains the success or failures of the Hanzelijn in the Netherlands. Supported by semi-structured interviews with experts, grey literature research and a state-of-the-art literature review. According to Creswell (2009), qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem.

Table 1 Methods per sub-question

Sub-question	Method
What key mechanisms and variables are identified in the literature as influencing the impact of public transport infrastructure on the accessibility and development of peripheral regions?	Literature review
What explains ex-post the success or failure of the Hanzelijn in the Netherlands?	Case study, grey literature and interviews
Which surrounding conditions have been identified as influencing the development and effectiveness of public-transport interventions?	Interviews

2.1 Scientific literature research

Sub-question 1

A literature review is carried out to develop an in-depth understanding of the key mechanisms, variables, and theoretical assumptions identified in scientific literature regarding the impact of public transport on the accessibility and attractiveness of peripheral regions. By systematically reviewing existing research, this method enables the identification of recurring themes, conceptual models, and empirical findings across various contexts. A state-of-the-art literature review helps to map which scientific sources have conducted ex-post evaluations of public transport interventions and mechanisms and variables in peripheral attractiveness due to public transport. Furthermore, it reveals gaps in the current academic knowledge and highlights the extent to which findings from urban or high-speed rail settings are applicable, or not, to conventional rail and peripheral regions. This provides a theoretical foundation for the empirical part of the study and ensures that the subsequent case study is informed by the most relevant and up-to-date insights from the field.

In table 2 the search terms are shown. The search terms in combination with synonyms and Boolean operators ensured a variety of literature sources and results. A screening was made based on location; Europe and the United States were the main focus. But with specific attention for the Netherlands. Furthermore, in figure 1 the Prisma chart can be seen. This shows how much literature was found and how many articles are selected.

The literature is found through different search engines such as Google scholar, Web of Science, Scopus, JPSTOR. A variety in search engines ensures a complete and extensive overview of the different literature sources. These engines show journal articles, reports and papers. Dependent on the search terms different results emerge. Furthermore, the acquired literature source is being used

for the “snow-balling effect”. By looking at the sources in the relevant article, other sources may be found. For the found literature a table with various categories has been made, as can been seen in table 3. For every literature source, a mark has been given if that source entails the category. As to be expected, most of the studies entail accessibility.

Table 2 Topics and search terms

Topic	Search Terms	Synonyms / Related Terms	Boolean Operators
Urbanization	urbanization	urban growth, city expansion, metropolitan development	urbanization OR "urban growth" OR "metropolitan development"
Disparity urban periphery	regional disparities	urban-rural divide, inequality, spatial imbalance	("regional disparities" OR "urban-rural divide") AND inequality
Peripheral regions	peripheral regions	lagging regions, rural areas, non-core areas	("peripheral regions" OR "lagging regions" OR "rural areas")
Accessibility	accessibility	mobility, access to services, connectivity	accessibility OR mobility OR "access to services"
Public transport	public transport	public transit, PT, transit systems, collective transport	"Public transport" OR "public transit" OR "collective transport"
Railways	railway transport	rail infrastructure, train networks, conventional rail	("railway transport" OR "rail infrastructure" OR "conventional rail")
Attractiveness of regions	regional attractiveness	regional appeal, liveability, location choice	("regional attractiveness" OR "liveability" OR "location choice")

Table 3 Literature source per category

Author(s)	Accessibility	Peripheral Regions	Urban-Rural Disparity	Labour Market	Rail Investments	Gentrification	Spatial Planning	Regional Development
Brovarone & Cotella (2020)	✓	✓	✓				✓	✓
Smetkowski (2013)	✓	✓	✓					✓
Newsham and Rowe (2022)	✓	✓	✓					
Farrington & Farrington (2004)	✓	✓	✓					✓
Steenbekkers & Vermeij (2013)	✓	✓	✓				✓	✓
Christiaanse (2020)	✓	✓					✓	✓
Lucas (2012)	✓	✓				✓		✓
Van Wee et al. (2011)	✓	✓				✓		
Frei et al. (2009)	✓							
Johnson et al. (2017)	✓			✓				✓
Anciaes & Alhassan (2024)	✓	✓		✓	✓			✓
Smith & Zenou (2003)				✓				
Coulson et al. (2001)				✓				
Alhassan and Anciaes (2025)	✓	✓		✓	✓	✓	✓	✓
Utsunomiya (2020)	✓	✓						✓
Arbués et al. (2015)	✓			✓	✓		✓	✓
Tulier et al. (2019)					✓	✓		✓
Holt-Lunstad et al. (2010)	✓				✓			
McDonagh (2006)	✓		✓					
Stockdale (2009)		✓				✓	✓	
Woods (2004)		✓				✓	✓	✓
Zuk et al. (2017)	✓				✓	✓	✓	✓
Bastiaanssen et al. (2020)	✓	✓		✓			✓	✓
Bastiaanssen et al. (2025)	✓	✓		✓			✓	✓
Åslund et al. (2017)	✓	✓		✓	✓			✓
Rotger & Nielsen (2015)	✓	✓		✓	✓		✓	✓
Pokharel et al. (2023)	✓	✓	✓	✓	✓		✓	✓

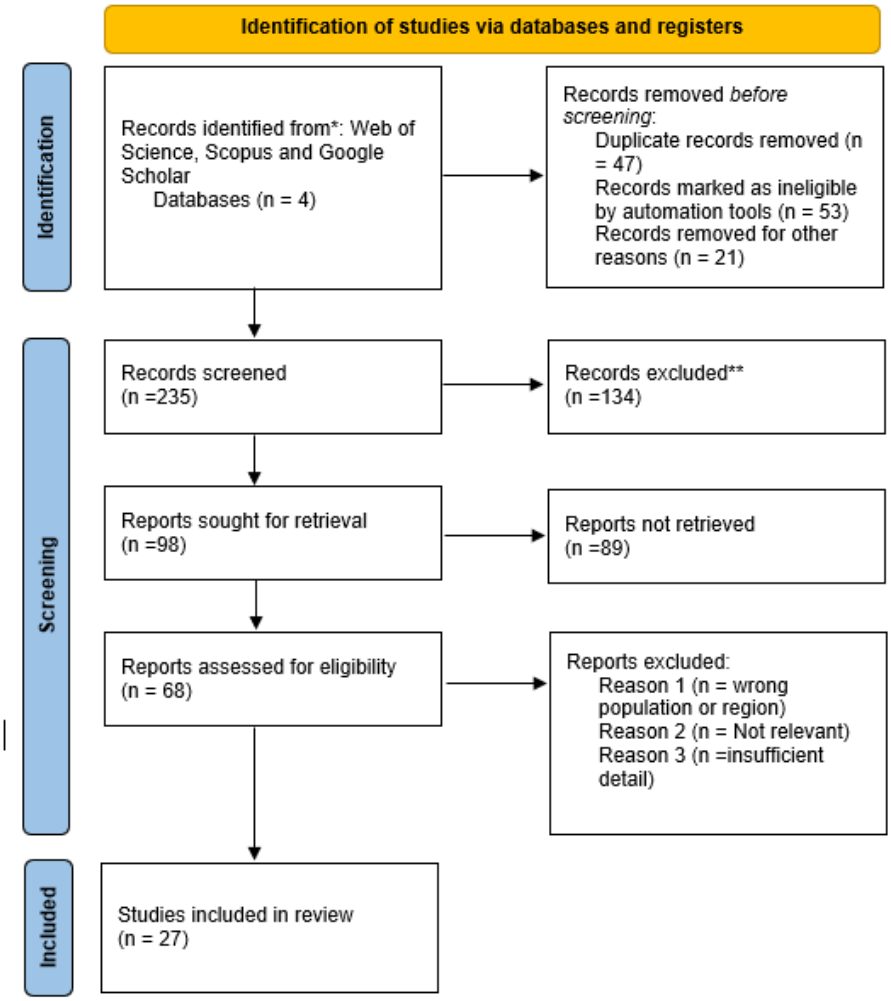


Figure 1 Identification of studies Source: PRISMA statement. (n.d.).

2.2 Case study

Sub question 2

To show a real-life public transport intervention, a case study was conducted on the Hanzelijn. A case-study design is well suited to this thesis because it allows to investigate a contemporary intervention, the Hanzelijn railway, in depth and within its real-world context (Yin, 2009). By drawing on multiple evidence sources (statistics, reports, interviews) you can triangulate data and trace causal mechanisms, thereby explaining how and why accessibility changes translate into regional outcomes. Case studies are also powerful for theory building: by pattern-matching empirical observations to the literature, you can refine existing ideas about public-transport impacts in peripheral regions. The approach does have limitations. Findings from a single case are not statistically generalisable, so transferability rests on analytic logic and transparent case selection. Furthermore, immersion in one context risks researcher bias, case studies are time- and resource-intensive, requiring careful planning and systematic coding of diverse materials. Finally, access to key documents or stakeholders can constrain breadth.

The selection of this case study was done iteratively. At first various transport investments were searched. By starting very broad, from the bridge built in Malmo and Oresund, the bike highway in Brabant and a mobility intervention in Portugal (Aarhus University, 2020), (Goudappel, 2021), (European Union, 2024). Nevertheless, after careful determination the research was scoped down. A new focus was identified on public transport in the Netherlands. The choice was made for public transport in the Netherlands since the level of public transport in peripheral regions has been scaled down, leading to reduced accessibility. And is more difficult to compare interventions abroad with the Netherlands, due to different institutions, culture and policies.

After choosing public transport, the choice was made for railways. Several train tracks in Dutch peripheral areas came up. Like the train track Enschede – Munster, Merwedelingelijn (Dordrecht – Geldermalsen), Apeldoorn – Deventer and the Hanzelijn. However, for most of the train infrastructure in the Netherlands, it has existed for quite long time already. For the development of these train tracks it was more a matter of difference in frequency, different train providers or reactivation of a line.

Until recently, a publication was released about the Hanzelijn by Weterings et al. (2025). As already illustrated in chapter 1.1. This was a completely new train track which has opened in 2012. It is one of the few completely new railway tracks that has been developed in the last 20 years. The connection has been newly built to connect Lelystad with the upper part (Groningen, Friesland, Drenthe and Overijssel). The track contains an intercity and a sprinter (a faster and slower train). The sprinter also stops in smaller cities, like Dronten and Kampen. For these cities two new stations were developed as well, Dronten and Kampen-Zuid. At the time the aim was to enhance the regional development of the northern part of Flevoland. With this case study the aim is to show if the expectations of the railway at the time have been met and what the developments have been due to the railway station.

The collection of data on this train track has been conducted through desk research. With a focus on grey literature, like reports of governmental institutions, regional governments. independent researchers and news articles. The aim was also to uncover the initial expectations of the Hanzelijn in history. This will likely be sources around 25 years ago, since the construction of the Hanzelijn was determined at that time.

2.3 Grey literature research

Sub question 2

In addition to peer-reviewed academic sources, this research incorporates grey literature to strengthen the empirical foundation for sub-questions 2 and 3. These sub-questions aim to assess the concrete socio-economic effects of the Hanzelijn railway on the surrounding peripheral region and to identify broader contextual factors that influence the success or limitations of public transport interventions.

Grey literature includes professionally relevant documents that fall outside the scope of academic publishing but are nonetheless rich in information and practical insights. These comprise reports from consultancy firms, evaluations by independent research institutes (e.g. PBL, CPB, KiM), publications from government agencies, railway operators (e.g. NS, ProRail), and regional authorities. Additionally, news articles from reputable media outlets are included to capture public discourse, local experiences, and political or social debates surrounding the Hanzelijn and similar infrastructure projects.

These sources help reconstruct the historical development behind the railway investment, assess real-time impacts and identify challenges or unintended consequences that may not appear in academic evaluations. News articles in particular offer timely perspectives on how interventions are perceived by citizens, municipalities, and other stakeholders, often including quotes, controversies, or coverage of follow-up policy measures.

To ensure credibility, grey literature has been selected based on the source (e.g. official institutions, established consultancies, or reputable news outlets), publication date, and relevance to the research topic. Selection was carried out primarily through the Google search engine, using targeted search terms and filters.

Together with academic literature, grey sources enable a comprehensive analysis that is both theoretically grounded and contextually rich, providing a nuanced understanding of public transport interventions in peripheral regions, particularly in the Dutch context.

2.4 Interviews

Sub-question 2 & 3

Interviews have been held with a diverse group of experts, as illustrated below in table 4. The participants include two consultants, one policy maker from the province of Flevoland, public transport providers from the railway sector and a participant from a research institute. Their reflections provided critical practical perspectives on the planning, implementation, and outcomes of the Hanzelijn. They have also offered insights into local perceptions, barriers faced during the development process, and ongoing consequences not captured in quantitative indicators, thereby enriching the empirical understanding of the Hanzelijn's impact (sub-question 2).

Moreover, for sub-question 3, the interviews have been instrumental in uncovering surrounding conditions for influencing the development of public transport interventions. Through firsthand accounts, this method helped identify enablers such as strong regional governance, side effects or effective/ineffective spatial planning policies. It also allowed for the recognition of obstacles like car use, limited follow-up investments, or lack of political continuity. These perspectives have been vital for understanding the general conditions under which public transport investments succeed or underperform in peripheral areas.

Table 4 Overview of participants

Affiliation		Role/Function	Region	Date Interviewed
Consultancy firm	Participant 1	Advisor spatial planner and economic geographer	National	15-05-2025
Province Flevoland	Participant 2	Policy advisor rail and public transport	Flevoland	19-05-2025
Consultancy firm	Participant 3	Advisor economics and spatial environment	National	20-05-2025
Public transport provider	Participant 4	Manager public affairs	National	05-06-2025
	Participant 5	Product market manager		
	Participant 6	Product manager		
Research institute	Participant 7	Researcher	National	11 – 06 -2025

The interviews were conducted with semi-structured interviews. As stated by Adeoye-Olatunde and Olenik (2021) are a suitable qualitative tool for this study because they strike a balance between structure and discovery. On the one hand, the discussion guide is built around the key factors already uncovered in the desk research and literature review, such as public-transport service quality, first/last-mile connectivity, station-area development. On the other hand, the open-ended format gives experts the autonomy to bring up knowledge and ideas. It helps to highlight context-specific nuances, unexpected barriers, or tacit knowledge that would remain invisible in fixed-format structures.

This flexibility is vital for three reasons. First, public-transport projects are embedded in complex local realities; allowing interviewees to “go off script” helps surface causal mechanisms and path-dependencies that a purely structured questionnaire would miss. Second, semi-structured interviews facilitate additional findings: where the desk research shows what happened, expert testimony explains why it happened or why not. The answers given by the interviewees will be analysed with Atlas.ti (Atlasti, 2025). This tool will give a structured view of the answers of the interviewees and can give a clear overview of their important findings and insights.

The participants were purposively sampled for their direct knowledge of the Hanzelijn connection. And in consultation with Studio Bereikbaar, which maintains an extensive professional network in accessibility issues and regional development circles, a short list of candidates was selected. In total 5 interviews were conducted with 7 participants between May and June 2025.

The coding of the interviews was conducted inductively and deductively. Based on the literature review and the case study, several codes were determined beforehand. The coding scheme will therefore be illustrated in chapter 5, after the literature review and the case study.

Regarding the interviews, beforehand a few directions of questions were prepared. The interviews started by asking a broad question like “Do you recall what the expectations were at the time of the development of the Hanzelijn?” and “What is your view on developing railways to enhance attractiveness for peripheral regions?”. Starting from these questions, the participants had their own points of view, and these broad questions usually ended up in other interesting observations by the participants. Furthermore, dependent on the participant, the question entailed more focus on the Hanzelijn or on generally in the Netherlands. For example, the interview with the policy maker of Flevoland entailed more focus on the development of the Hanzelijn than the participants mobility consultants. After this the interviews were transcribed. Furthermore, based on the interviews new codes are also identified.

In sum, the interview component adds depth, context, and practical relevance to this study by incorporating the lived experiences and expert judgments of those directly involved in, or impacted by, regional public transport interventions in the Netherlands.

3 Literature review

This literature review aims to identify existing knowledge gaps regarding the challenges facing peripheral regions and the role that accessibility plays in addressing these issues. As discussed in chapter 1, peripheral regions experience a range of difficulties that hinder their attractiveness for citizens and businesses. Identifying these problems through scientific literature is essential for understanding how these areas can regain their appeal for living and working. Furthermore, the coding scheme will be partially based on the literature review, in combination with the case study in chapter 4. This coding scheme will be represented in chapter 4.

3.1 Challenges peripheral regions

As was stated in chapter 1 peripheral regions are facing several difficulties such as population decline, economic challenges and reduction of public transport services. To maintain a certain quality of life and attractiveness in the region, it is crucial to first identify the actual challenges the residents of these peripheral regions are facing. To ensure a clear overview on what impacts these peripheral regions based on scientific studies. Therefore, a causal diagram is illustrated, as can be seen in figure 2. In order to illustrate the problems peripheral regions are facing, a causal diagram is defined from the perspective of citizens within a peripheral region. This was defined in order to gain a comprehensive understanding of the crucial problems.

The causal diagram presented here is grounded in empirical literature that clarifies the interconnected processes affecting peripheral regions. First, Smetkowski (2013), Brovarone & Cotella (2020), and Newsham and Rowe (2022) demonstrate that depopulation, ageing, and the erosion of human settlements directly lead to a decline in the number of residents, which, in turn, impacts the attractiveness of a region, where for example the number of facilities can decline. This relation is defined below in the diagram with a positive relation (+), the more severe the demographic decline, the less attractive a region becomes for living and working.

Another link is supported by Farrington & Farrington (2004), who explains that demographic decline makes it difficult to maintain public transport services and other local amenities. Thus, as indicated in the diagram, a decrease in population (+) results in a decrease in of public transport services.

Building on this, Farrington & Farrington (2004) further argue that diminished facilities and public transport lead to lower levels of accessibility in peripheral regions. The positive (+) relation in the diagram reflects that as the availability of public transport services declines, accessibility also drops. Moreover, looking at the Netherlands specifically, Christiaanse (2020) highlights that the reduction in citizens also results in less availability of public transport. This relation (+) is illustrated below.

The next causal link, between accessibility and the attractiveness of peripheral regions, is underpinned by the same body of literature: Farrington & Farrington (2004) and Steenbekkers and Vermeij (2013) show that when accessibility decreases, a region becomes less attractive for both residents and businesses. Moreover, the decline in public transport accessibility in recent years has been particularly pronounced in Dutch peripheral regions. This reduction not only restricts mobility for certain groups, but can also lead to social exclusion (Lucas, 2012; Van Wee et al., 2011). Which ultimately leads to a reduction in attractiveness of a peripheral region. Hence, decrease in quality of life which may prompt further out-migration, this relation is defined by a (+). This attractiveness can eventually reduce economic vitality and impact the labour market. The reduction in attractiveness and labour market then accelerates out-migration and further reduces population numbers, as observed by Smetkowski (2013) and Brovarone & Cotella (2020), closing the feedback loop illustrated in the diagram.

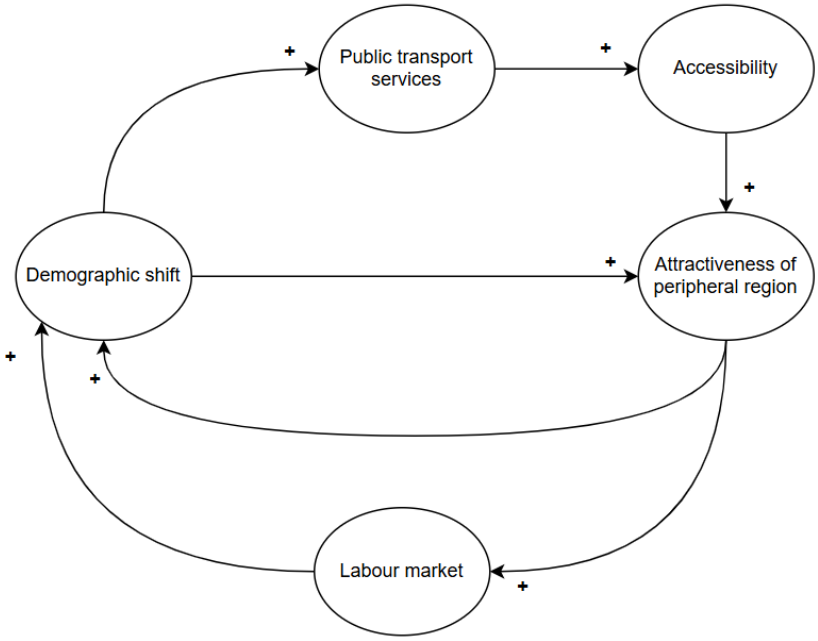


Figure 2 Causal diagram illustrating key challenges on peripheral regions.
Arrows marked with a (+) indicate a positive relationship: when one variable increases, the other increases as well, and when one decreases, the other correspondingly decreases.

3.2 Transport infrastructure investments

In Chapter 3.1, the challenges faced by peripheral regions were outlined based on various literature sources. However, to gain a more comprehensive understanding, it is also essential to examine the effects of public transport infrastructure investments on these regions. As shown in Figure 2, the availability of public transport services was identified as a critical variable influencing the attractiveness of peripheral areas. Therefore, analysing studies that specifically focus on the impact of transport infrastructure investments is crucial to better distinguish and understand their role in regional development.

To further support this, Pokharel et al. (2023) developed a conceptual model to illustrate the impact of interregional – and urban transport investments, as illustrated in figure 3. This paper synthesizes theoretical research on the more global effect of transport infrastructure investments, thus not only public transport. Where the causal diagram in figure 2 highlights the problems which peripheral regions are currently facing, figure 3 by Pokharel et al. (2023) illustrates the overall effects of transport infrastructure on urban and interregional accessibility.

The model outlines how various components of a regional economic system interact in a complex, systemic, and dynamic way. At its core are four interdependent variables—interregional accessibility, urban accessibility, economic activity, and the attractiveness of a location. These are considered endogenous, meaning they influence one another in continuous feedback loops that can either reinforce growth or balance it. Without external intervention, these loops tend to stabilize over time, often leading to stagnation in city size and regional economic output, particularly in regional areas that already face structural disadvantages.

The first variable, the attractiveness of a location is understood as a characteristic of a location that provides better opportunities for people to reside and firms to locate and produce there. Whereas the second shows that when economic activities flourish in a city or village, industry and firms attract additional labour; other investors and entrepreneurs see an opportunity to invest in an economically vibrant place. The third and fourth variable based on accessibility show that urban accessibility refers to the ease with which people and goods can move within a city or urban area. It is primarily influenced by the capacity and quality of intra-urban transport infrastructure, such as local roads,

public transport, and cycling networks. Interregional accessibility, sometimes referred to as hubness, describes the extent to which a city or region is connected to other regions through major transport infrastructure.

To stimulate development and break out of this equilibrium, the model incorporates five exogenous policy levers. These include two hard interventions, interregional and urban transport infrastructure investments, and three soft interventions: urban planning (such as land use or building regulations), urban transport policy (including congestion management), and institutional or innovation-related factors such as education, taxation, or healthcare systems. These external factors influence the internal dynamics of the system.

The model shows, for example, that improved interregional accessibility can increase the attractiveness of a location for both people and businesses. This rise in attractiveness leads to more economic activity, which in turn further enhances a region's appeal, a reinforcing feedback loop that supports regional growth. However, the model also identifies several balancing feedback loops. As economic activity and population increase, congestion can arise, reducing both urban and interregional accessibility. This can diminish the region's attractiveness and ultimately slow development. In this way, the model also accounts for the limitations of infrastructure capacity and the importance of coordinated planning.

Applied to the context of regional development, particularly in peripheral areas, this conceptual model highlights the importance of transport accessibility as a lever for enhancing regional attractiveness and economic performance. However, it also underlines that infrastructure investments alone are insufficient. Without complementary soft policies and careful consideration of socio-spatial impacts, efforts to boost regional development risk reinforcing inequalities or producing limited results. Therefore, this model is used not only to interpret the findings of this study but also to inform a more comprehensive understanding of how transport interventions can be designed to promote inclusive and sustainable regional growth.

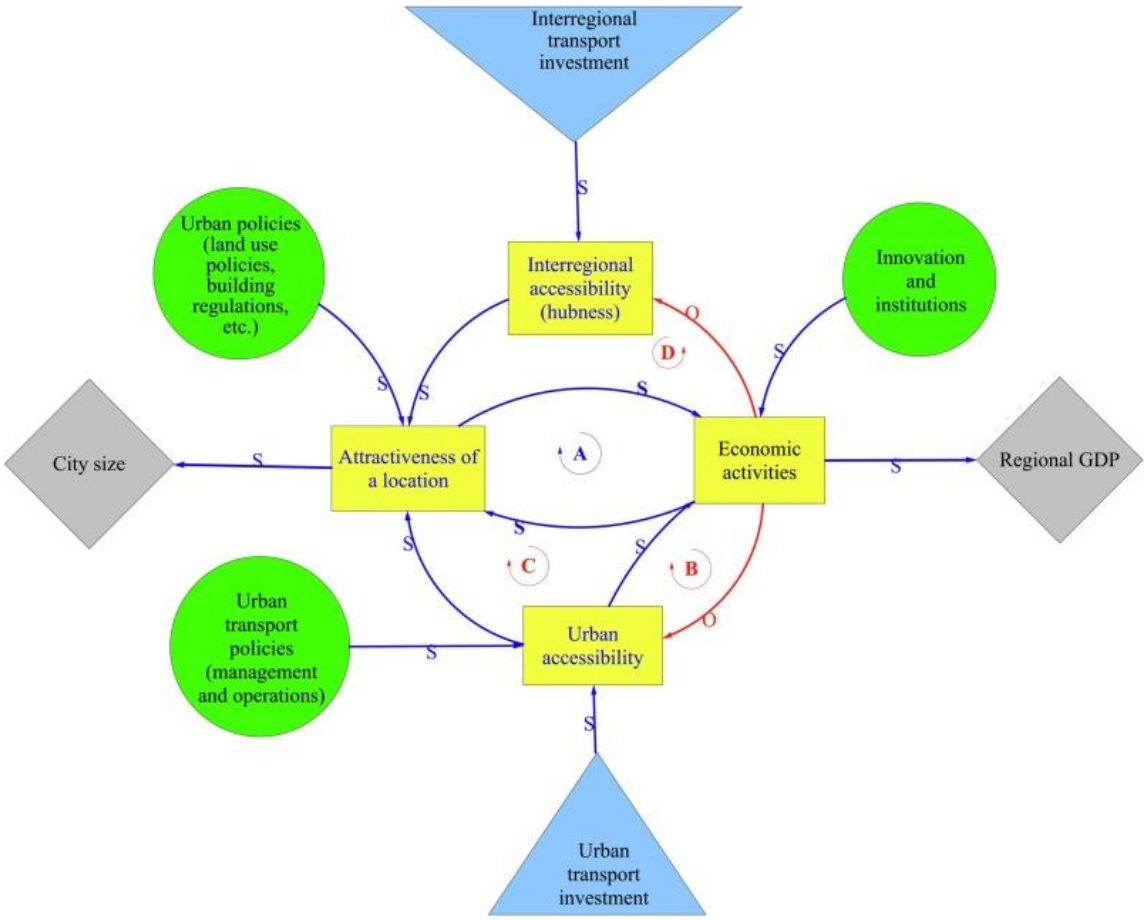


Figure 3 Conceptual model Source: Pokharel et al.(2023)
Notes: Yellow boxes = endogenous variables, blue triangles = hard policy inputs, green circles = soft policy inputs, grey rectangles = outputs.
S: positive relation (variables move in the same direction).
O: negative relation (variables move in opposite directions).
A: reinforcing loop between attractiveness and economic activity.
B: balancing loop between economic activity and urban accessibility.
C: balancing loop between economic activity, urban accessibility, and attractiveness.
D: balancing loop between economic activity, interregional accessibility, and attractiveness.

3.2.1 Effects of transport infrastructure on peripheral regions

As illustrated in figure 2, peripheral regions face a range of interrelated challenges, with public transport emerging as a critical factor influencing both accessibility and thus regional attractiveness. While figure 3 demonstrated the broader role of transport infrastructure in regional economic systems, it is essential to further explore the specific impacts of public transport through a more detailed, citizen-focused lens. To better understand these impacts, this section draws on a selection of theoretical insights and empirical case studies that collectively illustrate how public transport investments can shape social, economic, and spatial dynamics in peripheral regions.

First, Bastiaanssen et al. (2020) examined the relationship between transport accessibility and the likelihood of employment. Their findings indicate a clear positive correlation: enhanced transport access increases the chances of securing a job. Notably, car ownership was identified as the most significant factor in improving employment prospects. Thereby, longer average commute times were shown to negatively affect job opportunities, particularly among young adults who are more sensitive to time and cost constraints. The study also highlights that denser public transport networks and higher job-accessibility scores are associated with improved employment outcomes. For non-car households in peripheral or transit-poor regions, the authors emphasize the need for targeted policy measures, such as improving local public transport.

Building on this, Bastiaanssen et al. (2025) focused on the Netherlands and showed that jobs for low-skilled workers are disproportionately located outside public-transport corridors, and that a 10 % rise in PT accessibility lifts their probability of being employed by roughly 0.03 %. However, vehicle access itself produces a much larger employment premium, implying that, without targeted service improvements, reliance on the car will continue to widen labour-market gaps. In addition to this, Steenbekkers and Vermeij (2013) show that when public transport declines, citizens are more dependent on their car. Which in the long-term makes life in smaller villages particularly difficult, especially for people without a car.

As was also already mentioned by Bastiaanssen et al. (2020), the economic effects of public transport are also frequently mentioned by other studies. Regions with better public transport access typically see increased employment levels (Johnson et al., 2017). As was also highlighted by Anciaes and Alhassan (2024), the presence of reliable public transport services can stimulate economic activity by enabling labour market participation for individuals who otherwise would be excluded. Besides the need for access to public transport, Smith and Zenou (2003) and Coulson et al. (2001) both argue that the commuting times can also impact the labour market. The studies stated that when the commuting time is longer, people are less like to search for another job and thus refuse jobs with longer commuter times. Showing the need for reliable and fast public transport.

Besides economic benefits, public transport investments can contribute to substantial social benefits. Several studies indicate that enhanced public transport access fosters social interaction and engagement, both of which are fundamental to individual and community well-being. Frei et al. (2009) and Utsunomiya (2020) link public transport to more frequent social contact, while Holt-Lunstad et al. (2010) emphasize the importance of social connections for public health. Furthermore, improved services help reduce social exclusion, particularly in rural or low-mobility areas, by enabling access to vital services and networks (Lucas, 2012; McDonagh, 2006).

As the studies show, public transport can contribute to economic – and social benefits. In addition, Alhassan and Anciaes (2025) emphasize the dual benefits for specifically rail-based infrastructure. On the one hand, such investments enhance regional productivity and household income, strengthen labour mobility, and encourage local economic development. On the other hand, improved public transport can significantly reduce social isolation, particularly among elderly residents in peripheral areas, by facilitating participation in community life and improving access to essential amenities.

However, these transport infrastructure investments are not without downsides. Since an area may become more accessible, this may also result in problems for the residents who already lived there before an intervention has been made. The term that arises is gentrification. Tulier et al. (2019) described gentrification as unequal, upward societal transformation of urban space. While the process has always been fundamental to urbanization, it was first explicitly named half a century ago. Initial descriptions of upper-middle-class “gentry” moving into poor and working-class inner-city neighbourhoods.

As was also mentioned by Alhassan and Anciaes (2025). Improved public transport often leads to rising property prices, potentially causing displacement and gentrification if affordable housing policies are not concurrently implemented. Additionally, the benefits of transport investments are not always evenly distributed, potentially exacerbating regional inequalities, as economically vibrant areas tend to disproportionately benefit.

Stockdale (2009) gained empirical evidence from Scotland which demonstrates that gentrification is not confined to cities but is reshaping selected rural districts. Income-weighted census data and rapidly rising house prices reveal significant inflows of high-earning households to peripheral regions in Scotland. Interviews confirm systematic overvaluation of traditional cottages, steadings and large detached homes in anticipation of wealthy buyers, while local testimonies point to early-stage displacement of lower-income residents and first-time buyers. Together these findings show that classic gentrification dynamics can occur in peripheral regions.

Woods (2004) stated that due to large scale infrastructure projects and industrialization they seek to regenerate rural areas. However, rural development is not always the desired outcome for all local citizens. Not all local communities are equally equipped to participate in this new development. And can lead to inequalities, resulting in local citizens with lower incomes moving away. This was also

argued by Zuk et al. (2017). This study researched publicly financed rail transit and shows that new or improved fixed-rail lines frequently reshape neighbourhoods by boosting accessibility and, in turn, land values. Proximity to stations is generally capitalised into higher home prices and rents. A growing body of empirical work links these real-estate gains to gentrification indicators, rising household incomes, educational attainment and shifts in the housing stock. Suggesting that rail investments can act as catalysts for neighbourhood “upgrading” and potential displacement of lower-income residents.

However, the study by Arbués et al. (2015) showed a different outcome of railway investments. This study argued that road infrastructure upgrades tend to produce local and spillover productivity gains. While looking specifically at rail improvements this showed no clear macroeconomic effect. This suggests that rail investments may offer more localised benefits that are slower to materialise or limited by already saturated networks.

In conclusion, public transport investments in peripheral regions carry the potential for significant social and economic benefits, including stronger communities, improved employment opportunities, and higher regional productivity. However, they also come with potential negative consequences, such as rising housing costs, physical fragmentation of communities, and unequal distribution of gains.

3.2.2 Ex-post studies

Concrete ex-post studies in Europe on the effects on public transport and especially railway investments are scarce. Most of the studies are based on a comparison of literature sources and theoretical studies. Thereby, examples in Europe and specifically the Netherlands based on railways are also quite scarce. Nonetheless, Åslund et al. (2017) also researched the impact of the introduction of a commuter train on a pre-existing railroad in Sweden. This considerably decreased commuting times by public transit and thus increasing access to regional employment centre. The case study Upptåget, was initiated in the early 1990, which would connect the northern part of the city Uppsala in Sweden with the local centre and further away towards the Stockholm area. This showed that the introduction of this commuter train did not in show any significant effects on the employment probability or labour earnings of those people living in the treated area before the new commuter trains were introduced (Åslund et al. ,2017). A remarkable result of the study was that the only exception for the result of labour earnings/probability were for people with a non-western background. Nevertheless, this constituted a small group in area and should be interpreted carefully. This is however a result which one could expect since with this group the economic position is poor, meaning they are less likely to have different transport options. From theoretical point of view, one could expect that people already use private transport to get to work.

Besides the study in Sweden, Rotger and Nielsen (2015) conducted research on improved public transport in Copenhagen, Denmark. A metro line was constructed and opened in 2002. The metro line connects the suburban area of Copenhagen with the city centre. Before this metro line, the city was only connected by busses, a regional train and private transport. The study obtained empirical evidence of the effects of improved access to jobs on individual earnings of people living in the treatment area 7 years before the opening and 4 years after the opening. The findings showed that good access to the metro is associated with a wage increase. Commuting destinations had also been redistributed within in the suburban area. People who experienced an increase in wages are only significant for people who were employed in the suburban area. Meaning that the metro increased access to the city centre, thus probability of higher paying jobs.

3.3 Conceptual model

The causal diagram in figure 2 illustrated the problems faced by peripheral regions. In combination with the conceptual model which illustrates the impact of public transport investments in figure 3 by Pokharel et al. (2023), a newly adapted conceptual model is presented in figure 4. The model by Pokharel showed several relationships which are used in the model in figure 4. However, the scientific studies in sub chapter 3.2 highlighted additional findings which have been used to assess the effects on peripheral regions.

While conceptual models such as Pokharel et al. (2023) highlight the systemic and positive feedback between accessibility, attractiveness, and economic activity, they rarely include the socio-spatial repercussions such as gentrification and displacement. Furthermore, as was also argued by Bastiaanssen et al. (2020), the public transport service quality is also of influence on the level of accessibility. Therefore, the conceptual model established by Pokharel et al. (2023) was adapted to a model which incorporates the obtained literature findings.

The adapted model collapses urban and interregional accessibility into one “general accessibility” variable to keep the focus squarely on the single policy lever most relevant to peripheral regions—public-transport investment. Combining the two dimensions avoids unnecessary complexity and keeps the model parsimonious for empirical testing.

Public-transport investment enters the model as the principal external intervention, directly enhancing general accessibility. Higher accessibility is expected to improve public health and equity in transport. Higher levels of accessibility facilitate more social interaction and smaller chance of social exclusion. Additionally, enhanced accessibility by public transport creates more equity in transport, since residents who may not have access to a car are also able to reach their destinations. As highlighted by previous literature, the quality of public transport services significantly influences accessibility. Shorter commuting times and a reliable transport network directly contribute to improved accessibility levels.

Moreover, accessibility has a positive impact on the attractiveness of a location and employment level of the residents in a peripheral region. Since the variable economic activities primarily reflects internal economic processes within a region, the employment level was introduced as an additional variable to explicitly capture labour-market dynamics. Scientific studies highlight that improved access to jobs significantly increases individuals' employment prospects. Consequently, enhanced accessibility contributes directly to a region’s attractiveness, as it enables residents not only to access local jobs but also facilitates travel to and from surrounding areas.

Following Pokharel et al. (2023), the adapted conceptual model retains the feedback loop linking attractiveness and economic activities, along with the external influence of urban policies. A notable addition derived from scientific studies is the inclusion of a negative feedback loop addressing gentrification and displacement in peripheral regions. Specifically, as a region’s attractiveness increases, housing costs and unequal development can rise, potentially displacing existing residents. This negative loop thus captures the unintended socio-spatial consequences that may accompany improved regional attractiveness.

Additionally, increased economic activity can negatively affect accessibility. Economic growth typically generates more employment opportunities, but this growth may also lead to higher traffic volumes and congestion, ultimately reducing accessibility. On the other hand, economic activities are positively influenced by innovation and supportive institutional frameworks. Furthermore, employment levels and economic activities mutually reinforce one another, forming a positive feedback loop. When residents in a location experience higher employment levels, they are likely to enhance the local economy. This also works the other way around, when economic activities of a location are higher, resident are more likely to find a job there.

Finally, the variables attractiveness of a location and economic activities influence the city and regional GDP positively. As was also illustrated by Pokharel et al. (2023), when a location is more attractive, people are more likely to start living or working there. Whereas a higher number of economic activities results in an increase in regional GDP.

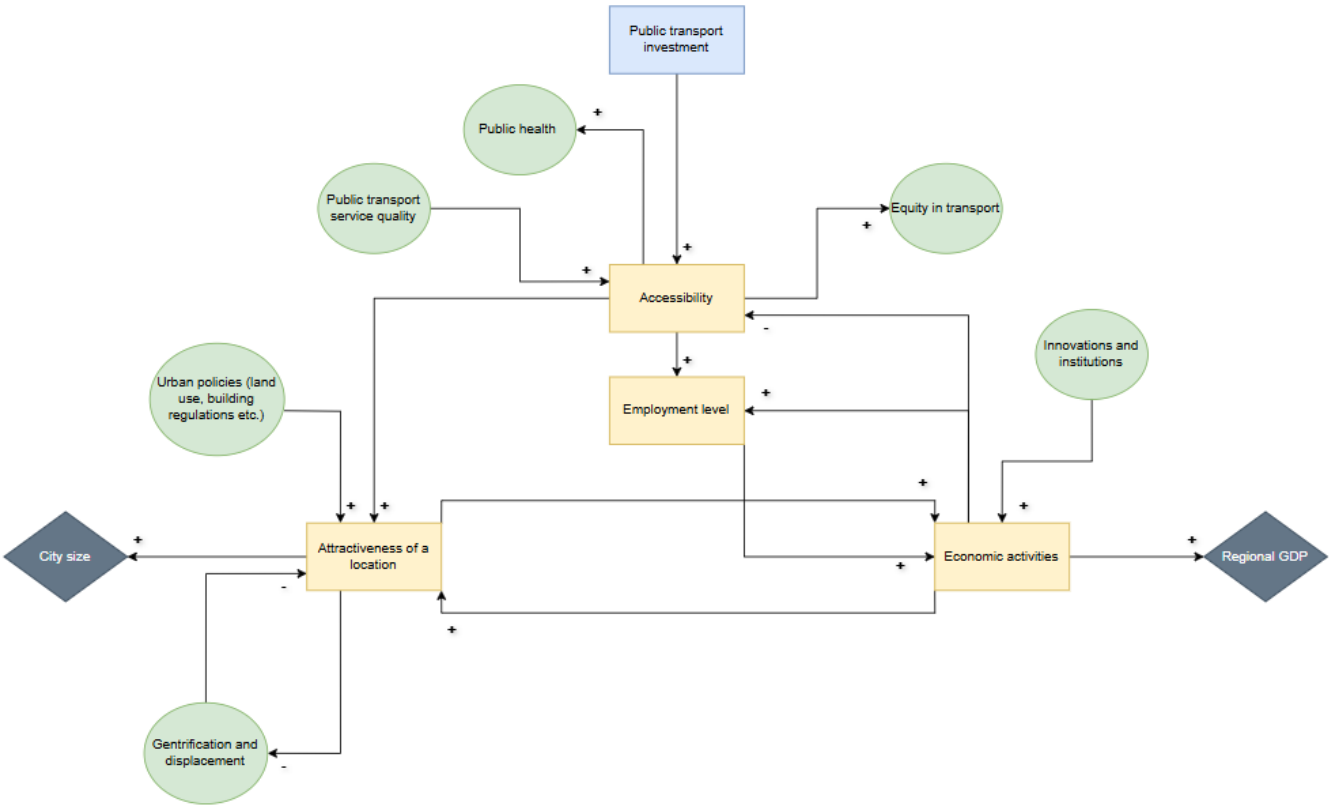


Figure 4: Conceptual model on public transport investment.
Notes on the conceptual model: Arrows marked with a (+) indicate a positive relationship: when one variable increases, the other increases as well, and when one decreases, the other correspondingly decreases. Arrows marked with a (-) indicate a opposite relationship: when one variable increases, the other decreases, and when one decreases, the other correspondingly increases.

3.4 Concluding remarks

In conclusion, the literature review demonstrates clearly that transport infrastructure investments shape the liveability and attractiveness of peripheral regions. The causal diagram presented in Figure 2 offers a structured depiction of the key challenges faced by residents in these areas, grounded in insights from the scientific literature. Complementing this, the conceptual model by Pokharel et al. (2023) systematically captures the dynamics through which transport infrastructure affects both urban and regional locations. Together, these models provide a robust foundation for further investigating the specific role and impacts of public transport investments in peripheral regions.

However, the literature identified both positive and negative findings. On the positive side, improved public transport connectivity enhances employment opportunities, social inclusion, and regional economic growth. As accessibility improves, peripheral areas become more attractive to residents and businesses, promoting a reinforcing cycle of regional prosperity. Enhanced public transport reduces social isolation, particularly among vulnerable groups without car access, and contributes positively to overall public health and quality of life.

Additionally, the scientific sources highlighted the negative side-effects associated with these investments. Improved accessibility can lead to gentrification, and displacement of original residents, exacerbating socio-spatial inequalities. Additionally, increased economic activities and resulting congestion can negatively impact accessibility if transport infrastructure does not adequately support growing travel demand.

Two ex-post studies on the impact of a public transport interventions were found. The first study by Åslund et al. (2017) showed no significant effects on the employment probability and the labour earnings of the people living there before the trains were introduced. In addition to this, Rotger and Nielsen (2015) conducted research on the metro line developed in Copenhagen. This showed that people with good access to the metro experienced a wage increase. However, it is very likely that these people have started working in the city centre due to the enhanced accessibility. These ex-post studies give an indication of a real-life intervention on a region. This can ultimately have an impact on the employment level of a region, as this variable was also incorporated into the conceptual model.

While the conceptual model developed by Pokharel et al. (2023) effectively captures many complex relationships, it has notable limitations. Specifically, the model inadequately addresses socio-spatial repercussions such as gentrification, displacement, and detailed aspects of public transport service quality. Consequently, the adapted conceptual model presented here explicitly integrates these aspects, aiming for a more comprehensive model to guide inclusive and sustainable regional development. Adding external variables such as public health, public service quality, equity in transport and gentrification and displacement. Furthermore, the model was adapted towards the focus on public transport and removed the difference between urban and interregional accessibility for a clearer overview.

The newly adapted model based on the scientific literature clearly shows that the so-called benefits of public transport investments mentioned in scientific studies is not automatically equitable. Many variables have an impact on the attractiveness of a peripheral region and thus on the residents for these regions. Where it is important to take these effects into consideration.

The conceptual model introduced earlier serves as the analytical framework for the subsequent chapters. Its main endogenous variables: accessibility, attractiveness of a location, employment level, and economic activities, provide a structured lens through which the observed data can be interpreted. In the context of the Hanzelijn case study, these variables are applied systematically to assess both the direct and indirect impacts of the railway on the peripheral region.

4 Case Study: The Hanzelijn

In this chapter the case study on the Hanzelijn is explained. The structure of the chapter is as followed. The Hanzelijn is a relatively newly developed railway connection between Lelystad and Zwolle, which opened in 2012. This connection also opened completely new stations: Dronten and Kampen-Zuid. For the case study an evaluation on the effects before 2012 and after 2012 have been made.

Therefore, an analysis before and after 2012 has been carried out. This chapter compares pre- and post-2012 conditions to assess the Hanzelijn impact on the region. The railway opened in December 2012. Therefore, some figures are of the year 2012, since the railway did not open until the last month of 2012. The analysis combined quantitative and qualitative indicators. On the quantitative side, factual data such as projected versus actual passenger numbers and changes in travel times have been examined. The qualitative side, interpretations of trends and interviews with experts are presented in chapter 5.

4.1 Introduction

In 1859 there were already calls from inhabitants of islands in the Zuiderzee in the Netherlands for a train line from Amsterdam towards Kampen (Kamperlijntje, 2012). However, the province of Flevoland did not yet exist, and the realization of a train line through the Zuiderzee for these islands was quite unrealistic. In 1986 Flevoland was realized (Provincie Flevoland, 2025). This gave a way for the development of new cities and villages like Lelystad, Dronten and Almere.

The first train line in Flevoland that was realize was the Flevolijn. This is a train line which entails the connection between Weesp and Lelystad, via Almere (Kamperlijntje, 2012). This line unfortunately did not connect with the rest of the north. Meaning that when people wanted to travel towards Overijssel, Drenthe or Groningen, they needed to travel via Zwolle. Or the other way around, lacking a faster connection from the north towards the rest of the Netherlands. Besides Flevolijn, there is the Kamperlijntje (Kamperlijntje, 2012). This is a train line from Zwolle towards Kampen and vice versa. The Kamperlijntje is a slower train which starts in the centre of Kampen and only goes towards Zwolle. Nevertheless, a direct connection from Zwolle towards Dronten, Lelystad and Almere remained unrealized.

In 1988 the Hanzelijn was mentioned for the first time by the Nederlandse Spoorwegen (NS) (Kamperlijntje, 2012). However, due to the realization of the Flevolijn, the Hanzelijn was put on hold. Around a decade later, research on the Hanzelijn was activated, NS Railinfrabeheer et al., 1996 published the “Startnotitie”. This was published to provide information on the route planning of the Hanzelijn and the opportunity to express an opinion as a citizen. Following this publishment in 1996, the “Trajectnota” in 2000 was published by NS Railinfrabeheer et al., 2000. This is a planning and research document in the early phase of an infrastructure project.

This document stated that the Hanzelijn was developed to address three key problems in the Dutch rail network. First, the main route from Amsterdam to Zwolle, via the Gooilijn (Amsterdam–Hilversum–Amersfoort) and the Veluwelijn (Amersfoort–Zwolle), was facing capacity problems, with congestion expected to worsen. Second, Flevoland and the northern and north-eastern provinces lagged behind in economic development, partly due to limited rail accessibility. Finally, there was a recognised need for an alternative route between the northern Randstad and the north and north-east, to improve regional connectivity and increase the flexibility and resilience of the national network.

In light of these problems, NS Railinfrabeheer et al., 2000 defined the following goals of the Hanzelijn:

- Improvement of the relationship in the national railway network between the northern part of the Randstad and the north and north-east of our country (including Zwolle), possibly as part of a cross-border service.
- Realisation of an interregional connection between Lelystad and Zwolle
- Enhancing regional access: reducing the one-sided westward orientation of Lelystad and Almere and changing it to a more balanced westward, northward and north-eastward orientation. By connecting Dronten to the rail network and providing Kampen with a greatly improved (direct) rail connection to the west.
- Relief for the Gooi and Veluwe line (Amsterdam-Amersfoort-Zwolle).
- Promotion of economic development in the north, north-east and the province of Flevoland.

Eventually in 2002 the decision to develop the railway was made (Ministerie van Verkeer & Waterstaat, 2002). Based on the goals defined in the “Trajectnota”, the case study examined whether the ambitions set at the time of planning and decision-making for the Hanzelijn have been realised in practice. An analysis before and after the opening has been conducted. Where the Hanzelijn opened in December 2012, the building took about 5 years. A windfall for this project was that the Hanzelijn ended up less expensive than expected, the budget was estimated at 1 billion euros (NU.nl, 2025). The actual cost turned out to be 90 million euros less than budgeted.

Furthermore, the choice was made for the analytical spotlight on Dronten, because, unlike Lelystad, Kampen or Zwolle, it had no station before the Hanzelijn opened. Focusing on a community that moved from zero to full rail access eliminates a host of confounding factors (legacy service levels, pre-existing station areas) and makes any observed shifts in mobility, land use or labour markets easier to interpret as consequences of the new line rather than background noise. This does not mean that the effects on the other Hanzelijn municipalities are excluded from the analysis. They are still examined, albeit to a lesser extent. Depending on the source or the specific variable under study, the city of Zwolle is sometimes omitted from the analysis because its role as a major regional hub gives it a fundamentally different economic and transport profile compared to the smaller Hanzelijn municipalities.

Last, based on the presented conceptual model in figure 4 in chapter 3, the case study is conducted. The presented variables: accessibility, attractiveness of a location, employment level and economic activities have been used to determine the effects on the Hanzelijn municipalities. According to scientific literature are these variables a measure to determine the effects on a region. For clarity, the variables employment level and economic activities have been combined into a single subchapter. Presenting them together allows for a more integrated analysis of how the Hanzelijn influenced the regional economy, making trends and relationships between employment patterns and broader economic activity easier to follow.

4.2 Accessibility

One of the core expectations for the Hanzelijn was that it would lead to a measurable improvement in regional accessibility. Before the line opened, NS Railinfrabeheer et al. (2000) projected that between six and seven percent of bus passengers would switch to rail. This shift was expected to result in fewer bus trips, particularly in Flevoland, as train services would replace part of the existing bus network. In addition, the Hanzelijn was intended to encourage travellers to move from car to public transport, thereby easing road congestion and contributing to a more sustainable transport system.

To examine whether these expectations have been met, accessibility in this case study is measured through an analysis of modal split, the number of travellers, travel times and public transport options. Changes in the modal split reveal how the share of trips by train, bus, car, and bicycle has evolved since the opening of the line. The number of travellers provides insight into actual station usage and allows for a comparison with pre-opening forecasts. Finally, the analysis of travel times shows whether journey durations between key destinations have decreased to the extent anticipated. Together, these measures offer a clear and factual basis for assessing the impact of the Hanzelijn on mobility patterns and accessibility in the municipalities it serves.

4.2.1 Number of travellers

In table 6, the number of entries and exits are illustrated for the different stations alongside the Hanzelijn. NS Railinfrabeheer et al., (2000) estimated at the time, before the opening of the Hanzelijn, the number of travellers for each Hanzelijn municipality. Nevertheless, for Zwolle there was no expectation on the number of entries and exits given. Table 5 shows four years, these years were chosen since they give the expectation before the opening and the growth after the opening up to 2024.

Table 5 shows that the number of entries and exits for Lelystad and Kampen-Zuid have not been met. For Kampen-Zuid they estimated a significantly higher number than the actual realised entries and exits. Dronten did meet the estimated number of travellers. Another observation is that the number of travellers in 2024 is lower than in 2019. This is the consequence of the Covid-19 pandemic. Due to the pandemic, much more people started to work at home (TNO, 2023). Eventually leading to less people taking the train (Kennisinstituut voor Mobiliteitsbeleid, 2023).

Table 5 entries and exits (Hildebrand (Treinreiziger.nl) & treinreiziger.nl, 2020) (NS, 2025) (NS Railinfrabeheer et al., 2000)

Station	Entries and exits with Hanzelijn estimation: 2010	2013	2019	2024
Lelystad	14.000	12693	14.441	12.592
Dronten	3000	3142	3545	2931
Kampen-Zuid	1800 - 6800	1141	1910	1618
Zwolle	-	38.594	52.342	42.976

4.2.2 Modal split

In addition to passenger counts, an examination of the modal split before and after the Hanzelijn opened is presented below. Figures below show the shares for rail, bicycle, car, and walking, using 2004-2011 as the pre-opening period and 2016-2019 as the post-opening window. Choosing a few years after 2012 allows travel behaviour to stabilise while avoiding any Covid-19 distortions, making the pre-/post-comparison more reliable.

This analysis was conducted with the “Vierkantjes”-tool of Studio Bereikbaar. This tool is based on CBS data on the mobility modes of the embarking and disembarking passengers. On the y-axis the travel distance is presented. Ranging from short trips, shorter than 2,5 kilometres to longer trips of

more than 25 kilometres. Above the figure the percentage of the mobility mode can be read. The wider the colour, the wider the share of that mobility mode in that municipality.

For this analysis Zwolle was left out of the picture. Zwolle functions as a regional rail hub and already had a mature, multi-modal transport network before the Hanzelijn opened, so including it would blur the analysis by mixing a large urban node with smaller, genuinely peripheral municipalities.

Dronten

In figure 8 and 9 the modal split for Dronten is illustrated. Walking and cycling are the most used modes of transport for trips shorter than 2.5 kilometres. Over time, the share of cycling for these short trips has decreased, while the share of car use has increased.

For trips between 2.5 and 10 kilometres, the share of public transport has decreased to zero. Over the same distance range, the share of cycling has increased, while car use has remained approximately the same. For distances of 10 to 25 kilometres, the share of public transport has increased slightly. For distances greater than 25 kilometres, the share of public transport has decreased slightly, while the share of car use has increased.

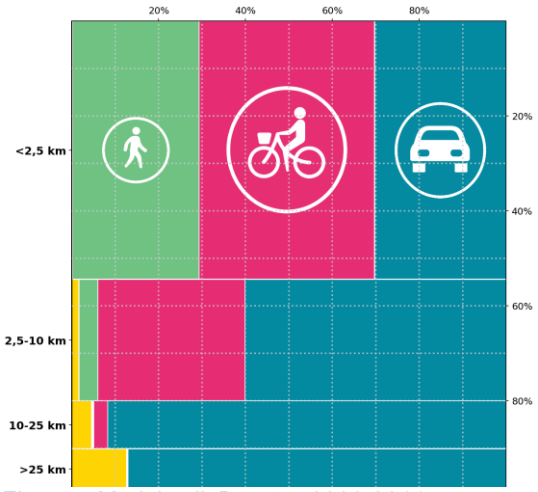
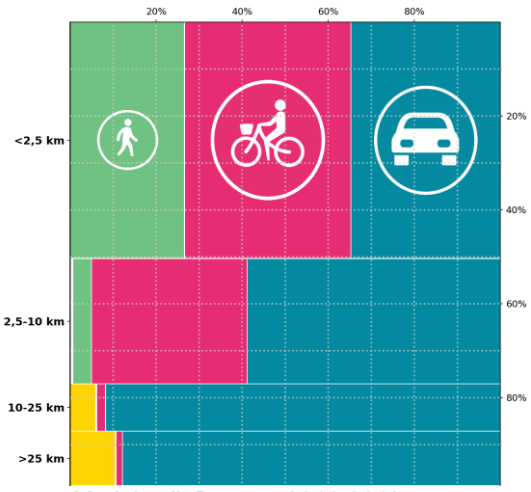


Figure 5 Modal split Dronten 2006-2011



Modal split Dronten 2016-2019

Kampen

In figure 10 and 11 the difference for Kampen are illustrated. The figures below are illustrated for the whole of Kampen, meaning that the figures of the Kamperlijntje towards Zwolle are also included.

The data show that for distances shorter than 2,5 kilometres, the share of walking has decreased, and the share of biking has increased significantly. For the distances between 2.5 and 10 kilometres, the share of walking has decreased compared to the pre-opening period. Over the same distance range, the shares of cycling and car use have increased. Public transport use over this distance range is zero both before and after the opening of the Hanzelijn.

For distances between 10 and 25 kilometres, the share of public transport use has decreased slightly compared to the pre-opening period. The share of car use over this range has remained stable, while the share of cycling has increased.

For distances greater than 25 kilometres, the share of public transport use has increased compared to the pre-opening period. Over this same distance range, the share of car use has decreased, while the shares of walking and cycling have remained largely unchanged.

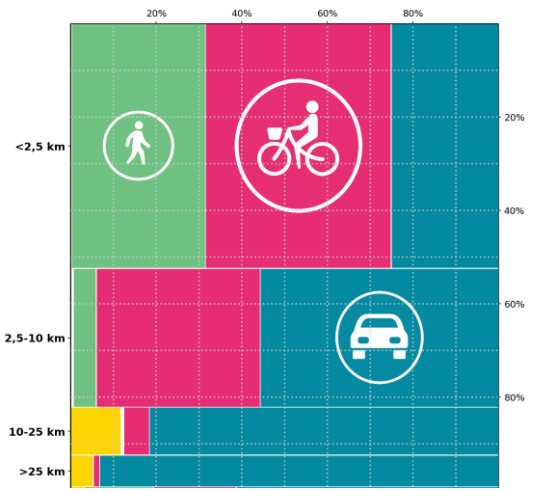
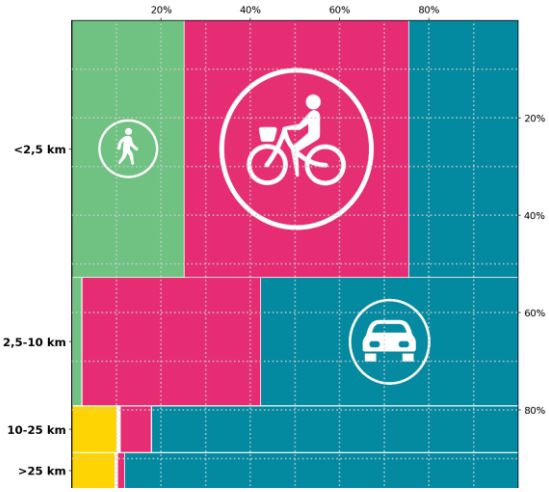


Figure 6 Kampen 2004-2011



Kampen 2016-2019

Lelystad

For distances shorter than 2.5 kilometres, the share of public transport use increased in the period 2016–2019 compared to the pre-opening period. Over the same range, the shares of walking and cycling remained the dominant modes.

For distances between 2.5 and 10 kilometres, the share of public transport use remained approximately the same before and after the opening of the Hanzelijn. Over this distance range, the share of cycling increased, while the share of car use decreased.

For distances between 10 and 25 kilometres, the share of public transport use decreased compared to the pre-opening period. Over the same distance range, the share of car use remained stable, while the share of cycling increased.

For distances greater than 25 kilometres, the share of public transport use increased after the opening of the Hanzelijn, while the share of car use decreased. The shares of walking and cycling over this range showed minimal change.

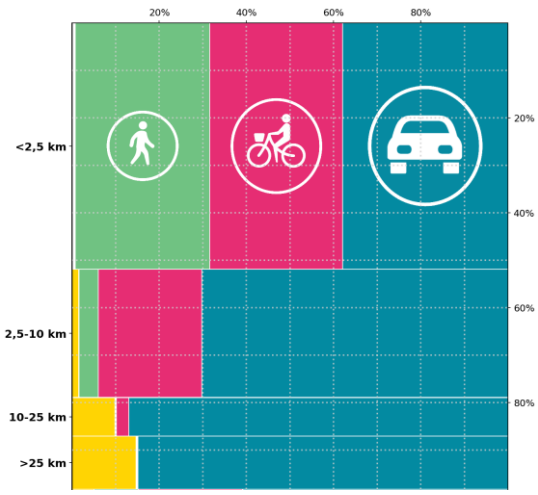
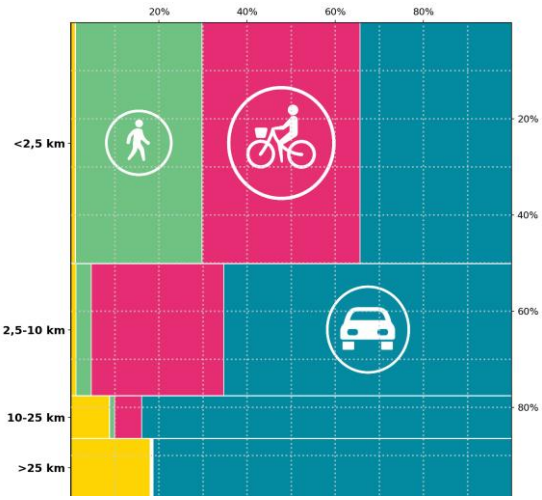


Figure 7 Lelystad 2004-2011



Lelystad 2016-2019

In conclusion the modal split analysis shows that the expectation that the Hanzelijn would lead to a clear shift from car use to public transport has only been partly realised. For longer distances (>25 km), Lelystad and Kampen experienced an increase in public transport share accompanied by a decrease in car use, in line with expectations, while Dronten saw the opposite trend. Over shorter and

medium distances, shifts were more varied, with some increases in cycling and stable or declining public transport shares, particularly where bus services were reduced. Overall, the results indicate that while the Hanzelijn has stimulated rail use for certain longer trips, the anticipated broad reduction in car dependency has not materialised across all municipalities.

4.2.3 Travel times & public transport options

To analyse the accessibility of the region, the expected travel times before and after the opening have been determined. Before the opening of the Hanzelijn, only busses were available between Leystad and Zwolle with stops in the other Hanzelijn municipalities. After the opening, the train replaced this connection.

Before the opening of the Hanzelijn the travel time between Zwolle and Amsterdam Central was 76 minutes (Treinreiziger, 2012). The expected travel speed by the train at the time was approximately 200 km/h (NS Railinfrabeheer et al., 2000). However, this speed was not reached but was set at 140 km/h (Treinreiziger, 2012). For the connection Amsterdam Central and Zwolle, the expected travel time was estimated at 51 – 57 minutes (Treinreiziger, 2012). However, due to the slower travel speed this travel time was not reached and the travel time right after the opening was approximately 63 minutes. At this moment (2025) the travel time is still at 62 – 65 minutes between Amsterdam Central and Zwolle (NS, 2025). Illustrating that the travel time gain has not been as significant as expected but did increase compared to before the opening of the Hanzelijn.

Besides these figures, an estimation for the Hanzelijn municipalities has been conducted below in table 7. A comparison between 2012 before the opening of the Hanzelijn and after the opening in 2013 is made. For almost most every route a decrease in travel time is noted. Especially for Lelystad – Zwolle and Dronten – Zwolle, the travel time decreased significantly. Furthermore, for Dronten – Kampen the travel time remained the same. Apparently, this train connection is not much faster than the bus connection.

Table 6 Travel times public transport in minutes. Source: Molema et al. (2013)

Travel time in minutes		
Route	2012	2013
Lelystad – Dronten	35	33
Lelystad- Kampen Zuid	59	39
Lelystad – Zwolle	86	44
Dronten – Kampen	35	35
Dronten – Zwolle	64	36
Kampen – Zwolle	34	24

Following the development of the Hanzelijn, the number of bus services in Dronten was reduced, as anticipated in NS Railinfrabeheer et al. (2000). Before the opening, Dronten had no railway station, and bus services were the only available form of public transport. After the introduction of the train connection, several bus lines were scaled back. Table 9 shows the number of buses departing during the morning peak in 2012 and 2013, illustrating this reduction.

According to Weterings et al. (2025), this decrease in bus services had a notable impact on Dronten. Neighbourhoods located close to the new rail station experienced improved travel times and job accessibility, while many outlying areas saw a decline in public transport accessibility. The location of the station on the edge of the town means that residents without access to a bicycle or car must rely on feeder buses, adding additional waiting and travel time. The extent to which the Hanzelijn improves accessibility therefore varies within Dronten, depending on the distance from and connectivity to the station.

Table 7 Number of bus lines and leaving busses 2012 -2013 (07:00 – 08:00 am) Source: Molema et al. (2013)

Municipality	2012		2013	
	Number of bus lines	Number of leaving busses	Number of bus lines	Number of leaving busses
Lelystad	8	15	7	7
Dronten	5	17	4	5
Kampen	12	21	6	6
Zwolle	24	34	22	30

4.3 Economic activities & employment levels

To assess the effects of the Hanzelijn, this section examines developments in economic activity. Based on the literature review in chapter 3 and the goals stated in chapter 4.1, expectations at the time of planning included a strengthening of economic performance in the region. Thirteen years after the opening of the line, the analysis evaluates whether these expectations have been met.

In addition to encouraging a modal shift from car to rail, a key goal for the government was to promote more balanced economic development across all Dutch regions (NS Railinfrabeheer et al., 2000). The aim was to foster a competitive market and stimulate employment growth, particularly in regions with structural and long-term lags in development.

In 2000, the province of Flevoland faced several structural economic challenges (NS Railinfrabeheer et al., 2000). Its contribution to national GDP was the lowest of all provinces at 1.3%, its employment rate was underdeveloped, and a large share of its workforce commuted elsewhere for work. The province expected that the Hanzelijn would support and accelerate its economic development.

For Lelystad specifically, there were additional expectations. Plans called for developing the area around the station into a central business district (NS Railinfrabeheer et al., 2000). With 20,000 m² of business floor space, aimed at attracting higher-segment business services such as call centres, regional headquarters, and pension insurance companies. While the opening of the Hanzelijn did reduce public transport travel times, the anticipated broad improvements in labour market outcomes have not been consistently observed across the population.

4.3.1 Employment level Dronten

Weterings et al. (2025) analysed the number of jobs accessible by public transport in combination with the bicycle for the municipality of Dronten. The study calculated the number of jobs that could be reached within 45 minutes from each neighbourhood in Dronten and compared the situation before the Hanzelijn opened in 2012 with the year after the opening in 2013. The results were presented in maps showing accessibility levels, where darker blue areas represent a higher number of accessible jobs. The maps are presented in appendix A.

The maps show that job accessibility increased in most parts of Dronten after the opening of the Hanzelijn. The largest increase occurred in the northern part of Dronten, near the new railway station. In the southern part of the municipality, accessibility remained unchanged, likely due to the reduction of bus services and the longer cycling distance to the station (more than 15 minutes) combined with the absence of a nearby bus stop.

When comparing accessibility by public transport with accessibility by car, the study found that the gap between the two decreased significantly after the opening of the Hanzelijn. Depending on the location, the number of jobs accessible within 45 minutes by public transport increased by a factor of three to almost nine. Despite this improvement, the number of jobs reachable by car within the same travel time remained higher.

Overall, the introduction of the Hanzelijn resulted in a substantial increase in the number of accessible jobs for almost all neighbourhoods in Dronten. However, the findings also indicate that reductions in bus services can lead to accessibility losses in certain areas, even when a new rail connection is introduced. This shows that a new railway connection can also have negative downside for citizens in some regions. Since Dronten was the only Hanzelijn municipality without a previous rail connection and is located furthest from the larger employment centres of Zwolle and Lelystad, the relative increase in job accessibility was greatest here.

Weterings et al. (2025) also examined whether the opening of the Hanzelijn station in Dronten affected residents' labour market position. The study compared labour market outcomes for Dronten residents with those of matched control neighbourhoods whose accessibility to jobs remained unchanged after 2012. By using these control areas as a counterfactual, the analysis estimated how labour market outcomes in Dronten might have evolved had the station not been built. The expectation was that, if the station had a positive effect, Dronten residents would show greater improvements in employment indicators compared to the control group after 2012.

The analysis covered the period 2006–2018 and focused on 20- to 55-year-olds living in Dronten just before the Hanzelijn opened. While public transport travel times fell and the number of jobs reachable within 45 minutes increased substantially, these improvements did not lead to higher employment rates or more full-time workdays for Dronten residents compared to the control group. After 2012, the share of residents with paid employment rose slightly faster in Dronten, but this difference disappeared when adjusting for demographic characteristics such as age distribution and educational attainment. The same pattern applied to the small increase in average full-time days worked per month after 2014.

The only statistically significant effect was on wages. After adjusting for personal characteristics, Dronten residents experienced an average real hourly wage increase of €0.34 more than their counterparts in the control areas in the six years following the opening. This suggests that the station's opening may have improved earnings for those already employed, even though it did not increase overall employment or working hours. The study does not establish the precise mechanism behind this wage growth, leaving open whether it is due to workers moving into better-matched jobs or becoming more productive in their existing roles.

4.3.2 Employment level Hanzelijn municipalities

Weterings et al. (2025) analysed the impact of the Hanzelijn in detail for Dronten, the most logical focus since it was the only Hanzelijn municipality without a pre-existing railway station. Lelystad and Kampen already had stations prior to the Hanzelijn, making the change in accessibility for Dronten far more significant. However, because there were also economic development expectations for Lelystad, Dronten, and Kampen, this subchapter includes all municipalities along the Hanzelijn to give a complete picture of employment trends. Dronten is therefore presented both for its unique accessibility change and as part of the wider trend, allowing its trajectory to be compared with municipalities that already had rail access.

Table 9 shows the number of jobs per municipality, with Zeewolde included as a reference case. Zeewolde, located in the same province but without a railway station, serves as an untreated control, offering a similar provincial context without direct rail investment. Data for all branches of economic activity were used to provide an overall measure of employment, with observations taken for 2010 (pre-opening), 2013 (just after opening), 2019 (pre-Covid), and 2021 (most recent available).

The results show notable differences between municipalities. Lelystad experienced a decline in economic activity after the Hanzelijn's opening, which may reflect the lingering effects of the 2008 financial crisis (Centraal Economisch Planbureau, 2012). Zwolle also saw a drop initially, but recovered by 2019, following the national trend. Only Dronten and Zeewolde showed consistent growth in the number of economic activities. Since Zeewolde, without a railway station, displayed a similar upward trend, this suggests that Dronten's increase cannot be solely attributed to the Hanzelijn.

Table 8 Number of jobs per municipality source: (CBS, 2025b)

Number of jobs by employers in December						
	Netherlands	Dronten	Kampen	Lelystad	Zeewolde	Zwolle
Branches (SBI 2008) December	X1000	x 1 000	x 1 000	x 1 000	x 1 000	x 1 000
A-U All economic activities 2010	7884,5	11,4	19,3	42	8,3	93,5
A-U All economic activities 2013	7701	11,5	19,1	32,7	9	91,8
A-U All economic activities 2019	8543,9	14,2	20,9	31,4	10,3	104,4
A-U All economic activities 2021	8996,7	14,2	22	33,8	10,9	108,6

4.3.3 Economic activities:

The Hanzelijn Monitor conducted in 2015 examined property value developments since the line's opening (Buunk & De Vor, 2016). The study found no significant relationship between the presence of a station and property values in Hanzelijn municipalities. Price trends were similar to those in locations further from the stations, indicating that proximity to the new rail connection did not produce a distinct increase in property values.

Appendix C presents CBS (2025e) data on the number of offices in Flevoland municipalities—Dronten, Lelystad, and Zeewolde—between 2012 and 2024. Zeewolde serves as a reference case, as it lacks a train station but shares the provincial context. The number of offices was analysed because the Hanzelijn was expected to attract businesses, in line with literature suggesting that offices often locate near highly accessible sites such as train stations (Willigers & Van Wee, 2011).

However, the data show no sustained growth in the number of offices over the past 13 years. Dronten saw the sharpest decline, reaching a low point in 2022 before a slight rebound in 2023. Lelystad also shows no consistent increase, despite policy ambitions to attract call centres, pension insurers, and administrative offices (NS Railinfrabeheer et al., 2000). By contrast, Zeewolde experienced steady growth in office numbers from 2012, stabilising after 2014, contrary to expectations based on rail accessibility.

In Kampen, the number of offices rose in 2013 but plateaued after 2014, likely influenced by the proximity of Zwolle, where offices are more inclined to locate. For Zwolle, data were presented separately due to its much larger scale. Here, office numbers declined steadily from 2013 to 2024, following a brief rise in 2012–2013.

4.4 Attractiveness of a city

NS Railinfrabeheer et al. (2000) stated that one of the objectives of the Hanzelijn was to promote economic development in the region. Improving the region's accessibility by rail was seen as a key lever for enhancing its appeal to businesses, residents, and investors, thereby stimulating long-term economic growth. The conceptual model presented in chapter 3 highlights the close relationship between economic activity and the attractiveness of a region. Additionally, according to Buunk & Bezembinder (2012) the Hanzelijn could make the Hanzelijn municipalities more attractive. The expectation at the time was that the Hanzelijn municipalities would experience population growth and that new built developments would emerge around the station areas.

Following this framework and the study, the development of population growth, housing and the build environment in the Hanzelijn municipalities is used as an additional variable to assess whether the line has achieved its intended impact on the attractiveness of the region.

4.4.1 Population development

Table 11 presents the population trends for Dronten, Lelystad, Kampen, Zwolle, Zeewolde, and the Netherlands for the years 2010, 2013, 2019, and 2024. Including Zeewolde, a municipality without a train station but within the same province, allows for comparison with a location unaffected by direct rail connectivity. The Netherlands as a whole is included to provide a national reference trend.

The data show population growth in all municipalities over the observed period. In Dronten, growth between 2013 and 2019 was relatively modest compared to Zeewolde, where the increase was more pronounced despite the absence of a station. Across most municipalities, the largest population increases occurred between 2019 and 2024, consistent with the national trend. This acceleration aligns with broader demographic patterns in the Netherlands, including the effects of the housing shortage, which has contributed to population growth in more peripheral regions as housing availability in the Randstad remains constrained.

Table 9 Number of inhabitants Source: (CBS, 2025a)

Number of inhabitants				
	2010	**2013**	**2019**	**2024**
Municipality				
Dronten	39.787	40.679 (+2.24 %)	40.815 (+0.33 %)	44.354 (+8.67 %)
Lelystad	74.628	75.778 (+1.54%)	77.893 (+2.79%)	84.080 (+7.95%)
Kampen	50.051	50.924 (+1.74%)	53.779 (+5.61%)	56.177 (+4.46%)
Zwolle	119.030	122.562 (+2.97%)	127.498 +(4.03%)	133.141 (+4.43%)
Zeewolde	20.906	21.262 (+1.70%)	22.309 (+4.92%)	23.899 (+7.13%)
Nederland (mln)	16.57	16.78 (+1.27%)	17.28 (+2.98%)	17.94 (3.82%)

In addition to overall population growth, it is relevant to examine migration patterns from other municipalities to Dronten, Lelystad, Kampen, Zwolle, and Zeewolde (the reference municipality). Table 12 presents these trends over time, showing annual changes in net settlement to indicate whether inflows increased or decreased compared to the previous year.

The data show that in 2013 net migration from other municipalities was negative in all Hanzelijn municipalities as well as in Zeewolde, with the exception of Kampen, which recorded a positive inflow. From 2019 onwards, all municipalities experienced growth in net settlement, reflecting an overall increase in people moving to these areas, consistent with national population trends. In Dronten, there was a notable rise in in-migration in 2019; however, Zeewolde, without a railway station, recorded an even stronger increase.

Table 10 Number of establishments Source: CBS Statline (2025c)

Region	Indicator	2010	2013	2019	2024*
Netherlands	**Total establishments**	744 302	778 922 (+4.65 %)	1 026 586 (+31.8 %)	1 116 236 (+8.73 %)
	From another municipality	589 870	614 150 (+4.12 %)	757 522 (+23.3 %)	802 164 (+5.89 %)
Dronten	**Total establishments**	2 474	2 529 (+2.22 %)	3 060 (+21.0 %)	3 648 (+19.2 %)
	From another municipality	1 599	1 540 (–3.69 %)	2 287 (+48.5 %)	3 201 (+40.0 %)
Kampen	**Total establishments**	1 281	1 338 (+4.45 %)	1 912 (+42.9 %)	2 016 (+5.44 %)
	From another municipality	1 115	1 142 (+2.42 %)	1 649 (+44.4 %)	1 667 (+1.09 %)
Lelystad	**Total establishments**	3 003	2 858 (–4.83 %)	4 223 (+47.8 %)	4 929 (+16.7 %)
	From another municipality	2 448	2 306 (–5.80 %)	3 186 (+38.2 %)	3 588 (+12.6 %)
Zeewolde	**Total establishments**	877	1 108 (+26.3 %)	2 705 (+144 %)	2 458 (–9.13 %)
	From another municipality	768	663 (–13.7 %)	1 130 (+70.4 %)	1 536 (+35.9 %)
Zwolle	**Total establishments**	5 873	5 817 (–0.95 %)	6 915 (+18.9 %)	6 870 (–0.65 %)
	From another municipality	5 212	5 138 (–1.42 %)	5 940 (+15.6 %)	5 752 (–3.16 %)

4.4.2 Spatial development

According to Buunk & Bezembinder (2012), the opening of the Hanzelijn was accompanied by the expectation that it would stimulate substantial housing growth and broader spatial development around the stations in Lelystad, Dronten, and Kampen, thereby contributing to regional attractiveness. CBS (2025d) data, presented in Appendix B, show the number of houses in Dronten, Kampen, Zeewolde, Lelystad, and Zwolle. The separation of Zwolle and Lelystad from the smaller municipalities allows a clearer view of local trends. The figures indicate a gradual but limited increase in housing across all municipalities. Dronten experienced a small dip in 2014 before returning to a growth trajectory similar to Zeewolde and Lelystad. Lelystad's housing stock expanded more notably from 2018 onwards, while Zwolle has shown substantial growth since 2012. Although these increases align with population growth patterns, it is difficult to directly attribute them to the Hanzelijn.

Besides the number of houses, long-term changes in the built environment were assessed using Topotijdreis maps for 2006 and 2024, supplemented by floor space index (FSI) and mixed-use index (MXI) measures in appendix E (Harbers et al., 2018). Floor Space Index (FSI) measures building density, calculated by dividing total floor area by land area. Higher values indicate more intensive use of space. Mixed-Use Index (MXI) measures the diversity of land uses in an area. Higher values show a balanced mix of functions, while lower values indicate single-use zones.

In Dronten, the area north of the station—primarily a business district before the Hanzelijn—has expanded modestly, and new housing has been added mainly in the town's western areas, away from the station. The immediate station surroundings have seen limited residential development, and the MXI indicates predominantly single-use (business) functions. The low FSI values confirm a relatively low density in this part of Dronten.

In Kampen, the Hanzelijn station is located in Kampen Zuid, while the older Kamperlijntje station lies in the town centre. A new neighbourhood has developed around Kampen Zuid, and growth has also occurred across the river near the old station. MXI values indicate a diverse mix of housing, retail, and business functions around Kampen Zuid, though the FSI suggests a relatively spread-out building pattern. Overall, Kampen is denser than Dronten, especially near the historic city centre.

Lelystad, which had high expectations for both housing and office growth, shows increased density around its centrally located station area, reflecting targeted spatial planning. MXI values are high in much of the city, indicating a mix of offices, retail, and housing, while lower FSI values in the waterfront area suggest lower density and a concentration of single-use functions, likely business parks.

4.5 Concluding remarks

This chapter examined the development and impacts of the Hanzelijn, opened in December 2012 after decades of planning to improve accessibility, stimulate economic growth, and strengthen connectivity between the Randstad, Flevoland, Overijssel, and the north of the Netherlands. While the line closed a key network gap and reduced travel times the overall outcomes have been mixed. As can be seen below in table 11.

The comparison between initial expectations and realised outcomes (Table 10) illustrates the gap between policy ambitions and practical results. While certain goals, such as improved accessibility near stations, were partly achieved, other indicators — including travel time targets, passenger volumes, and modal shift — fell short. Economic development outcomes, particularly in job creation and business activity, were weaker than anticipated, suggesting that the Hanzelijn alone was insufficient to stimulate significant regional growth. Moreover, the unexpectedly negative effect of bus service reductions highlights how changes in one part of the transport system can undermine overall project benefits.

The indicators resulting from the case study gave a good base for the questioning and coding of the interviews. Where questions based on the employment market, modal shift from car to rail and urban attractiveness are further questioned.

Table 11 Outcomes chapter 4

Indicator	Expectations	Realized Outcomes	Evaluation
Travel Time	Amsterdam–Zwolle: 51-57 min	Amsterdam–Zwolle: 62-65 min	Partially realised
Passenger Volume	Significant passenger increase	Growth below expectations	Below expectations
Modal Shift	Shift from car/bus to rail	Limited shift: car usage stable/increased	Below expectations
Employment & Economy	Significant economic boost and job creation	Limited economic/job growth impact	Below expectations
Accessibility	Improved job accessibility (especially Dronten)	Significant gains near stations	Partially realised
Bus Services	Shift towards railways	Significant cuts; negative peripheral impact	Unexpectedly negative
Urban Attractiveness	Growth in housing/offices near stations	Modest growth; uneven spatial impacts	Below expectations

5 Interviews

5.1 Introduction

In this chapter the conducted interviews are presented. This chapter employs semi-structured interviews with domain experts to deepen the understanding of the ex-post effects of public-transport investments in the Netherlands. The aim of these interviews was twofold. First, to gather more knowledge about the Hanzelijn, which did not emerge from the case study yet. To gain a more comprehensive understanding of the effects of this trainline. Chapter 4 mainly described the factual number of the Hanzelijn on the region. However, a qualitative analysis to interpret the Hanzelijn's results in light of expectations and planning goals is by using interviews is highly relevant to add to this case study. Second, to understand the broader conditions which influence the effect of the development of a new railway on a peripheral region. In the end of this chapter the additional factors identified from chapter 4 and this chapter are presented.

For the interviews with domain experts, the questions were developed based on the key variables identified in the conceptual model (Chapter 3) and the findings from the case study analysis (Chapter 4). Several overarching topics—such as accessibility, economic activities, employment, and the attractiveness of locations—were defined in advance to ensure a structured exploration of the research objectives. Within these topics, specific questions were formulated to probe the experts' perspectives, experiences, and interpretations in greater depth. A list of several starting questions, along with the thematic structure, is provided in the appendix F.

For the illustration of the interviews, a hybrid coding strategy was adapted. It initiated with a small, theory-driven codebook derived from the literature review and the case study, applying these deductive codes to every transcript. Codes such as scaling down of bus routes, the employment market and public transport services were used as base for the coding. While coding, I simultaneously noted unanticipated ideas that surfaced repeatedly and added these as inductive codes.

In the table the coding scheme is illustrated. The questions which were asked were partly focused on the Hanzelijn and on the general view on the impact of a railway on a peripheral region. For the effects on the Hanzelijn various questions concerning the expectations at the time, prerequisites of making a railway a success, how a railway enhances accessibility and how the Hanzelijn affected the economy of the surrounding regions. Besides questions on the Hanzelijn, questions based more on national level were asked. The takeaway was to question what their view was on the deployment of railways to enhance peripheral attractiveness. Here was also asked if they had any experience with research on railway development in the past.

Table 12 Coding interviews

Theme	Code	Description	Example Quote
Accessibility	Station use & travel time	Station location, frequency, and speed influence use; Kampen-Zuid underused due to slower service and orientation to Zwolle	"It is still not that you say… you are very quickly in Amsterdam. It is only a sprinter stop."
	Bus service changes	Scaling down of buses reduced accessibility for some, especially non-cyclists and people outside centre	"Travellers who live further away… have no connection to them."
	Awareness & integration	Awareness of rail possibilities low; integration with rest of network key	"The station… actually came up very little in municipalities policy."
Economic Development	Employment & offices	No measurable increase in jobs; expected office growth did not occur	"We see no effect on the number of people with paid work… That… hasn't really taken off at all."
	Productivity	Increased accessibility may raise productivity rather than employment	"They may be able to work more efficiently… but you just can't test that."
Attractiveness	Population change	No significant growth vs. controls; long-term change expected	"Dronten is very slowly transforming… that just takes a very long time."
	Urban development	Housing plans not centred near station; station-area development important	"Additional construction on the south side [away from station]."
Policy & governance Factors	Service quality	Travel time, comfort, and frequency affect PT use	"If you… have to stand, you're more likely to choose something else."
	Explicit goals & impacts	Need for clear objectives; recognize potential negative effects	"It only justifies an investment if people actually use it… Business activity moves away."

5.2 Synthesis of Chapter 4 Results

The first group of codes is categorized on the effects of the Hanzelijn. Several questions in the interviews were based on the findings in the case study. Such as the lack of effects on the labour market, the scaling down of the busses, and attractiveness of the Hanzelijn municipalities. Therefore, the personal view on the development of the Hanzelijn has been given.

5.2.1 Accessibility

Number of travellers

For the variable accessibility various number were presented in chapter 4. The first result from the case study was that the number of travellers did not meet the expectations for all Hanzelijn municipalities. The goal stated by NS Railinfrabeheer et al., (2000) that the Hanzelijn would provide Kampen-Zuid a fast connection towards the west of the Netherlands (the Randstad). However, the expected number of entries and exits was not realised (Oost, 2015). One of the participants of the interviews showed the possible reason for that below. However, due to its strong orientation towards Zwolle and a slower train, so called sprinter, the connection was not as efficient as was expected. Meaning that it is likely that people still take the Kamperlijntje to Zwolle if you want to reach the Randstad, because it is quicker.

Participant 4: “Which is why you see that Kampen, and Kampen is very strongly focused on Zwolle. Yes, because the Kamperlijntje is of course focused on Zwolle, so to speak. There was never a connection towards the Randstad from Kampen. It was always via Zwolle. Now Kampen is connected towards the Randstad for the first time. The only tricky thing is it is with a sprinter. It is still not that you say, from Kampen you are very quickly in Amsterdam. It is only a sprinter stop. And the centre of gravity of the city is still focused on the connection to Zwolle, so to speak. And there you can easily take the Intercity to Amsterdam.”

Travel time

The travel time reduction was also less than was expected. However, the travel time did decrease as illustrated by participant 4 below. Stating that the travel time could also have been much worse.

Participant 4: “That current travel time of 62 minutes is already a lot smoother if we have to for the Hanzelijn was it 79. Between Zwolle and Amsterdam.”

As argued in chapter 4, the aimed speeds by the Hanzelijn were not met. Even though the Hanzelijn was built with the idea for much higher speeds, and that this has not been realised yet. Where the aim is to increase the speed, so the travel time will be reduced.

Participant 4: “The Hanzelijn is classically built, with a view to, you might someday replace the top line with something else and then you can drive just 200 there. So, that always makes it a bit complex, but it is true that the Hanzelijn was built to achieve a higher driving speed than 140. And that is also what we are working towards together with our partners.”

Participant 2: “There is a speed increase coming up on the Hanzelijn. From 2027, trains will be able to travel 180 km/h. The Hanzelijn was built for 200 km/h, but it's not that far yet. And that is part of the approach to save eight minutes of travel time between Amsterdam and Groningen.”

Participant 2 stated that the accessibility in Flevoland increased tremendously. Showing that people now have more options to go to other places in the Netherlands by train.

Participant 2: “It obviously has meant a lot for Flevoland, that several extra stations have come, so that travellers can offer some more options. Connections with the rest of the country have improved tremendously. You can now get to Groningen from Almere within an hour and a half. Well, before, that was unthinkable. Since construction of Hanzelijn there have become quite tunings accessible from Flevoland stations that you didn't have before.”

Scaling down bus routes

Besides the travel time illustrated in chapter 4, the results also showed a reduction in number of bus lines for Dronten. The consequences of this development were highlighted by the participants as well.

Participant 2 illustrates how the decision to scale down the bus lines was made at the time, highlighting the trade-off between reducing bus services in Flevoland and developing a new railway. This choice, which was already predicted by NS Railinfrabeheer et al. (2000), ultimately meant that citizens living further away from the station now bear the burden of reduced accessibility.

Participant 2: “The advantage of a bus service is that it also provides access to the region. That you have many more stops. And a train that stops only at a station. So, by building the Hanzelijn, the bus line has been scaled down. As a result, travellers who live further away from the stations have no connection to them. But that's always a trade-off you have of okay, most of the owners will benefit and a small part, yes, they will also have a bit less transport”

Participant 7 illustrated another side of the scaling down of the bus lines. It showed that some citizens in Dronten actually worsened in accessibility. Especially for citizens living outside the centre are affected by the scaling down of the bus lines. Notably for people with low mobility who are not able or

do not want to walk or bike and want to make use of the station are dependent on the use of the busses. Showing that the development of public transport does not always increase the accessibility for all citizens. As outlined in chapter 3, enhancing accessibility through public transport is expected to promote greater equity in mobility. However, the participants' insights suggest that, in practice, this assumption does not always hold true.

Participant 7: "A lot of regional bus transport has been scaled down. So now if you want to use public transport, you do have to use the station and the rail link. But then you also have to connect your bus, if you can't go by bike or are going to walk a lot. You do have to make sure the bus connects to the departure and arrival times of the site. And certainly, to Lelystad I think you have 18 minutes of transfer time."

Participant 7: "Our hypothesis was, based on the literature we had hypothesised it, that accessibility increases. And that's true, but I didn't know that those at the same time so many bus lines had been lifted, scaled down. So that you also have negative effects. You never actually see those in studies."

In addition to the reduced accessibility experienced by some citizens in Dronten, this participant also highlighted the advantages of regional buses, noting that they can offer greater flexibility and, in some cases, better accessibility for residents.

Participant 7: "Whereas the regional bus services, while taking longer, used to leave from the centre of the route. So, you now have to walk for 15 minutes or cycle for over five minutes to the station. Certainly, for working people, that is often not a problem. But if you don't want to walk for 15 minutes and you can't cycle, then you're pretty long by bus too. Because it's not a direct, fast route. You have some transfer time. So, you see some varying effects. So yes, that achieved is strongly increasing. But especially in the centre, in the core below, to the outside, it has actually become worse. Because all those regional buses have been abolished."

The quote below illustrates that using the Hanzelijn requires more time for travellers, as they must first cycle or walk to the station—located outside Dronten's centre—park their bike, and navigate the station before boarding the train. This stands in contrast to the former bus services, which departed frequently from the town centre and provided more direct accessibility for many residents.

Participant 7: "The railway has significantly increased the number of accessible jobs within, say, 45 minutes, within the same time. There does go as a side note that all regional bus connections have been scaled down. So, you see that especially accessibility has greatly increased in the city centre, in the core below it. And from neighbourhoods from where you can still get to the station quickly. And then it is good to know that the station is placed far outside the centre. Actually, between the business parks on the north side"

Participant 7: "Further preconditions, of course, those railway lines have also come into Dronten, the station is located between the business areas on the north side of the Dronten core. So, you have to walk for 15 minutes from the city centre or at least five minutes by bike, you have to park, you have to climb up the stairs to the station, whereas before, you could catch the buses from the centre of Dronten. So, it's also they haven't made it easy."

The quotes by participant 7 state that for some citizens in Dronten the accessibility increased but that for some citizens depending on the location it did not. Where one of the goals of the Hanzelijn at the time was to enhance regional access (NS Railinfrabeheer et al., 2000). Therefore, these quotes show that only partly this goal was met. And that negative externalities due to scaling down of the busses the accessibility can also worsen for some citizens.

Modal split

The modal split figures in chapter 4 illustrated that for Lelystad, Kampen and Dronten the modal shift towards rail was modest. As an explanation Participant 2 sketched a clear example on the use of the railway when a highway is enlarged. This results in a driver for people to start using the car because it is most likely more comfortable and quicker since there is low congestion due to the new highway.

Participant 2: “Now I'm rather thinking of well maybe we shouldn't start investing more in the highways so that car traffic just completely piles up. Because as long as you keep facilitating the car, people will use it. To project it onto Flevoland for a moment, what we saw very well was that by widening the A6, which is the motorway between Lelystad, Almere and Amsterdam. It was widened in 2020-2021. As a result, we saw that public transport use decreased very much. Because the car was very much encouraged by that. We removed a very large part of the traffic jams. Car use was encouraged again. Which in turn led to a decline in public transport use. Of course, the question is whether that is what you have in mind with a motorway.”

Another participant noted the continued strong reliance on cars, as reflected in the modal split figures in Chapter 4, and observed that the station in Dronten was not a prominent consideration for most people. Furthermore, an interesting explanation for the limited shift from car towards rail was that the attention on the Hanzelijn and the use for it was also brought to the attention of the citizens limitedly. Of course, this research was only conducted for Dronten. May be that the sentiment is different in other Hanzelijn municipalities. Nonetheless, Dronten was the only municipality which did not have a railway station yet. One would expect that people and the city council would have more attention for it.

Participant 7: “Well you can look at the perceived accessibility and for example with mental maps you could say well with this new connection, and we have done that for the Hanzelijn. We included mental maps where people were asked, are you aware that there is a station and that you can get to Zwolle faster if you use that train, or to Lelystad. Yes, people were aware but did not show much concern, that was disappointing. Also, in the political programs of the political parties in Dronten and the whole Hanzelijn and the station actually came up very little. It also shows that there may be gains to be made there. That you may have to actively use that train to make people aware that there is a station, a new railway line and that it also offers all kinds of possibilities.”

Railway infrastructure of the Hanzelijn

In addition to discussing the results derived from chapter 4, the participants also reflected on the broader impact of the Hanzelijn’s railway infrastructure on the Dutch rail network as a whole. This perspective is significant, as one of the key objectives outlined by NS Railinfrabeheer et al. (2000) was not only to improve local accessibility but also to strengthen the national rail system.

Before the development of the Hanzelijn, the end of the railway was in Lelystad. Meaning that people could not directly go from Lelystad to Zwolle. Before, travellers had to go by the Veluwe-and Gooilijn. The quotes below show that if the Hanzelijn would not have been developed, the other lines would have suffered from congestion. Underscored by two different participants.

Participant 4: ‘‘The Hanzelijn was also built at the time, partly to influence a missing link, say, what we still had between of course the northeastern Netherlands and the northern wing of the Randstad. And also, of course, Flevoland was unilaterally opened up. You get from Lelystad only to the south. But Lelystad from you had to take the bus. And Kampen-Zuid and Dronten were even totally dependent on bus routes. So, this one was set up from day 1 of the Flevopolder. “

Participant 2: “Only it has of course meant a lot to the province where we previously only had a railway line between Weesp and Lelystad. Was that really a regional railway line that only provided for the passenger needs of Flevoland itself. Is it because of the arrival of the Hanzelijn, is it of course no longer a dead-end line. Furthermore, it was more from a national interest to realize a faster connection between the Randstad and Groningen. And the Hanzelijn was always prepared for that in Flevoland and at a certain point it was simply constructed.”

Participant 4: “So that bottle neck has been hugely reduced. Because of the Hanzelijn. The network has become much more robust for passenger and freight transport.”

Participant 4: “Without Hanzelijn, the Veluwe line and the Gooi line would really explode by now.”

As a part of the Dutch railway organisation the objective is when looking at railway tracks, it is also evaluating the entire network. So, in what way can the railway benefit more travellers. This way the Netherlands will open up more in the future. Thereby, the travel time is already much faster to and from Zwolle compared to before.

Participant 4: “In fact, our entire Dutch network. Which we are part of. And so, what you do is always look at how your whole network can make choices that ultimately benefit far more travellers than just those using that stretch of track. Ultimately, in this way, you will open up the Netherlands much better later and in the future with actually more capacity what you are going to offer. That's one of the things you naturally draw alongside.”

5.2.2 Economic development & employment

Employment level Hanzelijn municipalities

The results in chapter 4 showed that the number of citizens with jobs in Dronten did not increase compared to other municipalities. The participant below discusses the results of this research. Participant 7 states that accessibility has definitely increased since the opening. The hypothesis was also that due to the opening of the Hanzelijn, you would see a positive effect on the labour market.

Participant 7: “On the one hand, so first of all, that accessibility has also increased. Can you now reach more, because studies have given themselves towards the labour market, can you also reach more jobs. Because really only if you could reach more jobs or if you could get to a job faster, those same jobs then have. Only then would you expect it to have a positive effect on your labour market position. That you pre-empt job opportunities, that you might find a better job. So started working more hours, started earning more. We have two questions. One, has that accessibility of jobs increased? The answer to that is yes, and very significantly so. Dronten was previously only accessible by public transport with buses”

The study also showed that in some parts in Dronten the accessibility did not increase but even decline, due to the scaling down of regional busses. Thereby, they did not find effect for the improvement of the labour market position for people in Dronten. They did however find an increase for the increase in hourly wage, but the cause for that remains unknown. The hypothesis may be that people have become more productive which would ultimately lead to an increase in hourly wage. However, this relation was difficult to test.

Participant 7: “Then we looked in the neighbourhoods where accessibility has increased, so where you can actually reach more jobs, that is, from the neighbourhood in the Dronten core. Did the labour market position of people there also improve compared to a control group? That was done with statistical techniques. We don't actually find any effect for that. We see no effect on the number of people with paid work. So actually, your chances of being employed have not increased compared to people, compared to that control group in the same period, elsewhere in the Netherlands, but where we did not get an improved connection to the rail network. Nor do we see that they started working more. We did find that they were paid better, that hourly wages went up. Have become more productive.”

Participant 7: “So yes, we do see a positive effect on hourly wages, and we hypothesise that comes from improved productivity. And that may actually follow from that, yes, if you're more productive, that means that you've started working more, that you haven't necessarily started working more, because we know that the number of days they go to work together hasn't increased, but they may be able to work more efficiently. They are spending less time travelling, can apparently be more productive because of that, but what exactly is behind that, you just can't test that, find out with the data.”

Participant 7: “The policy also generally wants the maybe not so much that the number of hours people work or the hourly wage increases, but those actually look mainly at employment increases. So, then you would actually expect unemployment to fall. And we find no effect for that. The number of people in paid employment has not increased. The probability of employment, in other words, has not increased. For those existing residents of the round versus control.”

Participant 7 states that the accessibility has increased for all the Hanzelijn municipalities. But the most for Dronten, since it did not have a railway station yet. However, the positive link between increased accessibility and the employment level was not found.

Participant 7: “So yes, accessibility has increased sharply and also by far the strongest in Dronten. Much stronger than in Zwolle, Lelystad and Kampen, which, after all, are also connected to that Hanzelijn. But we see no link between positive effects on the labour market position of people in Dronten.”

Participant 7: “It may well be that the labour market position of young people who have companies, we looked specifically at the working population, but young people who grew up, children who grew up in science, from that station to that connection on the railway, it could well be possible for them, it could have an effect.”

The participant also illustrates in general that even though accessibility increases, it is likely that the citizens living there, already have a job. However, the enhanced accessibility can mean that citizens would achieve more and find a job that suits someone better than before.

Participant 7: “And quite a lot of people in rural areas also have jobs. So that might also make them less susceptible to improving public transport infrastructure. Because so you already have a job. If most people already have jobs, that doesn't increase your chances of getting a job, but then you would actually expect that at most increases the chances of getting a better job. So that you can achieve more, have a better hourly wage. You can also find work that you like more, we haven't been able to test that. And that fits your skills better. Say you want to set up a, I don't know, design studio or something. Or you want to look at a different type of work that better suits what you like at that point in your life, we can test those exactly. We do know what sector people work in, but whether that effect has been there, I don't know.”

One of the variables examined in chapter 4 was the number of offices in the Hanzelijn municipalities. The results indicated that office development had not increased over the years. Participant 3 confirmed this finding, noting that although office growth in Dronten was anticipated at the time of the Hanzelijn’s opening, these expectations never materialised.

Participant 3: “That there would also be opportunities there in terms of office development. Well, that hasn't really taken off at all in Dronten.”

The statements by the two participants show that the goal at that time has not been reached. The aim was to ensure economic development in the region. However, the results in chapter 4 and the statements by the participant illustrate the employment level did not rise in Dronten and that economic activities such as office development in Dronten but also in the other Hanzelijn municipalities has not taken off at all.

5.2.3 Attractiveness of a location

In addition to the variables on accessibility, economic activities, and employment, the final variable addressed in the conceptual model in figure 4 of chapter 3 is the attractiveness of a location. As outlined in the scientific studies reviewed in chapter 3, the underlying assumption was that improved transport connections would make a location more appealing for living or working. However, the results presented in chapter 4 indicated that the Hanzelijn’s impact on this aspect was limited. The following section presents participants’ perspectives on the attractiveness of the Hanzelijn municipalities.

In addition to the population development in chapter 4, Participant 7 conducted research on the population development in Dronten as well. As he states, one might expect a population increase due to the opening of the Hanzelijn. However, after using Zeewolde as a reference category. This did not occur.

Participant 7: “There were some stories about the population did increase significantly, so then the place has become more attractive after all. But it hasn't. Surely those are some stories you go around, but we just used that same microdata from CBS, Statline data to see how it is where the number has developed. We didn't do any specific statistical tests on that. But we looked at how that developed in the municipality of Dronten. The population development compared to the municipality elsewhere. So, the surrounding municipalities. Then you actually see that Zeewolde, for example, has grown much more strongly. Many more people have come to live there. the resident development in Dronten does not, it does not deviate significantly from the control group, but also not from the surrounding municipalities that did not receive a station.”

Participant 4 offers a more long-term perspective on the concept of attractiveness. Rather than expecting immediate change following the opening of the Hanzelijn, he/she emphasises that such transformations take considerable time. Using Dronten as an example, he/she explains that its origins as an agricultural village, with few residents working in high-profile urban jobs such as in Amsterdam’s Zuidas, have shaped its character for decades. While changes are slowly emerging, heshe argues that it could take another fifteen years before Dronten fully evolves into a different type of town, potentially with entirely new housing forms, such as apartment blocks, that are currently absent.

Participant 4: “Of course for origin, that is of course just an agricultural village. Yes, and there lived, yes, because of that history, so to speak, from Flevopolder there basically lived no people who worked nicely on the Zuidas. And that did not change for such a broad ten years. You can now see that Dronten is very slowly transforming into a different type of village, so to speak. But that just takes a very long time. I think that if you look more in fifteen years, Dronten will be very different. Maybe they will build flats. They do not know them there at all now.”

Additionally in chapter 3 the external effect of urban policies on attractiveness of location emerged from the scientific studies. Below this is also highlighted by participant 7 on the municipality Dronten.

A notable thing for Participant 7 is that new housing development is set to occur in the south of Dronten. Where the station of Dronten is actually positioned in the North. Showing that spatial development around the station is of crucial importance for the attractiveness of a municipality.

Participant 7: “But what struck me is that now in the new housing plans for Dronten, too, there will be additional construction on the south side”

Based on the scientific articles in chapter 3, an expectation that arises is that a certain area becomes more attractive for businesses and people to live and work there. However, the results in chapter 4 and the input from the participants show that this result is quite limited. And that it takes a long time for people to move to peripheral regions.

5.3 National level

Besides the questions on the Hanzelijn, several question on the general view of the development of railways in peripheral regions was also asked. Illustrated below are the various points of view of the participants, categorized based on the variables given in chapter 3: accessibility, economic activities and employment and attractiveness of a location.

5.3.1 Accessibility

As stated by Participant 1 he/she argues that for a railway to function properly and to attract many users to it, other modes should not deteriorate. As was seen with the Hanzelijn, bus routes were reduced. Leading to less accessibility for a number of people. But to keep people using public

transport, it is crucial that people can also reach the station. As outlined in chapter 3, improved accessibility through public transport can enhance equity among citizens. However, this perspective also highlights that maintaining equity requires preserving the quality of other public transport modes, rather than allowing them to deteriorate.

Participant 1 : “Well, I think it is really important to ensure that, if you build a railway line, the rest of your network does not deteriorate. If you build a Nedersaksenlijn for example, make sure that the small centres, that it is also interesting to make use of it, that you can get to the stations along the Nedersaksenlijn by bus in a decent way. I think if you think we have a Nedersaksenlijn, that's it, we can scale down some bus lines. Because that just causes people in smaller centres to drop out of using public transport. Whereas from the perspective of equality, you just want an attractive public transport product for everyone. So yes, that is important to take that into account though”

Participant 7: “Studies show very clearly that not having a car or no decent public transport. Then a bicycle, for instance, leads to people not being able to get to work and therefore staying unemployed longer.”

Participant 7: “Because the question is whether you can use that bus, or the tram, or the train, combinations of those. To get to work locations, to get to the hospital, to get to education. And not only during rush hour, but also during off-peak periods, in the weekend, etc.”

Besides the need for making the use of railways attractive, a public transport intervention is also required to deliver a high service quality. Otherwise, people are more likely to make use of other transport modes. Participant 1 sketched what happens if travel time is increased, this was however in a more urbanised area. Thereby, the comfort in trains is also of importance, if travellers are not able to take a seat, they experience less travel comfort. Maybe leading to the use of another travel mode such as the car. This shows how travel time and travel comfort can influence the number of travellers and thus the use of the railway.

Participant 1 : “The effect using the railway is that it is really a piece of travel time that is part of it. You do see that was what we saw very clearly in the case of HSL-South, that just the connections became a whole lot faster, for example Amsterdam-Rotterdam, but also Rotterdam-Breda. And if you then go on to Rotterdam-Eindhoven, which was also just a whole lot faster at once. There you really did see a substantial increase with train movements. And for other connections, you saw that travel time become much less attractive and there goes a decrease with the number of train passengers, again”

Participant 1 : “Yes, travel time and yet also, I guess, seating opportunities. Right, that also plays a role. If you just know, every time I make that trip, I have to stand, you're more likely to choose something else anyway.”

Participant 3: “So it also has to be a relatively fast connection that really reduces travel time. That works, simply. Speeding up the journey, increasing frequency. Those are all factors that help. So, you have to develop those station areas with decent densities.”

Besides the dependence on people’s cars, these two participants below also argue that when the public transport connection delivers bad service for some time, people are also more likely to switch to their car. Showing that public transport service quality is important for the use of public transport.

Participant 2: “You also very often hear about all kinds of delays in public transport during their student days. With delays and cancellations. And no seats. And yes, if at some point I also have to pay for it myself, then for a lot of people it's like, yes, bye. And besides, a lot of colleges are close to railway stations. So as a student, that's relatively easy, but employment, that's often, not always, but in many cases that's also just down to speed.”

Participant 6: “If a new train line is developed for example, then a growth period of a small two years sometimes is counted in. And that is why you also notice that such a short change does not immediately have a huge effect on car travel. It is also just a temporary choice that they make. And

that is also the disadvantage if you offer a bad connection for a while. Than also people say I am going to choose the car."

In chapter 3, the literature showed that people living in peripheral regions are often dependent on the car and that car use increased over the years in the Netherlands. To support the use of the railway, Participant 2 illustrates the underlying thought of people using the car. And to pull people out of the car, the first step is to prevent the use of the car in the first place.

Participant 2: "Once someone is in the car they don't drive out of it very easily. It should rather be the other way around of how you prevent people from switching from public transport to the car. And yet what you very often see is that people once they have finished their education and no longer have an OV student card. That they then very quickly switch to the car anyway. Because then they have a job, and they have a bit more money and then they buy a car and it's quite easy. So, the question should really be of how do you prevent people who use public transport from sticking with it? And reasoned the other way round of how much you come up with that now or how do you go about encouraging car users to use public transport more."

5.3.2 Economic development

In addition to the variables on accessibility, economic activities, and employment, questions were also posed about the broader role of railways in regional development. These questions aimed to capture how stakeholders perceive the railway's contribution to regional connectivity and economic vitality.

Participant 1 illustrated for the HSL below that there was some economic development around the station in Breda. However, just like the Hanzelijn the employment level effects were not very strong.

Participant 1 : "You do see a city like Breda, which is really much better connected thanks to the HSL line. In one go there is a very fast connection to Antwerp, but also to Amsterdam and Rotterdam thanks to the HSL line. So yes, you did see some development around Breda station, companies settling there faster. But really pure labour market effects, that the number of jobs then, was not very strong. Bit similar to what you also had for the Hanzelijn."

Participant 1 : "We also really mainly looked at the development on the railways. The connections where the number of passengers has really increased significantly. And we have also looked at developments in jobs, the number of companies that have established themselves in Breda compared to other cities, compared to a similar city like Arnhem, the same size, and how things have developed there, also in the direct vicinity of the station location. Yes, you didn't really see a very significant change there anyway"

These quotes reflect Participant 3's view that spatial and economic development in the Netherlands is shaped by a concentration trend, where both people and businesses gravitate towards areas with abundant job opportunities and potential workforce. While such agglomeration offers benefits like economic vibrancy, it also brings disadvantages such as congestion and high property prices.

The participant connects this to the role of railways, explaining that a new rail connection can significantly increase a location's "node value" — its importance as a transport hub. However, this potential is only fully realised when accompanied by targeted area development, such as housing, workplaces, or educational facilities around the station. Without such complementary measures, the opportunity to enhance the location's overall attractiveness is largely lost.

Participant 3: "Speaking more generically, what is the autonomous perspective for the medium-sized/medium-sized city? Look, as I look at spatial economic development in the Netherlands, I say see a concentration trend of people and of economy. And of course there is a correlation between that. People go to places where there is a lot of jobs or a lot of job choice. And companies go to places where there are lots of people available. Or there are potentially a lot of people. But if you were to extend that to infinity, then everything converges in one place eventually. The effect of agglomeration benefits is that. On the other hand, you also have agglomeration disadvantages, congestion, high property prices."

Participant 3: “So through the train you get that the node value at this place is greatly increased. And that offers the opportunity to then say, well then, we can add a package to that that actually increases the location value. So that node value is a factor that contributes to the location attractiveness of that place. And it can be for living, it can be for working, it can be for education. And so, a station without area development is a missed opportunity.”

Besides the agglomeration benefits, participant 7 highlighted that in order to achieve economic development in a region. It is wiser to invest in activity and employment. Since public transport is an option for citizens to reach their work, it can increase the level of employment, as shown in chapter 3. However, as shown by the case study of the Hanzelijn this does not necessarily occur, especially when people already have a job, also stated by participant 7. Therefore, only developing a railway does not necessarily improve the economic development in a region.

Participant 7: “I think if you want to improve regional economy in the north, it is much wiser, at least economists also say, to invest in activity, employment. That usually has a much greater effect than new infrastructure. Because that infrastructure itself, it doesn't do anything. That only makes your travel time less.”

5.3.3 Attractiveness location

For the last variable, the factors that influence the attractiveness of a location were asked and what makes a place more attractive. One of the quotes stated by participant 1, is that people also tend to find a place more attractive if they have the option to go to places like the theatre. Even though they are never going. Furthermore, participant 7 illustrated that for people to move to a location, especially a peripheral region, people need to have a connection with that place through friends, family or work.

Participant 1 : “Just say, I want to go to Amsterdam, because there's a nice theatre and this and that. While you never actually go there, a nice museum. But the fact that it's there, that for people it's a... Well, one factor is to choose to live in a place.”

Participant 7: “So if they come from there or if they have family or friends living there. And otherwise, most relocation movements you see quite strongly around the area where you live and work. And then you might move from your own residential and working municipality to a surrounding municipality in the same region.”

Participant 1 also argues that a railway does function as a factor for attractiveness towards a region. It can work a strong catalyst, since it does enhance accessibility

Participant 1 : “But well, it is of course a real catalyst, such a railway line. It is a reason for companies to establish themselves or to stay. Or for young people to perhaps continue living in that region. Because you are still within a reasonable travel time in Groningen, for example.”

Participant 7: “it also shows that there may be gains to be made there. That you may have to actively use that train to make people aware that there is a station, a new railway line and that it also offers all kinds of possibilities.”

The interview participants repeatedly emphasized that the success of a railway line depends not only on the track itself but also on the spatial development around station areas and the ease with which people can access them. As was also shown in chapter 3, urban policies such as built environment policies, impact the attractiveness of such a location. This is endorsed by the participants below.

Participant 5: “What we do try is to get governments to build near stations and create destinations there. So, the more people live there, work there, want to go there, the more they will be willing to take public transport. So those are also developments we like to encourage.”

Participant 3: “So, that interaction between tracks and area development is an absolute prerequisite. it is very important for the effect of such a rail connection is of course very decisive of yes, what kind of places are those station environments. And if nothing happens there. Yes, then such a railway line has no effect either.”

Participant 3: “NS also says that there must be so many thousand homes within a radius of so many kilometres, otherwise we don't find it interesting.”

Participant 6: “The distance people have from their homes to the station. So, what we see is, if people live pretty much within 800 metres of the station, then you see that people are more inclined to travel by train, for example, than if they live further away. So, people just always make a trade-off, if they can. Not everyone can make that trade-off. But when you make that finish, you also look at how much time it takes to make that journey.”

5.3.4 Policy & governance

Participant 7 shows that the goals by the government are often not made explicit. Where the question with railway development is also who is going to use it. And that if you spent public funds, it should also have an effect on the well-being of these people. Participant 7 states that the improvement in well-being should justify the investment.

Participant 7: “Who is using the railway now and who would potentially use it? I think you shouldn't overestimate who is there. A, what the demand is for that and B, who is using that. I think it is a limited need for a fairly selective group in the area. It might attract new residents, but we know from research on moving behaviour, that people often only move to other regions if they have a certain connection with it. So, if they are from there or if they have family or friends living there. And otherwise, most moving movements you actually see quite strongly around the area where you live and work. And then you might go from your own home and work municipality to a surrounding municipality in the same region.”

Participant 7: “And then the question is, if you spend public money on that, is it worth it? I wonder if just purely an improvement in accessibility, I can reach more jobs or more hospitals or whatever. Whether that in itself justifies such an investment.”

Participant 7: “In my opinion, it only justifies an investment if people actually use it and it also has an effect on their job opportunities or choice of study, on contacts they have with family and friends, on the productivity of companies, because then it is also direct benefits you have that contribute to your well-being quality society. Unless they think it is very important that there is a rail link at all.”

Participant 7: So, on the one hand because improving that infrastructure is often aimed at improving accessibility. And often the goals that the government sets are not very explicit.

Participant 7: “It also shows that there may be gains to be made there. That you may have to actively use that train to make people aware that there is a station, a new railway line and that it also offers all kinds of possibilities.”

Participant 7 illustrated that for the development and use of the railway, it is crucial to determine what the expectations are as the Dutch government. And that a railway can also lead to negative side effects. Interestingly, literature always presumes that better accessibility will also lead to more growth. Where Participant 7 also illustrates that it could also decline. People might also start to work in the Randstad for example. Leaving less people to work in the peripheral regions.

Participant 7: “If you want to improve the regional economy in the northeast of the Netherlands, the first thing you have to ask is to what extent such a railway line could contribute to that. Your travel times are also, if you don't have the intercity or a high-speed line running there or whatever, your

travel times to the Randstad are still long. So, the question is, what exactly do you expect in terms of positive and maybe negative effects? It could also lead to employment, companies thinking of well, then I'll move to the centre of the country. After all, with a new rail link like this, I am still accessible to employees who still live in the north. So, it can also have all kinds of negative effects in that sense."

Participant 7: "It is always the question with this kind of infrastructure what that does in not only a positive but also a negative sense. So, it can also seem that business activity moves away. And also, by no means everyone may be waiting for a new railway line and station. Being a traveller is nice, but if you live next to it, that thing is put away next to your house, your house value might drop. Because you have a lot of nuisances, et cetera, vibrations. So maybe also, that doesn't necessarily only have positive effects in that sense. And then the question is, who do you expect to use that?"

Furthermore, it was also illustrated that the expectation of people on using the railway unrealistic. People most of the time already have a job, and in peripheral region a car. Showing that their access to jobs is already quite high. Leaving their labour market position not necessarily much higher.

Participant 7: "So these are people who often already have jobs, who also often already have a car. They don't just get rid of those. So, what do you expect? There are certain groups who will undoubtedly use a railway connection. Especially the Lelylijn. Especially if there are long distances. There are people who already had a relatively good labour market position, already had a car. Their labour market position is in my expectation. So, you don't have to expect that labour market position to increase. And so that economic effect might stay out."

5.4 Concluding remarks

The expert interviews confirm that the Hanzelijn has delivered its core network objective—closing the missing link between Zwolle and the Randstad and relieving pressure on the Veluwe and Gooi corridors. Yet several other contributions to the variable's accessibility, economic activities, employment and attractiveness of a location have been made by the participants. It presents an evaluation of whether the goals outlined in Chapter 4 were achieved.

The first variable discussed was the accessibility, where the participants showed that the accessibility for the municipalities increased significantly. People are able to reach more places than before. However, due to the deterioration of the bus lanes in the Hanzelijn municipalities, some places have reduced in accessibility. Showing that accessibility does not necessarily enhance for all citizens with a public transport intervention, which does not necessarily enhance equity n transport as was argued by scientific studies in chapter 3.

Furthermore, chapter 4 illustrated that the number of travellers did not meet the expected number for alle Hanzelijn municipalities. Especially for Kampen-Zuid the number of travellers was lower than expected. According to the response of a participant this may have to do with the fact that Kampen-Zuid is positioned in the southern part of Kampen, not positioned in the city centre. Thereby, the train used for the connection towards the west is a slower train (sprinter) making the connection with the Kamperlijntje towards Zwolle and then the West still faster,

The participants did illustrate that one of the goals mentioned in chapter 4 were achieved. First, due to the Hanzelijn, the congestion on the Gooi-en – Veluwelijn was relieved. This was one of the main goals at the time to create a sustainable strong railway network. Furthermore, the goal to ensure interregional accessibility between Zwolle and Lelystad was also partly achieved. The connection between Zwolle and Lelystad is now much better. However, the accessibility as stated before, did not increase for everybody.

The second variable based on economic activities and the labour market was also evaluated by the participants. They showed that indeed the level of employment did not increase since the opening of the Hanzelijn in Dronten or showed a stronger trend compared to cities or villages without a Hanzelijn. And as also shown in in chapter 4, the office development in Dronten did not lift off as expected. Therefore, the goal to promote economic growth for Flevoland and in this case Dronten did not entirely succeed.

The last variable was the attractiveness of a location. The participants also illustrated that the population development did not necessarily increase more than other municipalities without a new railway. However, it was mentioned that it takes a longer time before people are adjusted to this and a city changes to a more attractive location. Additionally, a participant also stated that it was remarkable that the new housing development for Dronten was located more in the south. Instead in the station area. Showing that the need for urban policies with a focus on the station is also considered crucial.

The expert interviews, combined with the case study results, made it possible to identify a set of factors, defined here as key conditions or characteristics that influence the extent to which a new railway has impact on a peripheral region. The inductive coding scheme in table 12 helped in identifying these new factors. These factors represent as an external variable the impact on accessibility, economic activity, employment, and location attractiveness.

Table 13 below summarises these factors, combining insights from the Hanzelijn case study (Chapter 4) and the expert interviews (Chapter 5). It thus serves as a bridge to the adapted conceptual model in the next section, where these factors will be incorporated to more accurately reflect the dynamics observed in practice. The first four factors in blue are derived from the Hanzelijn case study, where the last two factors were derived from general insights on peripheral development due to public transport interventions are presented in green.

In chapter 4, the case study of the Hanzelijn revealed four crucial factors: the availability of alternative public transport, the degree of car use, the role of spatial development around stations and the location of the station. These factors were also reinforced by the participants. First, the participants stated the importance of feeder busses and other connecting modes which give access to the railway station. Second, they stated that due to the development of a highway, congestion declined, and people started using their car again. Third, spatial development was also considered important to enhance attractiveness of a region. And last, the location of a station also determines if people are likely to start using the train. As was seen in Kampen-Zuid, where the station was not positioned in the centre of Kampen.

Besides the reinforcement of these factors by the interviews, the interviews also showed two additional factors based on a broader public transport perspective. The interviews highlighted two additional factors that influence the success of a railway intervention. For participants the awareness of public transport services were also considered important for the use and success of the railway. Residents need to be fully informed about the available travel options to make use of them which contributes to their perceived accessibility.

Last, participants highlighted the importance of investments in the regional economy of peripheral regions. When a new railway is developed it is just there, and people might make use of it. However, to enhance a region’s attractiveness an additional investment in the regional economy is also needed.

Table 13 Additional factors

Factor	Description
Alternative Public Transport	Feeder buses and other modes to reach stations are essential; their absence can reduce accessibility.
Car use	High car ownership limits modal shift to rail.
Spatial development	Concentrating housing and activity near stations enhances accessibility.
Location of the station	The usage level of a newly developed station largely depends on its location.
Awareness of public transport services	Citizens should also be aware of the options of public transport.
Investment in regional economy	For a peripheral region to enhance attractiveness, it is recommended to invest in the local economy.

6 Conceptual model

6.1 Introduction

This chapter presents a newly adapted conceptual model. Drawing on additional evidence from Chapters 4 and 5, it synthesises the newly identified key factors that influence the development of peripheral regions. Chapter 3 introduced an adapted version of Pokharel et al.'s (2023) model, as can be seen below in figure 8. Here the conceptual model was refined further by integrating the crucial factors which were identified in chapter 5. The resulting model highlights the variables that best explain what determines the impact of the effects of a public transport outcome. First, the relations identified in the adapted conceptual model of chapter 3 will be discussed. To analyse if the stated relations from figure 4 were also found during the case study. Second, the newly identified factors will be added to the model, complemented with new identified relations by the case study.

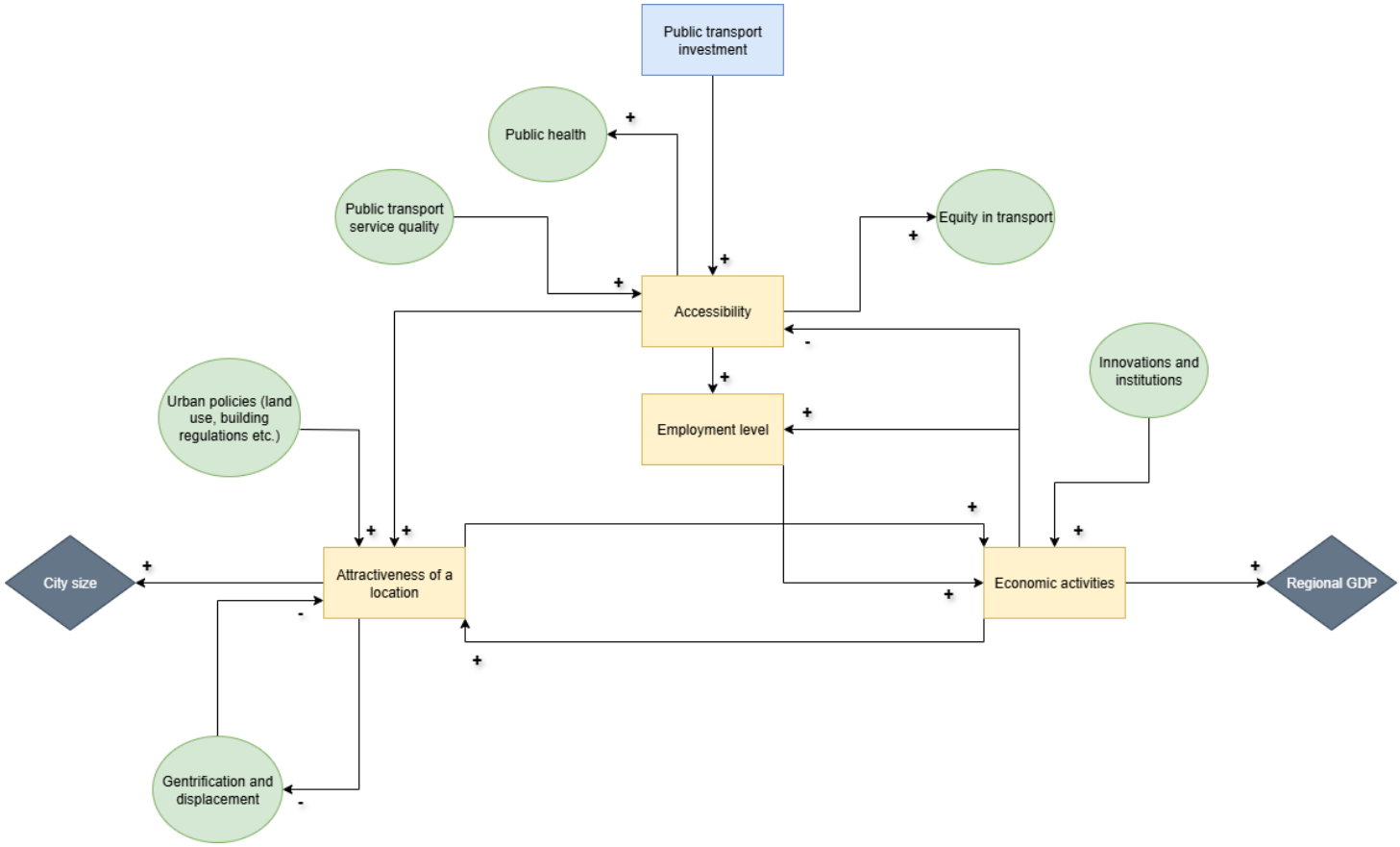


Figure 8 Conceptual model

6.2 Relations conceptual model

Figure 8 presents the conceptual model introduced in Chapter 3. This chapter examines the relationships outlined in that earlier model to assess whether they were also observed in the findings of the case study. The newly empirical insights enriches the conceptual model by highlighting factors and relationships observed in practice. Variables from Figure 8 that were not discussed in the case study or interviews remain informed by the literature reviewed in Chapter 3, ensuring that the model reflects both theoretical and practical perspectives.

First, the case study revealed a particularly noteworthy finding: due to the scaling down of regional bus services in Dronten, accessibility gains from the Hanzelijn were not shared equally among all residents. While citizens living closer to Dronten station experienced improved access to jobs and destinations, places where the bus used to stop, further away from the station, now had to travel a longer distance towards the train station. Resulting in a decline in accessibility for some citizens in Dronten. This outcome underscores that due to public transport investments, negative externalities can also occur. Where the aim of public transport is to ensure accessibility levels for everyone, it can also result in negative side effects for specific citizens if regional busses are scaled down. Which ultimately even undermines equity in transport.

The importance of public transport service quality, highlighted in Chapter 3, was strongly reinforced by the interviews. Participants stressed that competitive travel times, sufficient service frequency, and a high level of travel comfort, including the ability to find a seat, are all essential for attracting and retaining passengers. If service quality falls short, passengers are more likely to revert to car use, which erodes the intended benefits of railway investments.

As outlined in Chapter 3, the scientific literature often suggests that enhanced accessibility leads to higher employment levels. However, the findings in Chapter 4 and 5 show that this link did not materialise in the Hanzelijn context. Since the line's opening, the employment level for Dronten did not rise more significantly than other municipalities without a railway station. However, the positive relation between employment levels and economic activities was partly reinforced by the case study, the results did show an increase in hourly wages. Nevertheless, important sidenote is that the cause could not be clearly traced to the Hanzelijn.

Furthermore, improved accessibility did not significantly enhance the overall attractiveness of the Hanzelijn municipalities. Indicators such as population growth and housing development showed no stronger trends than in the reference municipality of Zeewolde, which lacks a railway station.

The interviews further underlined the positive relation of urban policies and governance on the attractiveness of a region. Clear goals and expectations from government, defining who the railway is intended to serve, are essential for maximising the benefits of such infrastructure projects. Without such coordinated policy measures, the transformative potential of railway investments remains limited, and the broader regional benefits may not materialise.

In addition to the gentrification and displacement effects discussed in Chapter 3, other negative externalities can arise from the development of a railway. As one participant illustrated, residents living close to a new line may experience increased noise, vibrations, or a reduction in property values. Similarly, business activity may shift away from certain areas, leading to local economic decline. To capture these broader impacts, the factor Gentrification and displacement was incorporated into the factor Negative Externalities of Railway Development is added to the conceptual model, encompassing both gentrification and displacement as well as other potential social, environmental, and economic downsides.

6.3 Additional factors

The results from both the case study and the additional general findings of the expert interviews have provided valuable empirical insights that extend beyond the variables originally identified from the literature in Chapter 3. While the conceptual model in figure 4 was grounded in theoretical relationships, the Hanzelijn analysis and the interviews uncovered additional, context-specific factors that directly influence the outcomes of railway investments in peripheral regions. Integrating these empirical findings into the conceptual model will make it more robust, ensuring it reflects not only theoretical expectations but also the practical realities and conditions under which railway projects operate. As discussed in the concluding remarks of chapter 5, additional factors were identified. For a clear overview, the table is repeated below.

The case study of the Hanzelijn revealed four key factors: the availability of alternative public transport, car use, the role of spatial development around stations and the location of the station. The analysis showed that feeder buses and other connecting modes are essential for ensuring that all residents can access the railway; without them, accessibility can even decline, as seen in Dronten. Modal split data further indicated that car use did not decline after the Hanzelijn opened, suggesting that entrenched car use limits the shift to rail. Moreover, spatial development around station was identified as crucial when determining accessibility and attractiveness of a city. Where spatial development also determines the potential ridership of the train line. And last, the location of the station also proved important according to participants. As was seen with Kampen-Zuid, the station was more in the south instead of the centre of Kampen. Resulting in less travellers than initially expected.

Besides the factors resulting from the case study on the Hanzelijn, did the participants also identify two other factors which have impact on the development of peripheral regions: awareness of public transport services and investment in regional economy. For enhancing local ridership, it is important that citizens are aware of the different options provided by the newly developed railway. Which ultimately enhances their accessibility, also referred to as perceived accessibility (Olsson et al., 2021). Participants highlighted that it is essential that they are aware of the travel opportunities offered by the railway. Second, to enhance economic activities in a region, the need for investment in the local economy is crucial. Since this gives a purpose for people to travel to a city and eventually enhances a cities attractiveness.

Table 14 Additional factors

Factor	Description
Alternative Public Transport	Feeder buses and other modes to reach stations are essential; their absence can reduce accessibility.
Car use	High car ownership limits modal shift to rail.
Spatial development	Concentrating housing and activity near stations enhances accessibility.
Location of the station	The usage level of a newly developed station largely depends on its location.
Awareness of public transport services	Citizens should also be aware of the options of public transport.
Investment in regional economy	For a peripheral region to enhance attractiveness, it is recommended to invest in the local economy.

6.4 Newly adapted conceptual model

Below in figure 9 the conceptual model is presented. As stated before, six additional factors were added to the model. And some relations between factors and variables were redefined due to outcomes of the case study. Thereby, the relations are defined as follows: The blue square shows the public transport intervention, the yellow squares the endogenous variables and the green circles the external effects. The relations are defined with plusses and minuses. A relation defined by a (+)

indicates a relation that if the variable increases, the influenced variable also increases. It also works the other way around, if a variable decreases, the influenced variable also decreases. Furthermore, the relation defined by (–) indicates that if a variable increases, the influenced variable decreases. Or the other way around, if a variable decrease the influenced variable increases. Last, the relationship denoted by (+/-) illustrates that the relationship on the influenced variables can be negative and positive, depended on the context.

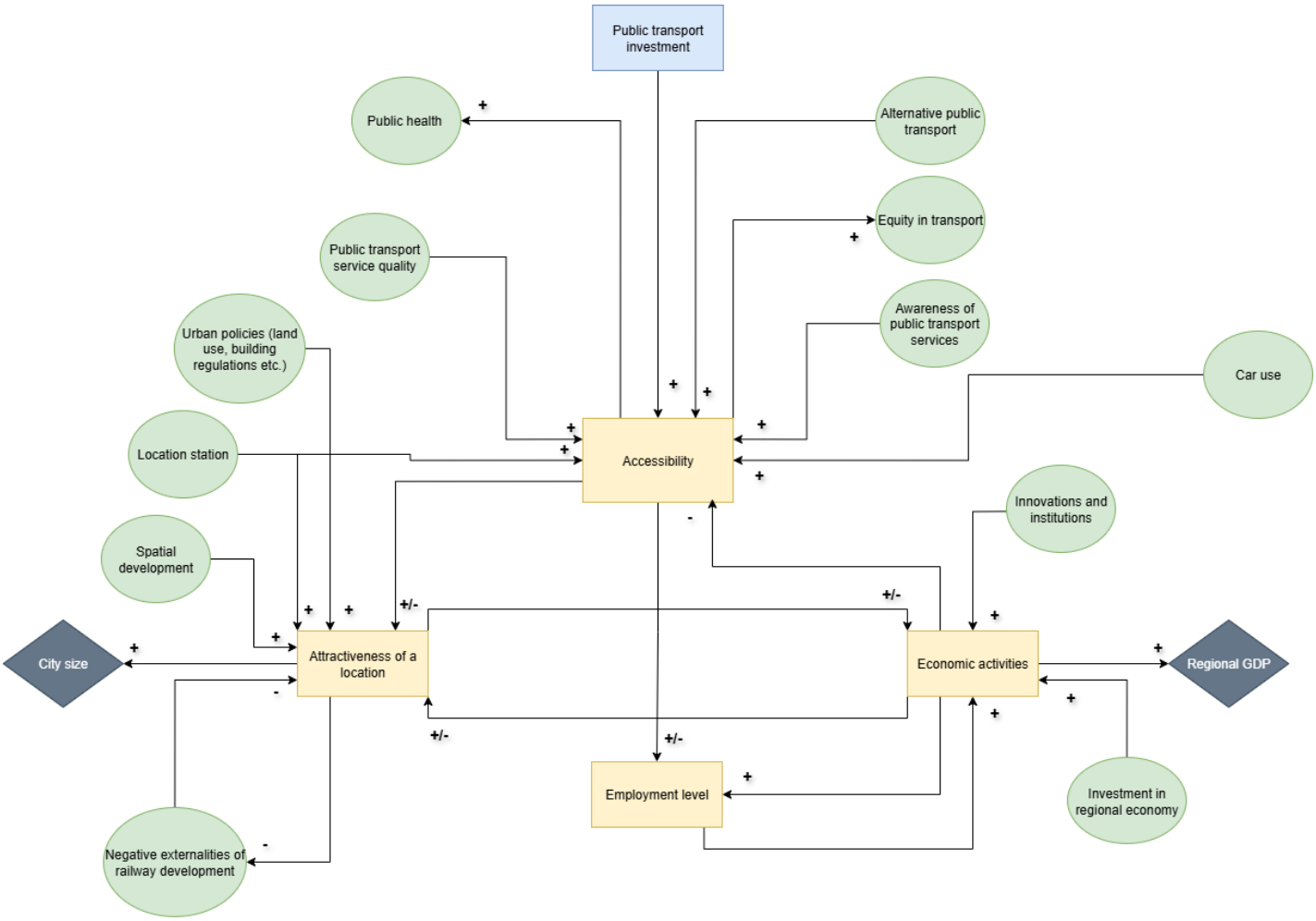


Figure 9 Adapted conceptual model based on the case study and additional findings from the interviews.

The Hanzelijn case study demonstrated that accessibility for many residents of Dronten improved, enabling them to reach more jobs within the same travel time compared to before the railway's opening. This supports the positive relationship between the public transport intervention and accessibility in the conceptual model. This positive relation in defined in the conceptual model above. However, the analysis also revealed that the scaling down of bus services in Dronten reduced accessibility for some citizens, particularly those living farther from the station. This finding led to the inclusion of alternative public transport as an additional factor: to enhance accessibility and promote equity in transport, the rest of the network must not deteriorate when a public transport investment is initiated. Where alternative public transport showed that this also contributes to a higher level of accessibility for all people in Dronten. Hence, the relation between alternative public transport and accessibility was positively defined. Thereby, the relation between accessibility and equity in transport

remained positive since enhanced accessibility results in more equity in transport. Crucial is to ensure high level of accessibility for all citizens through the whole network.

The interviews further reinforced the positive relationship between public transport service quality and accessibility. Participants emphasised that, for a railway to be attractive and genuinely enhance accessibility, factors such as service frequency, travel time, and overall comfort are crucial. In addition, awareness of public transport services was added with a positive relation towards accessibility. With participants noting that perceived accessibility depends not only on the existence of services but also on people's awareness of the possibilities they offer.

Another factor identified in the case study was car use. Since the opening of the Hanzelijn, there was limited modal shift from car to rail, indicating that car ownership plays a significant role in determining accessibility in a peripheral region. As also shown in the scientific literature in Chapter 3, people who own a car generally have enhanced accessibility since they can generally reach more destinations. Therefore, this relationship was defined with a positive connection towards accessibility.

Chapter 3 suggested that improved accessibility typically makes a location more attractive. However, this relationship was not clearly observed in the case study, population growth in the Hanzelijn municipalities was not significantly stronger than in the reference municipality without a station. Therefore, this relationship is indicated as (+/–) in the model. Additionally, as identified in Chapter 3 through the model of Pokharel et al. (2023) and the adapted conceptual model, the relationship between a location's attractiveness and its economic activities was described as a positive feedback loop. However, the case study did not confirm this dynamic. Despite improved accessibility, population growth in the Hanzelijn municipalities did not outpace that of comparable municipalities without a railway, and economic activities did not expand more significantly either. Consequently, both relationships are represented in the model with a (+/–) sign. Since this relation is based on a single case study, it does not mean that the results by the scientific literature are not relevant. Therefore, the relationship was defined with (+/-).

The interviews reinforced the positive link between urban policies and regional attractiveness, showing that for public transport investments to deliver their intended benefits, policies must be clearly defined. It should be explicit who the investment is intended to serve and how it will enhance the location's attractiveness. Thereby, the participants also illustrated that when building a highway simultaneously it can also result in less use of the railway and thus less impact of the public transport intervention on attractiveness of a location. Showing the need for clear policies on the development of public transport, so there is a clear vision on what the public transport intervention is trying to achieve.

In line with this, spatial development also emerged as a crucial factor of how attractiveness is perceived. Participants stressed the importance of developing housing and activities around stations to make these locations more viable for living and working. The case of Dronten illustrated this point, as new housing was developed in the south, away from the station in the north. Therefore, this relationship is defined by a positive link towards attractiveness of a location.

Similarly, the location of the station itself proved to be an important factor influencing railway ridership. For instance, the location of the station Kampen-Zuid contributed to passenger numbers falling short of expectations, as travel demand in Kampen remains primarily oriented toward Zwolle. This supports the positive relationship that a better-located station can enhance a location's attractiveness and also impacts the accessibility for citizens to be able to reach station more easily.

Beyond these accessibility-related factors, the scientific literature in Chapter 3 highlighted that gentrification and displacement can be negative consequences of induced transport investments. The interviews expanded on this by revealing additional potential downsides, such as the relocation of business activity and increased noise pollution for nearby residents. To incorporate these broader effects, the model includes the factor negative externalities of railway development, which encompasses both social and economic downsides. Where the relation was defined with a negative feedback loop. When the attractiveness of a location increases, negative externalities can increase, which ultimately can decrease the attractiveness of a location.

Studies reviewed in Chapter 3 indicated that higher levels of accessibility are generally associated with a greater likelihood of having a job. This relationship was therefore initially defined as positive in

the conceptual model. However, the case study showed that, since the Hanzelijn's opening, employment levels did not increase. Participants suggested that this may be because many residents in the region already had jobs, limiting the potential for growth in employment. As a result, this relationship is also represented in the model with a (+/–) sign. Thereby, the relationship from employment level towards economic activities was determined positive since the case study illustrated that hourly wages did increase resulting in more economic activities. Furthermore, the participants also illustrated that to enhance the economic activities in a region, only transport infrastructure will not contribute to this significantly. They stated that to enhance economic activities local investments are needed. Which ultimately results in a more attractive peripheral region.

In addition to the newly added factors, variables such as public health and innovation and institutions were not mentioned in the case study. These were therefore retained in the model, as presented in the original conceptual model in Figure 8. Similarly, the negative relationship between economic activities and accessibility was preserved, as were the links from the attractiveness of a location to city size and regional GDP. These were maintained on the basis of their inclusion in the model of Pokharel et al. (2023) and the underlying theoretical rationale.

6.5 Concluding remarks

This chapter has presented the newly adapted conceptual model. Initially based on the model by Pokharel et al. (2023), as presented in chapter 3 and the adapted model illustrated in chapter 3. Ultimately leading to the new conceptual model in figure 9. This conceptual model integrates the findings from literature, the case study and general findings from the interviews. By doing so, it moves beyond theoretical assumptions to capture the complex and often context-dependent realities of public transport interventions in peripheral regions. The newly developed conceptual model highlights several critical factors and their interrelations, offering a more system-based understanding of what determines the success and impact of railway investments on regional development.

Six additional factors—alternative public transport, car use, spatial development, station location, awareness of public transport services, and investment in the regional economy—were added to better reflect the specific conditions of peripheral regions. Some existing relationships were redefined based on case study outcomes, while others were retained from scientific studies presented in chapter 3 due to their theoretical relevance.

The revised model highlights that accessibility gains are not automatically shared equally among all citizens. And that negative externalities can occur when a new public transport development is implemented. The relation that accessibility also enhances employment levels was also not identified in the case study. Showing that increased accessibility does not always result in higher employment levels. Thereby, the identified positive feedback loop between attractiveness of a location and economic activities was not identified during the case study. Due to the Hanzelijn the municipalities did not see an increase in economic activities and attractiveness of a location compared to municipalities without a railway station.

This conceptual model is particularly relevant for evaluating the attractiveness of peripheral regions because it captures both the enabling and constraining factors that shape outcomes. It moves beyond a simple "accessibility equals attractiveness" assumption by demonstrating the contingent nature of this relationship. The inclusion of context-specific variables such as alternative transport services, spatial development strategies, and governance capacity ensures that the model can be applied as a diagnostic tool in real-world policy and planning.

7 Discussion

7.1 Interpretations of the findings in relation to scientific literature

The literature review, case study, and interview findings together produced several results. The case study and interview outcomes will be interpreted in light of existing scientific literature which affirms the found results. This not only contextualizes these findings but also underscores their contribution to ongoing research.

The results showed that peripheral regions are facing several problems, where these problems helped in identifying a conceptual model. Based on this model various factors which influence the development of peripheral regions. Where it was shown that relations which were identified in the literature review did not always emerge from the case study.

Across Chapters 3–6, several messages stand out. First, the Hanzelijn clearly improved rail connectivity, especially for Dronten, but the accessibility gains were uneven because regional bus services were scaled back. Which ultimately led to reduced accessibility for some citizens in Dronten. In addition to this Kåresdotter et al. (2022) showed that first- and last mile transport in public transport is a crucial factor for the accessibility of citizens. It illustrated that first- and last mile transportation also contributes to the perceived accessibility by citizens. The need for accessible transport by first- and last-mile options are crucial in public transport use and good functioning of public transport networks. In line with perceived accessibility, the results also highlighted the need for creating awareness of public transport services options to show possibilities by train for citizens.

Second, broader economic and attractiveness on the location effects were limited. The scientific studies in chapter 3 indicated that accessibility enhances employment levels. However, employment level in Dronten did not measurably rise relative to a non-rail reference, although hourly wages improved (with uncertain causality). The results also indicated that for a region to become more economically vital and attractive there is need for spatial development, local investment in the economy and clear policy measures. This was also highlighted by Banister and Berechman (2001). This study illustrated for a public transport project to become a success; a public transport investment must also be part of a system-based approach.

Third, whether rail investment translates into everyday use and place attractiveness depends on a set of newly identified external influences. The use of the car was identified as a factor which influences accessibility and the use of the train. This is also stated by Paulley et al. (2006) since car ownership results in less demand for public transport. Leaving a less big impact on the effects of a public transport intervention and also less need for a public transport service.

Besides the use of the car, the location of the station was also identified as a crucial factor in the accessibility of public transport for citizens. The realized number of travellers compared to the expected number of travellers showed that this was disappointing. One of the explanations was that Kampen-Zuid was not positioned in the centre of Dronten. This explanation is further endorsed by Cummings and Mahmassani (2022) where they showed in an American case study that the location of a train station matters in the amount of ridership of the train.

Besides these factors, the most significant outcome of the results was that with public transport development, negative externalities can also occur. Where gentrification and displacement were already mentioned in chapter 3. In addition to this, public transport can also lead to commercial gentrification, where small local businesses are displaced by bigger stores, which can lead to uneven benefits of transit development in a region (Wexler & Fan, 2022).

7.2 Implications for practice

These results suggest that rail lines are necessary but not sufficient as the only drivers of regional development in peripheral areas. Where feeder buses were withdrawn, some residents' door-to-door access worsened, showing that network design can undermine equity even as a railway improves speeds. The modest mode shift and stable car ownership indicate that deeply embedded car access continues to shape daily choices. Spatial outcomes were similarly contingent: station-area growth was strongest where land-use policy concentrated housing and activities near the station; peripheral station locations (e.g., Kampen-Zuid) curtailed potential demand. Importantly, the analysis also revealed a set of negative impacts that are often overlooked in rail planning discussions. Gentrification or displacement pressures may arise. These effects, while less visible than ridership or travel-time statistics, can erode local support for projects and create uneven distributions of benefits and burdens for citizens.

For planners and policymakers, the implications are practical. If the goal is inclusive accessibility, not just faster intercity times, then service quality (frequency, reliability, crowding/seat availability) and first/last-mile links must be protected or expanded alongside new rail. Where governments also set clear, place-specific goals (who should benefit, where growth should occur), rail investment is more likely to catalyse desirable development. Conversely, without supportive policy, negative externalities can dilute or even reverse local gains, making it essential that they are identified, monitored, and mitigated from the earliest planning stages.

7.3 Limitations

For this research a case study was conducted. However, this single case focus on the Hanzelijn isolates effects more cleanly than a multi-site comparison would. A single case offers depth, but it weakens external validity. It can be difficult to compare the Hanzelijn municipalities with other regions in the Netherlands due to the demographic mix, commuting culture and policy setting. Additionally, the Hanzelijn municipalities in Flevoland are also relatively new compared to other municipalities in the Netherlands. Which may result in making it less comparable. Furthermore, the case study partly entails a focus on Dronten, since this was the only municipality with no station. Nonetheless, this is also limiting since another municipality without a station may have had different developments than Dronten.

Scarcity of comparable ex-post studies remains a significant constraint on the strength of our conclusions. Because few transport projects anywhere are followed by systematic, post-opening evaluations, and even fewer focus on conventional rail in peripheral settings, the Hanzelijn results have little company for direct comparison. Without a bench-marking pool it cannot be tested whether the muted labour-market effects, the uneven station-area development, or the loss of feeder buses observed here are typical growing pains or case-specific quirks. The absence of parallel studies also limits methodological cross-checks: alternative data sets, counterfactual designs or analytic choices used elsewhere could have validated or challenged my own findings. The findings should be viewed as informed hypotheses, useful for shaping the evaluation protocols of future lines such as the Lelylijn and Nedersaksenlijn, rather than universal rules already validated by a broad evidence base.

Besides the single case study approach, the interview component of this study offers rich, practice-oriented insights, yet its composition inevitably colours the narrative. All seven participants are professionals who work daily with transport planning, rail policy or regional economics. Their expertise sharpens technical accuracy, but it also creates the risk of an 'insider echo'. By drawing primarily from a single professional milieu, the study may therefore tilt toward an expert-driven reading of success, and it could understate social costs such as loss of local services, changes in travel routines or feelings of exclusion. Expanding the sample to include the perspective by citizens of the Hanzelijn municipalities like Dronten would help balance this bias and provide a fuller picture of who gains, who loses and why.

8 Conclusion and recommendations

8.1 Conclusion

Across Europe, and even in densely populated countries such as the Netherlands, peripheral regions are ageing, losing population, and watching essential services migrate to larger metropolitan areas. These trends widen socio-economic divides, reduce national welfare, and undermine territorial cohesion. Against that backdrop, governments look to public-transport investments, especially rail, as a lever for revitalisation. Yet the real-world evidence base remains thin: most ex-post evaluations focus on urban settings or high-speed rail, leaving unanswered the practical question of whether conventional rail lines can halt or reverse peripheral decline. This thesis was set out to fill that gap.

The aim of this thesis was to establish whether developing new public transport interventions are able to strengthen the attractiveness and socio-economic prospects of peripheral regions, and, crucially, to uncover the contextual conditions that determine success or failure. By integrating a state-of-the-art literature review with an ex-post case-study of the Hanzelijn and a series of interviews, the study offers a rounded picture that moves beyond theory to the realities of practice. This research had the aim to answer the main research question: *"Which contextual factors and general lessons can be identified in previous studies and in the case of the Hanzelijn as contributing to the success or limitations of public transport interventions to make peripheral regions more attractive?".*

The main question was answered by a combination of three sub-questions, all with different methods. To answer the first sub-question: "What key mechanisms and variables are identified in the literature as influencing the impact of public transport infrastructure on the accessibility and development of peripheral regions?" a systematic literature review illustrated European empirical work to extract the core mechanisms and variables.

The literature review revealed several mechanisms which eventually have an impact on a peripheral region. First, the studies illustrated that peripheral regions are facing several challenges, where accessibility and especially public transport is mentioned as a need to create more equity in transport. One of the main findings of the literature review was that there is a lack of ex-post studies which evaluate a public transport intervention. A lot of studies were theoretically based. Furthermore, based on the findings in the scientific literature an adapted conceptual model was developed. These showed that a key mechanism is that accessibility impacts a regions attractiveness, which eventually influences economic activities positively. This also goes the other way around, where attractiveness is influenced by economic activities. Besides these key mechanisms, several variables were identified as well. Such as the public service quality, innovation and institutions and policies. Negative side effects such as gentrification and displacement of a too attractive location were also added as a result of the impact of public transport infrastructure.

The second sub-question — "What explains ex-post the success or failure of the Hanzelijn in the Netherlands?" — was addressed through an in-depth case study of the Hanzelijn, analysis of grey literature, and seven semi-structured expert interviews. These interviews also informed the third sub-question — "Which surrounding conditions have been identified as influencing the development and effectiveness of public-transport interventions?" — and together, they provided the empirical basis for developing a newly adapted conceptual model in figure 10.

The answer of the second sub-question are the following findings. Before the Hanzelijn was opened 5 goals by NS Railinfrabeheer et al. (2000) were identified. To strengthen the railway connection between the northern Randstad and the north and north-east of the Netherlands (including Zwolle). It sought to establish an interregional link between Lelystad and Zwolle, improve regional accessibility by shifting Lelystad and Almere's westward focus toward a more balanced west–north–north-east orientation, connect Dronten to the rail network, and give Kampen a faster direct link to the west. Additional goals included relieving congestion on the Gooi and Veluwe line and stimulating economic development in the north, north-east, and Flevoland.

A few remarkable outcomes were illustrated. The Hanzelijn undeniably achieved its technical objective of completing the missing rail link between Lelystad and Zwolle. This was also one of the goals identified before the opening of the Hanzelijn, where the new railway network had the aim to relieve other railway networks and prevent future congestion. Journey times on the corridor fell, giving northern Flevoland direct, rapid access to the Randstad and Zwolle for the first time. Despite this, the line attracted fewer passengers than forecasted, with only Dronten meeting its opening-year ridership estimate.

Furthermore, an unexpected outcome of the Hanzelijn was that accessibility gains were not observed for all citizens in Dronten. Due to the scaling down of the busses, it could take longer to reach the desired destination since people had to travel towards the station. Additionally, the location of the station was identified as important in the number of travellers on the Hanzelijn. Where a location is crucial in the accessibility of the public transport services. Last, the spatial development was also determined as an important factor in the success of the Hanzelijn. The case study showed that spatial development was not necessarily surrounded around the stations. These outcomes show that when a railway is newly developed there is a need to look at the entire network, rather than the implementation of isolated tracks.

Additionally, the goal was to enhance regional access in Flevoland, where Kampen should have a greatly improved connection towards the West. This was only partly realised. The railway is connected towards the West, but it consists of a slower train, and the location is to be found in the south of the city. Service quality also disappointed, because trains ran at 140 instead of the promised 200 km/h, reducing the speed advantage. On the goal to improve economic development in the north, north-east and Flevoland, results also disappointed. And on the labour-market side, average wages in Dronten increased slightly, yet the share of residents in paid work did not increase compared to municipalities without a railway station. Office development around stations proved modest and housing growth occurred, but this trend was more or less the same for municipalities with and without a railway station.

For the third sub-question, in addition to the findings on the Hanzelijn, several surrounding conditions were reinforced by existing scientific studies, while new conditions were also identified. Expert testimony paints a consistent picture on the surrounding conditions. When a new rail link closes a network gap, the strategic benefit is undeniable, yet the local pay-off depends on how well that link is woven into the wider mobility network. Neighbourhoods within walking or cycling distance of a station reap the largest accessibility gains, but if bus routes are scaled down or land-use remains low-density, outlying settlements can actually lose ground, and hoped-for office growth or population inflow did not materialise due to the new railway. Faster trains alone do not raise employment; at best they nudge wages by shortening.

Across interviews, a few prerequisites emerge for any future rail scheme: focus on the awareness of the possibilities of the public transport service possibilities, invest in the local economy and set clear policies and expectation on what the railway is aiming to achieve. Therefore, for the development of a new railway, the need for a system-based approach is needed for regional renewal.

The conceptual model eventually combined the three research questions and visualizes the mechanisms and variables which have an impact on peripheral development. Where a few key lessons can be retrieved from this model, as is illustrated in figure 10. This model makes it clear that the effectiveness of such interventions depends not simply on the presence of new infrastructure, but on how well it is embedded in broader territorial, social, and institutional systems.

The adapted conceptual model and empirical analysis ultimately highlight that the transformative potential of public transport in peripheral regions depends on the need for a systems-based approach. Rail investments deliver their greatest benefits when they are embedded in an integrated mobility network, supported by land-use planning, economic policy, and strong governance. Where these conditions are absent, even technically successful projects struggle to generate the intended societal impact.

Importantly, accessibility improvements alone do not guarantee economic revitalisation. The evidence shows that physical connectivity must be matched by targeted investment in the local economy and innovation to unlock wider benefits.

Finally, the analysis draws attention to the need for proactive management of negative externalities, such as displacement, noise, and the reallocation of economic activity. These factors are often overlooked in early planning stages, yet they can erode public support and undermine equity if left unaddressed.

Taken together, these insights show that public transport interventions can support regional attractiveness and resilience—but only when designed and implemented as part of a broader strategy. Transport, land use, economic policy, equity and clear governance must align. A railway line on its own cannot remake a region. But with the right supporting conditions, it may become a instrument of inclusive and sustainable development.

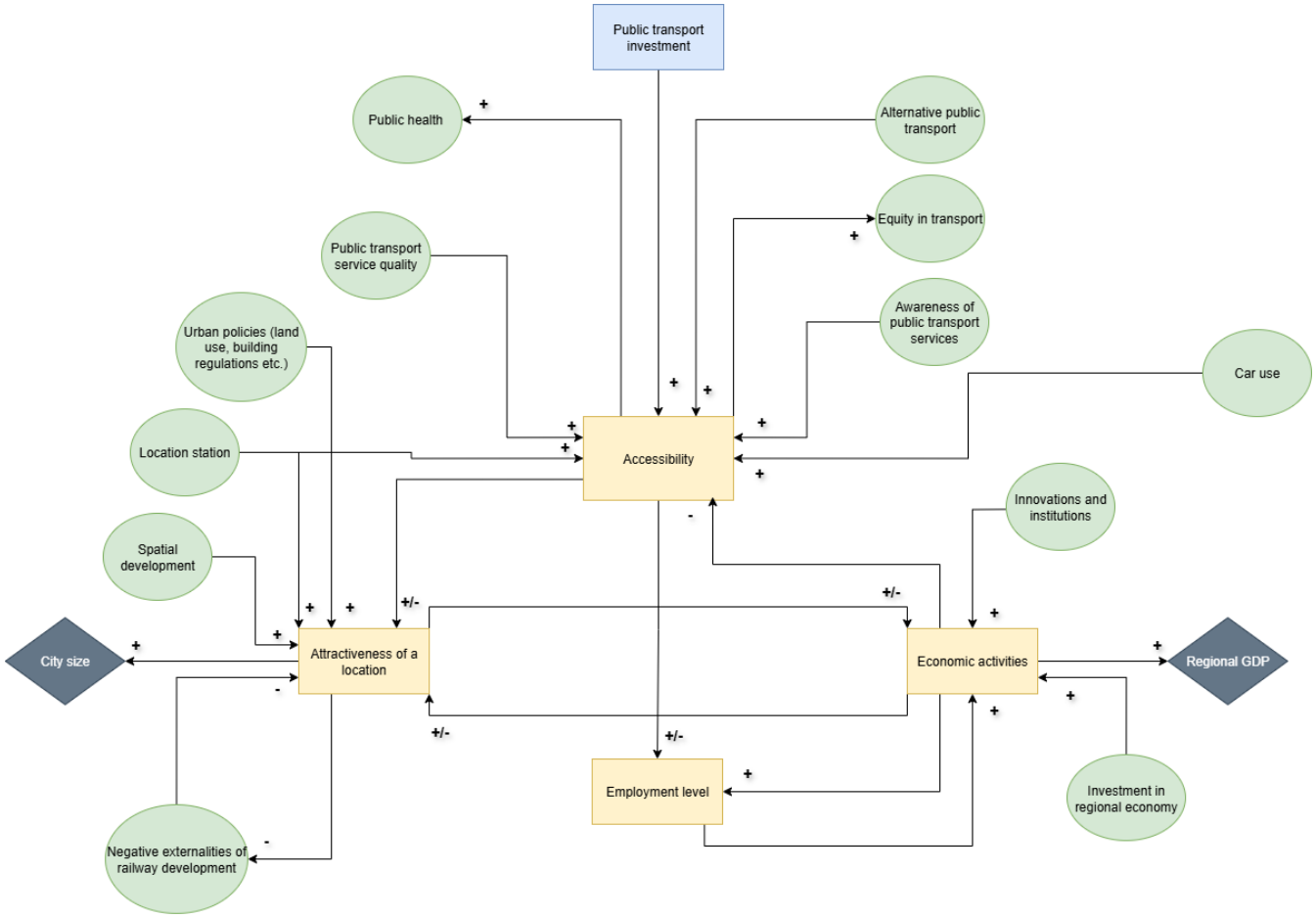


Figure 10 Conceptual model

8.2 Recommendations

Based on the findings in this study there are practical recommendations and recommended future research described below in this sub-chapter.

The first practical recommendation is advisable to evaluate the development of public transport interventions from a system-based perspective. Only implementing a public transport intervention will not enhance a region's attractiveness or local economy. To make a region more attractive additional measures might be needed. Think of more structured regional development in line with the new public transport intervention. Such as spatial development around stations for housing and enhanced

economic opportunities are crucial for the success of a public transport intervention. Likewise, socio-economic measures, including targeted investments in the local economy, can be necessary to provide compelling reasons for people to live and work in the area. Equally important is a clear and shared understanding of the intervention's purpose: defining its goals, identifying the target groups, and specifying the needs it aims to address are all critical to ensuring its success.

For this systems approach, it is evident to incorporate all these aspects and to analyse them in relation to each other. Thereby, negative side effects should also be considered. Transport projects can produce negative side effects such as gentrification and displacement when not paired with appropriate safeguards. The evidence from this study and the wider literature shows how rail investments can raise land values, trigger gentrification, or lead to public transport service withdrawal in outlying areas due to reduction of alternative transport such as regional busses, outcomes that disproportionately affect lower-income households and those without access to private transport. However, the Hanzelijn showed that negative side effects were not considered before the opening. Future interventions must therefore plan for these risks in advance, rather than reacting afterward.

Additionally, when developing a transport project, it is desirable to define the purpose of the project. The Hanzelijn shows that if stakeholders are unclear whether a railway aims to stimulate regional development, shift commuting patterns, or simply reduce travel time between cities, then critical design decisions become inconsistent. Projects like the Lelylijn and Nedersaksenlijn present a unique chance to change course. By stating transparent, measurable objectives, aligning all elements: station location, service frequency, pricing, spatial planning and committing to multi-dimensional, long-term evaluations, the Netherlands can ensure that its next generation of railways truly strengthens regional resilience, student accessibility, and inclusive economic opportunity.

Besides the practical recommendations, there is commendable for further research to systematically evaluate the long-term socio-economic impacts of rail investments in peripheral regions. First, a recurring theme throughout this thesis was the lack of rigorous ex-post evaluations of public transport interventions. Despite significant investments and policy ambitions, projects like the Hanzelijn continue to be assessed primarily through pre-opening projections and symbolic milestones, rather than long-term empirical outcomes. This leaves policymakers with little concrete insights when planning future lines such as the Lelylijn or the Nedersaksenlijn. Therefore, the recommendation is to further research public transport projects and evaluate their effect on a region.

Second, when evaluating the attractiveness of peripheral regions and the effect of public transport investments, current developments in the Netherlands should also be considered in the future. A particularly urgent contextual factor is the current housing crisis in the Netherlands, where high property prices and limited availability in the Randstad push more and more people to consider alternative living locations (Ministerie van Algemene Zaken, 2023). As housing in central urban areas becomes unaffordable for a growing share of the population, peripheral regions may gain new appeal as residential destinations—provided they are well-connected and supported by public infrastructure. This emerging demographic shift creates an opportunity for rail infrastructure to play a pivotal role in redistributing economic activity and population growth more equitably. In this context, rail interventions should not be assessed solely for their immediate transport performance, but also for their ability to support housing diversification and regional rebalancing in the long term.

Moreover, the role of students and universities must be recognised in these dynamics for future research. Universities and colleges in places like Zwolle, Groningen, Leeuwarden or Emmen depend on fast, affordable connections for attracting talent and linking to research networks. Yet if train schedules do not align with academic calendars, if fares rise too steeply, or if station locations remain poorly integrated into campus life, students will default to cars or avoid those areas entirely. For future research it is therefore highly relevant to assess the effects of education on a peripheral region.

The last recommendation for further research is the need for local perspectives. When a public transport intervention may be realised in the future, it is highly relevant to assess the opinions for the people in such a peripheral region. With questions like, would you consider using the railway, do you feel the need for a railway in your city, and do you think the railway would enhance economic prosperity? It may be that people in such a region would state that they would keep making use of their car. It can be very useful to take these findings into account. This way an assessment on the predominant feeling on public transport can be conducted.

9 Bibliography

9.1 Literature

Aarhus University. (2020, April 21). A short history of the Oresund Bridge. https://nordics.info/show/artikel/a-short-history-of-the-oresund-bridge

Adeoye-Olatunde, O. A., & Olenik, N. L. (2021). Research and scholarly methods: Semi-structured interviews. JACCP JOURNAL OF THE AMERICAN COLLEGE OF CLINICAL PHARMACY, 4(10), 1358–1367. https://doi.org/10.1002/jac5.1441

Alhassan, J. a. K., & Anciaes, P. (2025). Public transport investments as generators of economic and social activity. Journal of Transport & Health, 41, 101989. https://doi.org/10.1016/j.jth.2025.101989

Anciaes, P., & Alhassan, J. a. K. (2024). Economic and social impacts of public transport investments: A scoping literature review. In Advances in transport policy and planning (pp. 227–254). https://doi.org/10.1016/bs.atpp.2023.12.002

Arbués, P., Baños, J. F., & Mayor, M. (2015). The spatial productivity of transportation infrastructure. Transportation Research Part a Policy and Practice, 75, 166–177. https://doi.org/10.1016/j.tra.2015.03.010

Åslund, O., Blind, I., & Dahlberg, M. (2017). All aboard? Commuter train access and labor market outcomes. Regional Science and Urban Economics, 67, 90–107. https://doi.org/10.1016/j.regsciurbeco.2017.08.007

Atlasti. (2025). Retrieved April 15, 2025, from https://atlasti.com/students-and-education?_gl=1*1cg5u4o*_up*MQ..*_gs*MQ..&gclid=Cj0KCQjwh_i_BhCzARIsANimeoFQFKi4e3uTK 6kiZvBf4j8P0gUISxQySH2qAZdIlnJEm2hZxh9cBYgaAp-yEALw_wcB

Banister, D., & Berechman, Y. (2001). Transport investment and the promotion of economic growth. Journal of Transport Geography, 9(3), 209–218. https://doi.org/10.1016/s0966-6923(01)00013-8

Bastiaanssen, K. M. J. (2013, December 10). Vervoersarmoede belemmert arbeidsre-integratie. ESB. Retrieved June 16, 2025, from https://esb-nu.tudelft.idm.oclc.org/vervoersarmoede-belemmert-arbeidsre-integratie/

Bastiaanssen, J., Johnson, D., & Lucas, K. (2020). Does transport help people to gain employment? A systematic review and meta-analysis of the empirical evidence. Transport Reviews, 40(5), 607–628. https://doi.org/10.1080/01441647.2020.1747569

Bastiaanssen, J., & Breedijk, M. (2022). Toegang voor iedereen? Retrieved June 18, 2025, from https://www.pbl.nl/publicaties/toegang-voor-iedereen

Bastiaanssen, J., Breedijk, M., & Planbureau voor de Leefomgeving. (2024). Beter Bereikbaar? In PBL. Retrieved April 9, 2025, from https://www.pbl.nl/publicaties/beter-bereikbaar

Bastiaanssen, J., Johnson, D., & Lucas, K. (2025). The relationship between individual employment probabilities and accessibility to matching jobs: A study of the Netherlands. Transportation Research Part a Policy and Practice, 193, 104398. https://doi.org/10.1016/j.tra.2025.104398

Brovarone, E. V., & Cotella, G. (2020). Improving Rural Accessibility: A Multilayer Approach. Sustainability, 12(7), 2876. https://doi.org/10.3390/su12072876

Buunk, W., & Bezembinder, E. (2012). Hanzelijn Monitor Nulmeting. Retrieved June 4, 2025, from https://hbo-kennisbank.nl/details/sharekit_windesheim:oai:surfsharekit.nl:e53f148e-9b1d-4b75-94de-1c247c7d2655

Buunk, W., & De Vor, F. (2016, January 1). Hanzelijn Monitor 2015 : de derde staat van de Hanzelijn. HBO Kennisbank. https://hbo-kennisbank.nl/details/sharekit_windesheim:oai:surfsharekit.nl:cbf092f9-5c24-4513-8a22-c062ecfdd3df

CBS. (2025, March 17). 2011-2021: Bevolkingskrimp vooral in de kleinere kernen. Centraal Bureau Voor De Statistiek. https://www.cbs.nl/nl-nl/nieuws/2025/12/2011-2021-bevolkingskrimp-vooral-in-de-kleinere-kernen

Centraal Economisch Planbureau. (2012). *Centraal Economisch Plan*. Cpb. Retrieved August 10, 2025, from https://www.cpb.nl/publicatie/centraal-economisch-plan-2012

Christiaanse, S. (2020). Rural facility decline: A longitudinal accessibility analysis questioning the focus of Dutch depopulation-policy. Applied Geography, 121, 102251. https://doi.org/10.1016/j.apgeog.2020.102251

Coulson, N. E., Laing, D., & Wang, P. (2001). Spatial Mismatch in Search Equilibrium. Journal of Labor Economics, 19(4), 949–972. https://doi.org/10.1086/322824

Creswell, J. W. (2009). Research Design Qualitative, Quantitative, and Mixed Methods Approaches (3rd ed.). Thousand Oaks, CA Sage Publications. - References - Scientific Research Publishing. (n.d.). https://www.scirp.org/reference/referencespapers?referenceid=1763859

Cummings, C., & Mahmassani, H. (2022). Does intercity rail station placement matter? Expansion of the node-place model to identify station location impacts on Amtrak ridership. World Transit Research. Retrieved August 15, 2025, from https://www.worldtransitresearch.info/research/9027/

Eurostat. (2024). Urban-rural Europe - demographic developments in rural regions and areas. Retrieved June 28, 2025, from https://ec.europa.eu/eurostat/statistics-explained/index.php?oldid=588518&utm_source=chatgpt.com#Depopulation_of_rural_areas.2Fpopulation_change_due_to_migration

European Union. (2024). Comings and goings: on-demand mobility for isolated rural areas. Urbact. Retrieved April 15, 2025, from https://urbact.eu/good-practices/comings-and-goings-demandmobility-isolated-rural-areas

Farrington, J., & Farrington, C. (2004). Rural accessibility, social inclusion and social justice: towards conceptualisation. Journal of Transport Geography, 13(1), 1–12. https://doi.org/10.1016/j.jtrangeo.2004.10.002

Frei, A., Axhausen, K. W., & Ohnmacht, T. (2009). Mobilities and social Network Geography Size and Spatial Dispersion – The Zurich Case Study [E-book]. Taylor Francis. https://www-taylorfrancis-com.tudelft.idm.oclc.org/chapters/edit/10.4324/9781315595719-9/mobilities-social-network-geography-andreas-frei-kay-axhausen-timo-ohnmacht

Goudappel. (2021). Inzicht in effecten snelfietsroutes in Noord-Brabant: bijna 20% van de fietsers komt uit auto of ov | Goudappel. Retrieved May 28, 2025, from https://www.goudappel.nl/nl/projecten/inzicht-effecten-snelfietsroutes-noord-brabant-bijna-20-van-de-fietsers-komt-uit-auto-ov

Harbers, A., Spoon, M., Van Amsterdam, H., Van Der Schuit, J., & Planbureau voor de leefomgeving. (2018, December 12). Dichtheid en functiemenging in beeld. Planbureau Voor De Leefomgeving. Retrieved June 26, 2025, from https://www.pbl.nl/publicaties/dichtheid-en-functiemenging-in-beeld

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social Relationships and Mortality Risk: A Meta-analytic Review. PLoS Medicine, 7(7), e1000316. https://doi.org/10.1371/journal.pmed.1000316

Treinreiziger. (2012, October 15). Hanzelijn volledig klaar. Treinreiziger. https://www.treinreiziger.nl/hanzelijn-volledig-klaar/

Johnson, D., Ercolani, M., & Mackie, P. (2017). Econometric analysis of the link between public transport accessibility and employment. Transport Policy, 60, 1–9. https://doi.org/10.1016/j.tranpol.2017.08.001

Joint Research Centre. (2025, April 4). Demography 2040: cities keep growing, while population shrinks in remote rural regions. The Joint Research Centre: EU Science Hub. Retrieved June 28, 2025, from https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/demography-2040-cities-keep-growing-while-population-shrinks-remote-rural-regions-2025-04-04_en?utm_source=chatgpt.com

Jorritsma, P., Jonkeren, O., & Krabbenborg, L. (2023). Mobiliteit en bereikbaarheid in stedelijk en ruraal Nederland: Ontwikkelingen, kansen, bedreigingen en oplossingsrichtingen. Kennisinstituut voor Mobiliteitsbeleid (KiM), Ministerie van Infrastructuur en Waterstaat.

Kamperlijntje. (2012). Het Kamper Lijntje - de Hanzelijn: de eerste plannen. Hetkamperlijntje. Retrieved May 28, 2025, from https://www.hetkamperlijntje.nl/index.php/spoorlijnen/de-hanzelijn

Kåresdotter, E., Page, J., Mörtberg, U., Näsström, H., & Kalantari, Z. (2022). First Mile/Last Mile Problems in Smart and Sustainable Cities: A Case Study in Stockholm County. Journal of Urban Technology, 29(2), 115–137. https://doi.org/10.1080/10630732.2022.2033949

Kennisinstituut voor Mobiliteitsbeleid. (2023, October 10). OV-gebruik veranderd sinds COVID-19 | Kennisinstituut voor Mobiliteitsbeleid. Kimnet. Retrieved June 25, 2025, from https://www.kimnet.nl/actueel/nieuws/2023/10/10/ov-gebruik-veranderd-sinds-covid-19

Lammarino, S., Rodriguez-Pose, A., & Storper, M. (2018). Regional inequality in Europe: evidence, theory and policy implications. Journal of Economic Geography. http://eprints.lse.ac.uk/87491/

Lucas, K. (2012). Transport and social exclusion: Where are we now? Transport Policy, 20, 105–113. https://doi.org/10.1016/j.tranpol.2012.01.013

McDonagh, J. (2006). Transport policy instruments and transport-related social exclusion in rural Republic of Ireland. Journal of Transport Geography, 14(5), 355–366. https://doi.org/10.1016/j.jtrangeo.2005.06.005

Ministerie van Algemene Zaken. (2023, July 24). *900.000 nieuwe woningen om aan groeiende vraag te voldoen*. Volkshuisvesting | Rijksoverheid.nl. https://www.rijksoverheid.nl/onderwerpen/volkshuisvesting/nieuwe-woningen

Ministerie van verkeer en waterstaat. (2002). Tracebesluit Hanzelijn.

Molema, M., Bezembinder, E., & Buunk, W. (2013). Tussen Flevoland en Overijssel: Het verbindende vermogen van de Hanzelijn.

Newsham, N., & Rowe, F. (2022). Understanding trajectories of population decline across rural and urban Europe: A sequence analysis. Population Space and Place, 29(3). https://doi.org/10.1002/psp.2630

NS. (2025). Reizigersgedrag | NS Dashboard. Retrieved July 7, 2025, from https://dashboards.nsjaarverslag.nl/reizigersgedrag/dronten

NS. (2025). Nederlandse Spoorwegen – Stap je ook in? | NS. Nederlandse Spoorwegen. Retrieved July 7, 2025, from https://www.ns.nl/

NS Railinfrabeheer, Ministerie van verkeer en waterstaat, Directoraat-generaal Rijkswaterstaat, Directie Oost-Nederland, & Directie IJsselmeergebied. (1996). De_hanzelijn-Alles_over_de_startnotitie_het_startpunt_van_een_onderzoek. In Rijkswaterstaat. Retrieved June 2, 2025, from https://open.rijkswaterstaat.nl/zoeken/@118963/trajectnota-milieu-effectrapport/#highlight=hanzelijn

NS Railinfrabeheer, Ministerie van verkeer en Waterstaat, Directoraat-generaal Rijkswaterstaat, Directie Oost-Nederland, & Directie Ijsselmeergebied. (2000). Bijlagerapport A Nut en noodzaak trajectnota en MILIEU-effectrapport Hanzelijn.

NU.nl. (2012, March 29). Hanzelijn valt 90 miljoen goedkoper uit. NU. Retrieved June 2, 2025, from https://www.nu.nl/economie/2944064/hanzelijn-valt-90-miljoen-goedkoper-uit.html

OECD. (2020). Transport bridging divides. In OECD. Retrieved June 29, 2025, from https://www.oecd.org/en/publications/transport-bridging-divides_55ae1fd8-en.html?utm_source=chatgpt.com

OECD. (2025). Reinforcing Rural Resilience. In OECD. Retrieved June 29, 2025, from https://www.oecd.org/en/publications/reinforcing-rural-resilience_7cd485e3-en.html?utm_source=chatgpt.com

Olsson, L. E., Friman, M., & Lättman, K. (2021). Accessibility Barriers and Perceived accessibility: Implications for public transport. Urban Science, 5(3), 63. https://doi.org/10.3390/urbansci5030063

Oost. (2015, February 13). Twintig procent meer reizigers voor Hanzelijn, alleen Kampen Zuid blijft achter. *Oost*. https://www.oost.nl/nieuws/210996/twintig-procent-meer-reizigers-voor-hanzelijn-alleen-kampen-zuid-blijft-achter

Paulley, N., Balcombe, R., Mackett, R., Titheridge, H., Preston, J., Wardman, M., Shires, J., & White, P. (2006). The demand for public transport: The effects of fares, quality of service, income and car ownership. Transport Policy, 13(4), 295–306. https://doi.org/10.1016/j.tranpol.2005.12.004

Pokharel, R., Bertolini, L., & Brömmelstroet, M. T. (2023). How does transportation facilitate regional economic development? A heuristic mapping of the literature. Transportation Research Interdisciplinary Perspectives, 19, 100817. https://doi.org/10.1016/j.trip.2023.100817

PRISMA statement. (n.d.). PRISMA Statement. https://www.prisma-statement.org/

Provincie Flevoland. (2025). Geschiedenis van Flevoland - INFlevoland. Inflevoland. Retrieved May 28, 2025, from https://www.inflevoland.nl/wij/geschiedenis-van-flevoland

Rotger, G. P., & Nielsen, T. S. (2015). Effects of Job Accessibility Improved by Public Transport System: Natural Experimental Evidence from the Copenhagen Metro. Deleted Journal. https://doi.org/10.18757/ejtir.2015.15.4.3090

SMĘTKOWSKI, M. (2013). Regional Disparities in Central and Eastern European Countries: Trends, Drivers and Prospects. JPSTOR. https://www-jstor-org.tudelft.idm.oclc.org/stable/24534040?utm_source=chatgpt.com&seq=1

Smith, T. E., & Zenou, Y. (2003). Spatial mismatch, search effort, and urban spatial structure. Journal of Urban Economics, 54(1), 129–156. https://doi.org/10.1016/s0094-1190(03)00040-8

Snellen, D., Bastiaanssen, J., 't Hoen, M., & Planbureau voor de leefomgeving. (2021). BREDE WELVAART EN MOBILITEIT.

Steenbekkers, A., & Vermeij, L. (2013). De dorpenmonitor. Ontwikkelingen in de leefsituatie van dorpsbewoners. ResearchGate. https://www.researchgate.net/publication/312474660_De_dorpenmonitor_Ontwikkelingen_in_de_leefsituatie_van_dorpsbewoners

Stockdale, A. (2009). The diverse geographies of rural gentrification in Scotland. Journal of Rural Studies, 26(1), 31–40. https://doi.org/10.1016/j.jrurstud.2009.04.001

TNO. (2023, September 18). Aantal thuiswerkuren sinds coronapandemie fors gestegen. tno.nl/nl. Retrieved June 25, 2025, from https://www.tno.nl/nl/newsroom/2023/10/corona-thuiswerkuren-gestegen/

Tulier, M. E., Reid, C., Mujahid, M. S., & Allen, A. M. (2019). “Clear action requires clear thinking”: A systematic review of gentrification and health research in the United States. Health & Place, 59, 102173. https://doi.org/10.1016/j.healthplace.2019.102173

Utsunomiya, K. (2020). The impact of regional railways on travel behaviour and social capital. Research in Transportation Economics, 83, 100945. https://doi.org/10.1016/j.retrec.2020.100945

Van Wee, B., & Geurs, K. (2011). Discussing Equity and Social Exclusion in Accessibility Evaluations. Deleted Journal. https://doi.org/10.18757/ejtir.2011.11.4.2940

Weterings, A., Bastiaanssen, J., & Planbureau voor de leefomgeving. (2025). DE (SPOOR)WEG NAAR WERK?

Wexler, N., & Fan, Y. (2022). Transitway investment and nearby commercial gentrification. Multimodal Transportation, 1(2), 100015. https://doi.org/10.1016/j.multra.2022.100015

Willigers, J., & Van Wee, B. (2011). High-speed rail and office location choices. A stated choice experiment for the Netherlands. Journal of Transport Geography, 19(4), 745–754. https://doi.org/10.1016/j.jtrangeo.2010.09.002

Woods, M. (2004). Rural Geography : Processes, Responses and Experiences in Rural Restructuring. SAGE Publications Ltd - Torrossa. https://www.torrossa.com/en/resources/an/5019319

Yin, R. K. (2009). Case Study Research Design and Methods (5th ed.). https://books.google.nl/books?hl=en&lr=&id=FzawIAdilHkC&oi=fnd&pg=PR1&dq=Robert+K.+Yin.+(2014).+Case+Study+Research+Design+and+Methods+(5th+ed.).&ots=l-2P4fnYYw&sig=UFkqEHTzVlxEEPfXeObxdN6SnIY#v=onepage&q&f=false

Zuk, M., Bierbaum, A. H., Chapple, K., Gorska, K., & Loukaitou-Sideris, A. (2017). Gentrification, Displacement, and the Role of Public Investment. Journal of Planning Literature, 33(1), 31–44. https://doi.org/10.1177/0885412217716439

9.2 Sources for figures and tables:

CBS. (2025a). Inwoners per gemeente. Centraal Bureau Voor De Statistiek. Retrieved June 10, 2025, from https://www.cbs.nl/nl-nl/visualisaties/dashboard-bevolking/regionaal/inwoners

CBS. (2025b). StatLine - Banen van werknemers in december; economische activiteit (SBI2008), regio. Retrieved July 4, 2025, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83582NED/table?ts=1751633658842

CBS. (2025c). StatLine - Verhuisde personen; binnen gemeenten, tussen gemeenten, regio. Retrieved July 4, 2025, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/60048ned/table?ts=1751633961214

CBS. (2025d). StatLine - Verhuisde personen; binnen gemeenten, tussen gemeenten, regio. Retrieved July 4, 2025, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/60048ned/table?ts=1751633961214

CBS. (2025e). StatLine - Vestigingen van bedrijven; bedrijfstak, regio. Cbs. Retrieved July 4, 2025, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81578NED/table?ts=1751635834862

CBS. (2025g). StatLine - Voorraad woningen en niet-woningen, 2012-2025. Retrieved July 6, 2025, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81955NED/line?ts=1751806976272

Hildebrand (Treinreiziger.nl) & treinreiziger.nl. (2020, December 8). Aantal in- en uitstappers per station bij NS 2013-2018. Treinreiziger.nl. https://www.treinreiziger.nl/aantal-in-en-uitstappers-per-station-2013-2018/

Topotijdreis: 200 jaar topografische kaarten. (n.d.-a). Topotijdreis. https://www.topotijdreis.nl/vergelijk/satelliet/2007/satelliet/2024/@189402,505426,8.46

Molema, M., Bezembinder, E., & Buunk, W. (2013). Tussen Flevoland en Overijssel: Het verbindende vermogen van de Hanzelijn.

Weterings, A., Bastiaanssen, J., & Planbureau voor de leefomgeving. (2025). DE (SPOOR)WEG NAAR WERK?

Appendix A: Accessible jobs

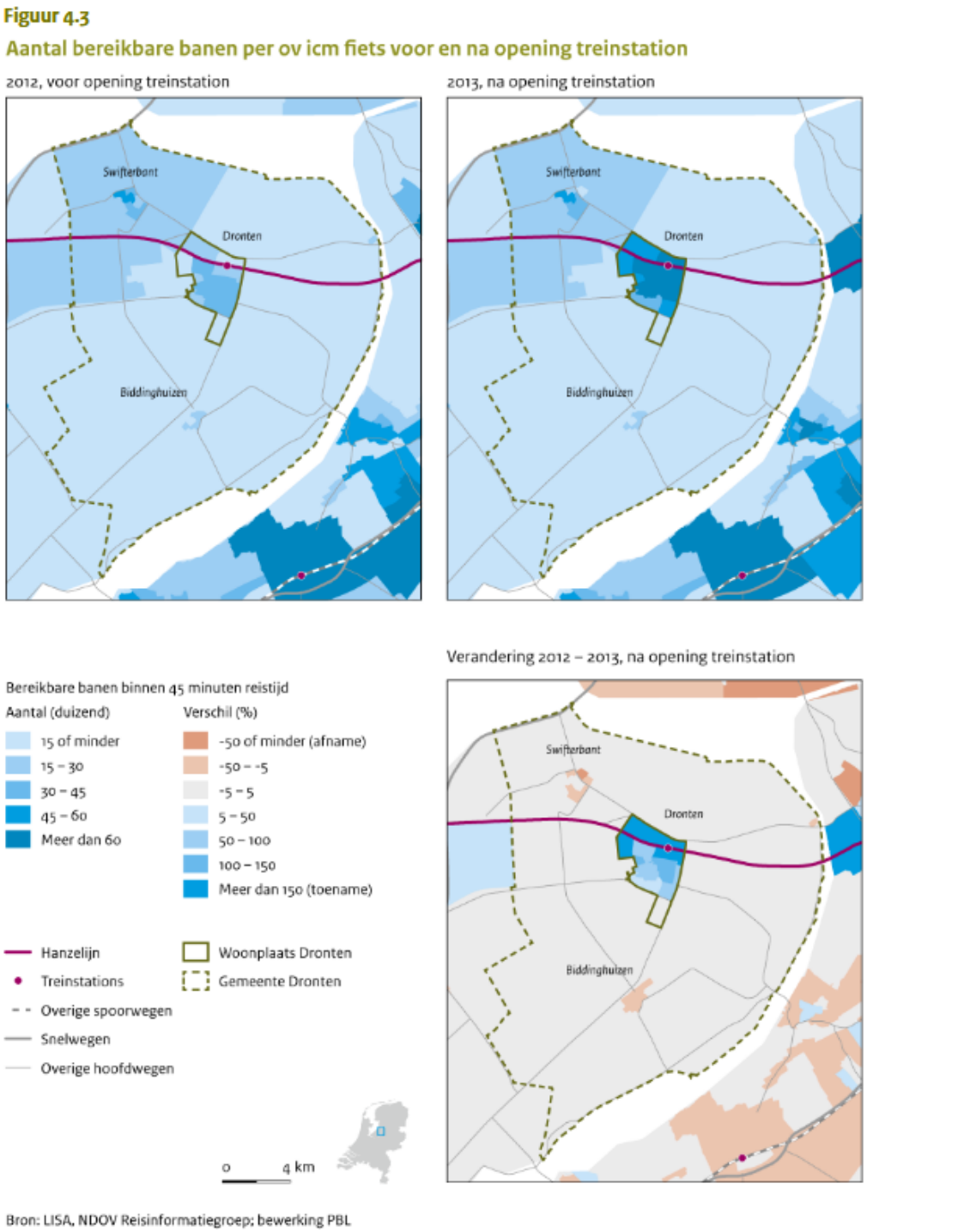


Figure 11 Number of accessible jobs before and after the opening of the Hanzelijn. Source: Weterings et al. (2025)

Appendix B: Housing

In this appendix the graphs on the development of the number of houses is demonstrated (CBS, 2025f). The y-axis demonstrates the number of houses, and the x-axis the number of years. Starting from the year 2012 towards the most recent published year, 2024. The graphs are illustrated for the Hanzelijn municipalities, Dronten, Kampen, Zwolle, Lelystad. And as reference category Zeewolde.

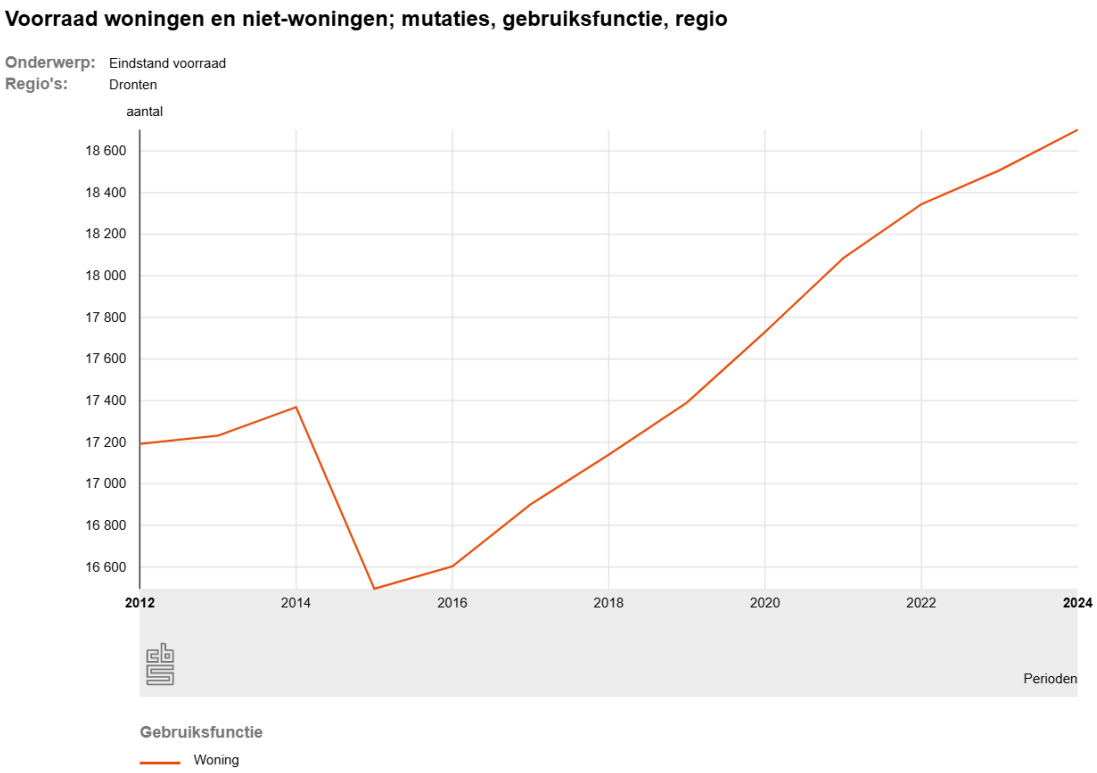


Figure 12 Number of houses - Dronten Source: CBS (2025f)

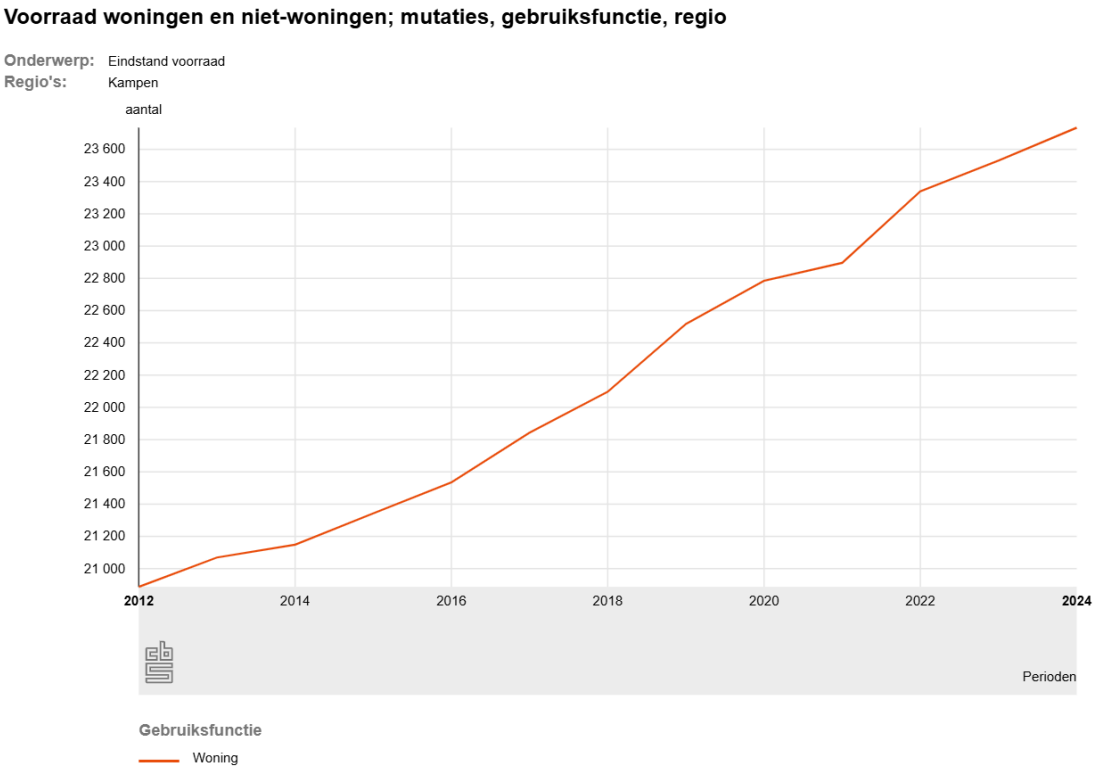


Figure 14 Number of houses - Kampen Source: CBS (2025f)

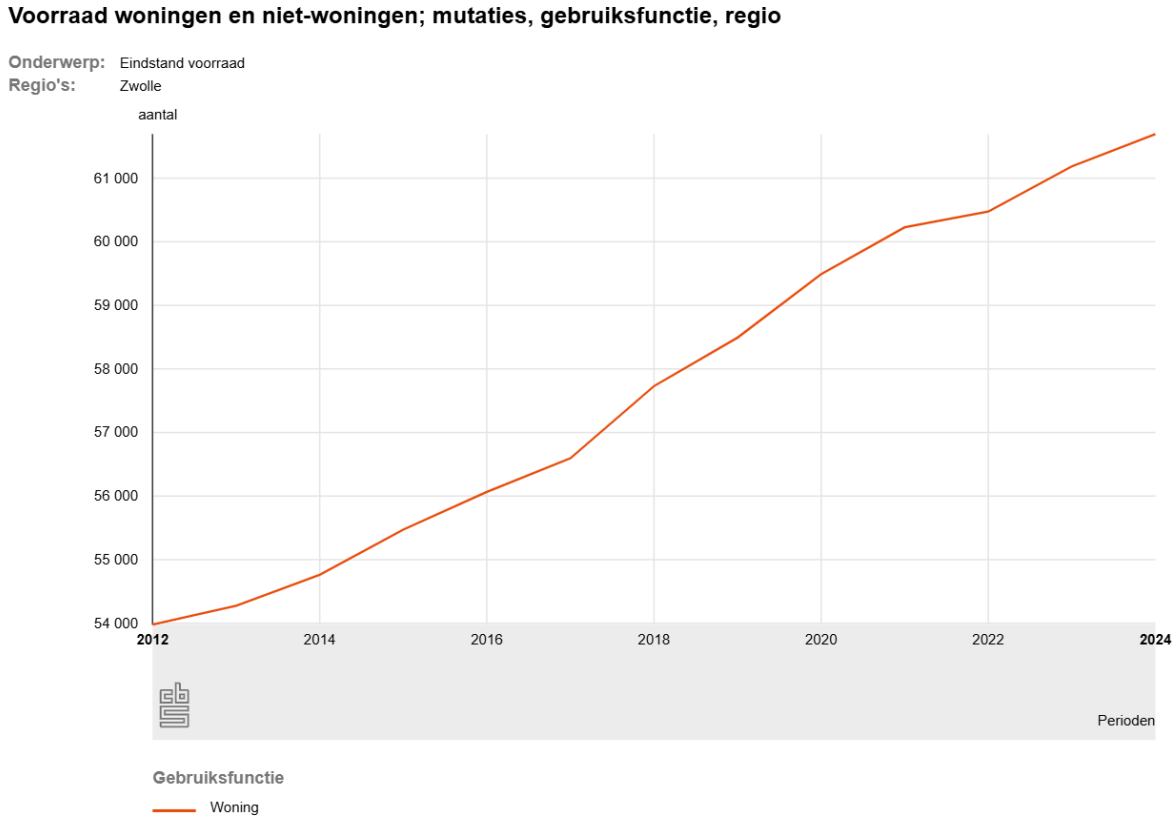


Figure 13 Number of houses - Zwolle Source: CBS (2025f)

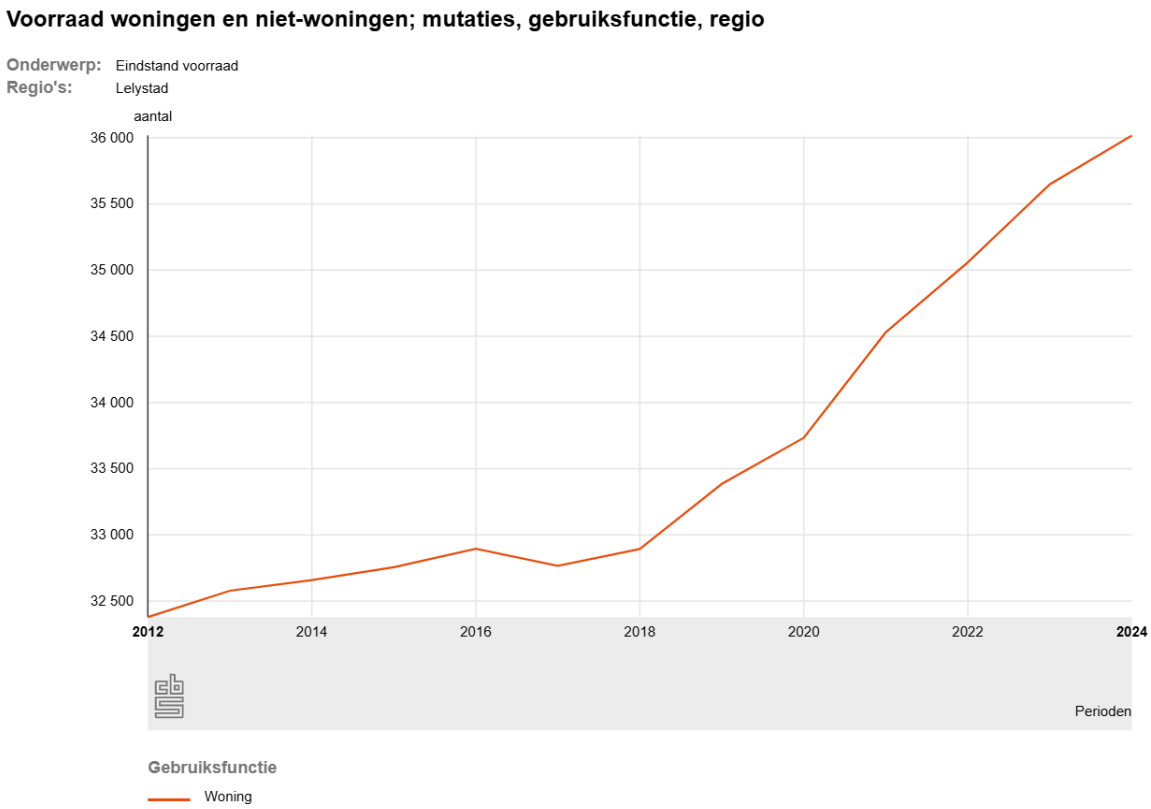


Figure 15 Number of houses - Lelystad Source: CBS (2025f)

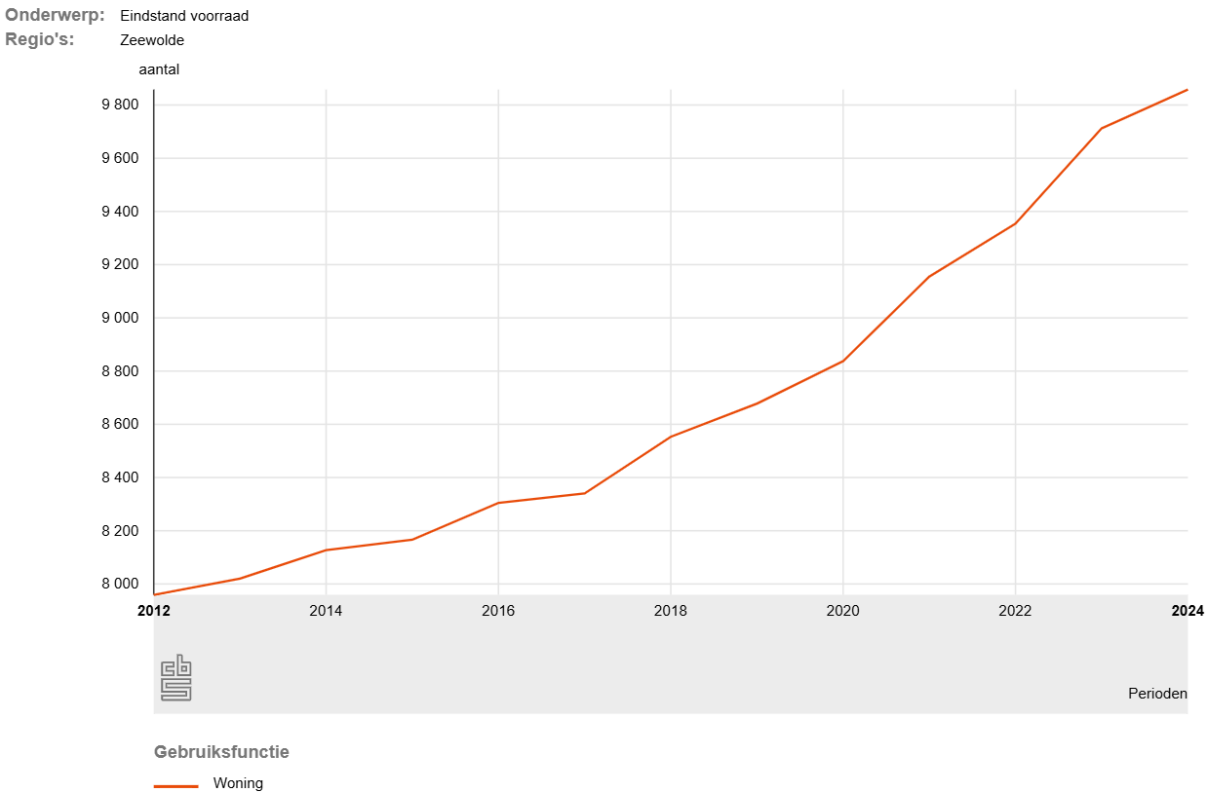


Figure 16 Number houses - Zeewolde Source: CBS (2025f)

Appendix C: Number of offices

In this appendix the graphs on the development of the number of offices is demonstrated (CBS, 2025g). The y-axis demonstrates the number of offices, and the x-axis the number of years. Starting from the year 2012 towards the most recent published year, 2024. The graphs are illustrated for the Hanzelijn municipalities, Dronten, Kampen, Zwolle, Lelystad.

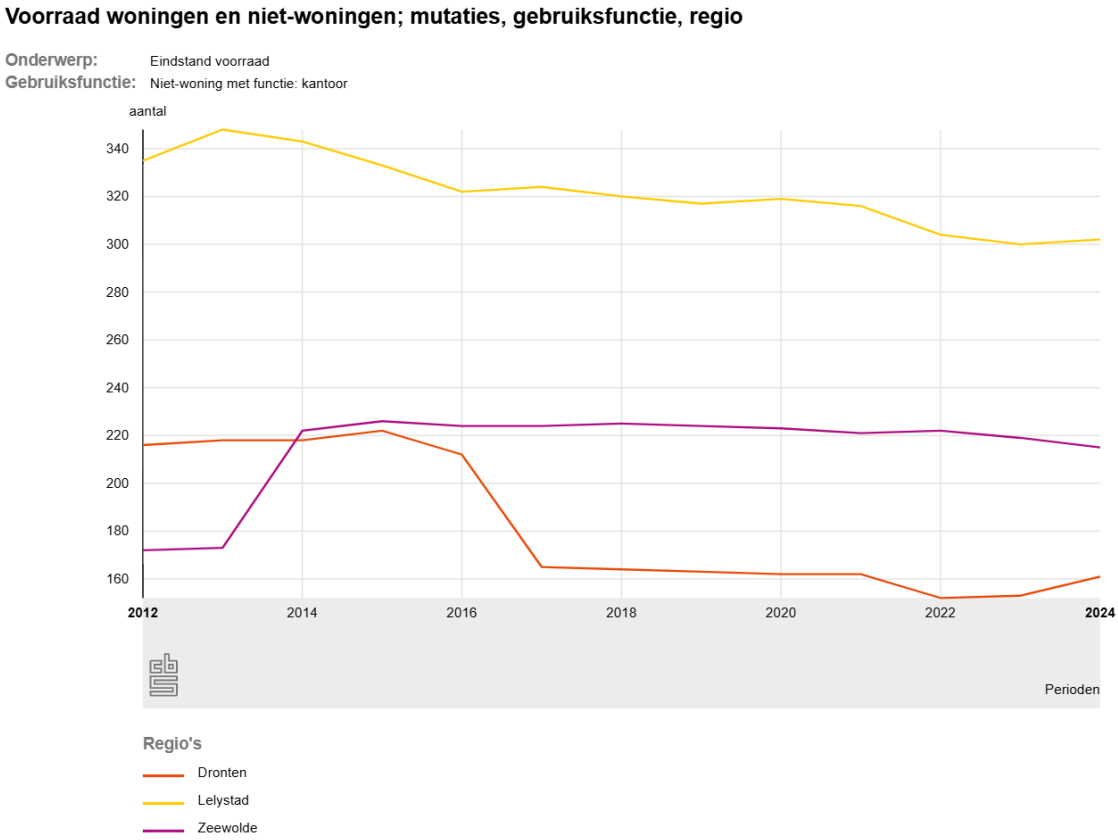


Figure 17 Number of offices - Dronten, Lelystad, Zeewolde Source: CBS (2025g)

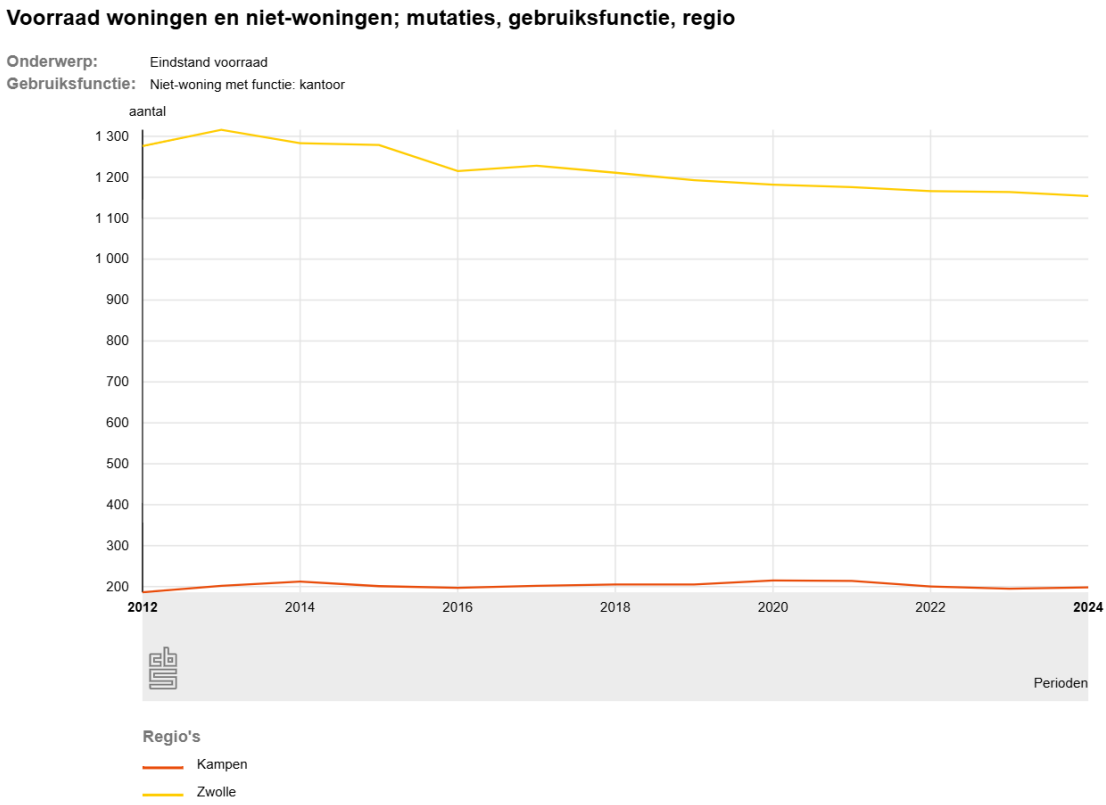


Figure 18 Number of offices - Kampen, Zwolle Source: CBS (2025g)

Appendix D: Build environment

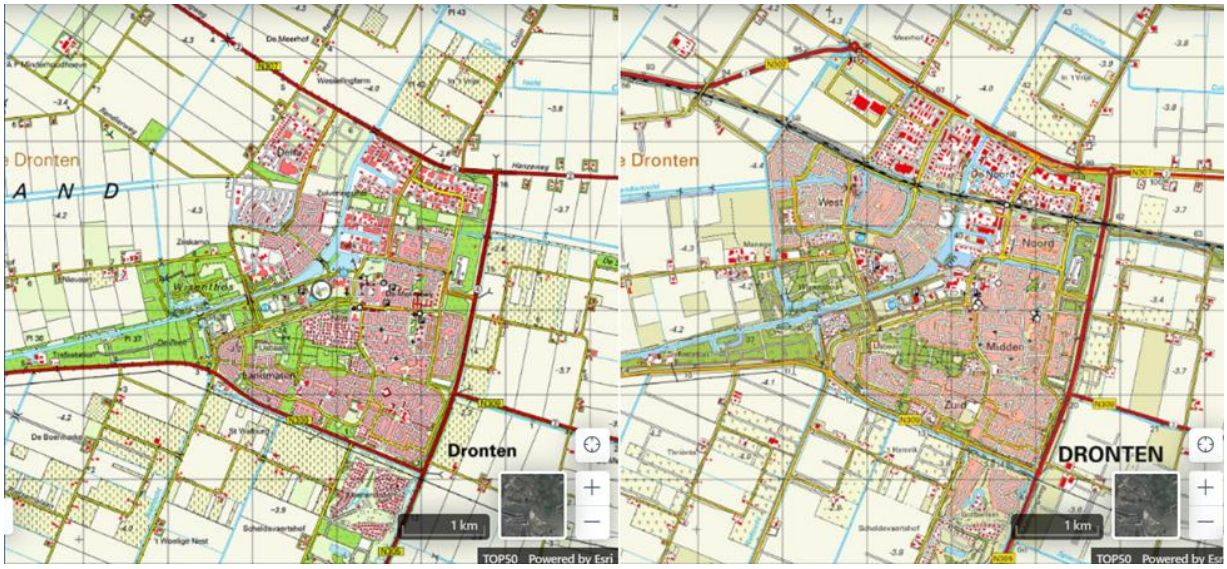


Figure 19 Dronten 2006 – 2024 Source: Topotijdreis (2024)

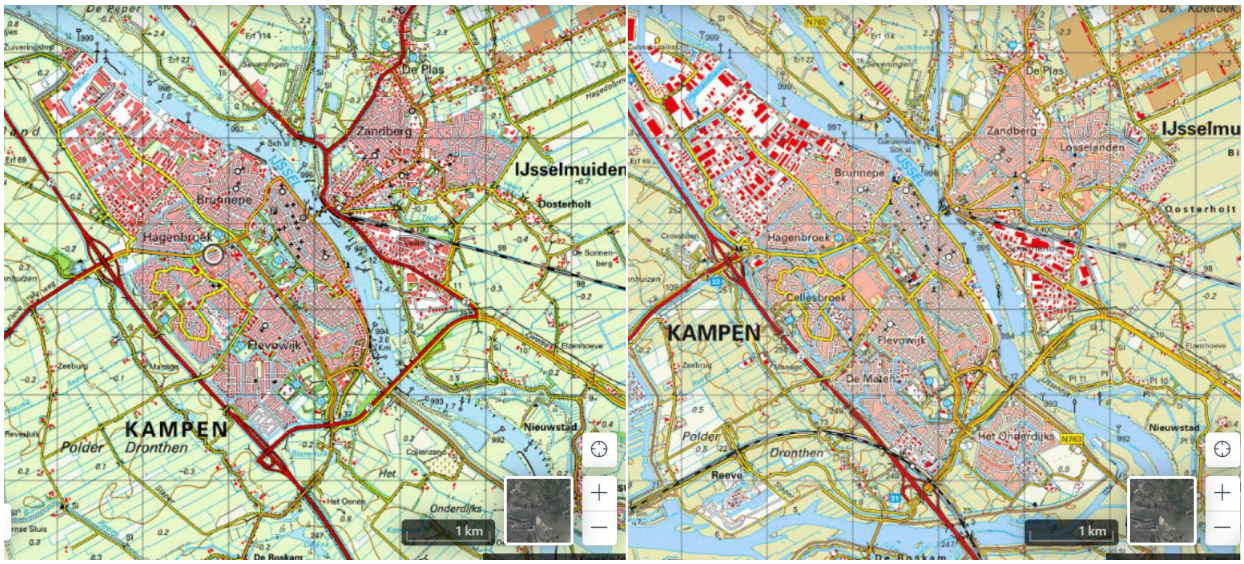


Figure 20 Kampen 2006 – 2024 Source: Topotijdreis (2024)

Figure 21 Lelystad 2006 – 2024 Source: Topotijdreis (2024)

Appendix E: FSI and MXI

Besides the number of offices, the FSI and the MXI is illustrated below. The Floor Space Index (FSI), a measure of the intensity of land use in a given area. It represents the ratio between the total floor area of buildings and the size of the parcel on which they are built. A higher FSI indicates denser development, often seen in urban centres, while a lower FSI reflects more spacious or suburban environments. FSI is commonly used to assess building intensity and to guide planning and zoning regulations.

The Mixed-Use Index (MXI) quantifies the degree of land-use diversity within a specific area. It measures how evenly different types of functions, such as residential, commercial, institutional, and recreational uses, are distributed. A higher MXI suggests a balanced mix of uses, which typically enhances vibrancy, walkability, and urban resilience. In contrast, a low MXI points to more mono-functional, segregated areas.

Together, FSI and MXI illustrate the spatial structure and functional complexity of urban environments, providing insight into how intensively and diversely an area is used.

The FSI and MXI for Dronten, Lelystad and Kampen are illustrated below.

Figure 22 Dronten MXI Source: QGIS

Figure 23 Dronten FSI Source: QGis

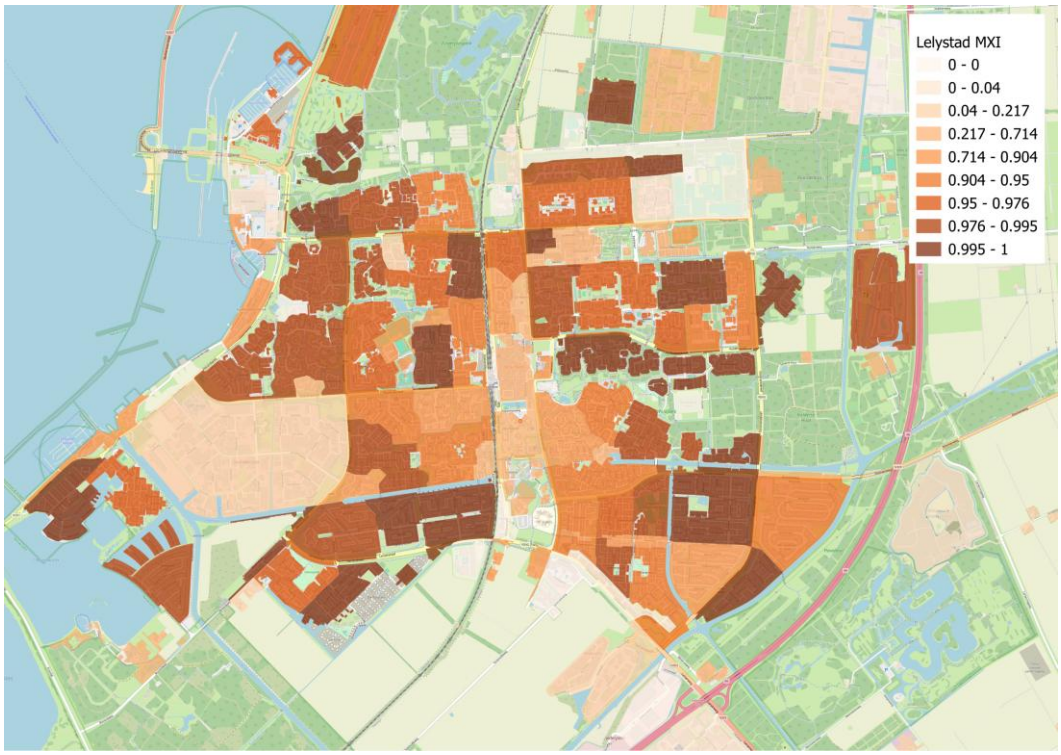


Figure 24 MXI Lelystad Source: QGIS

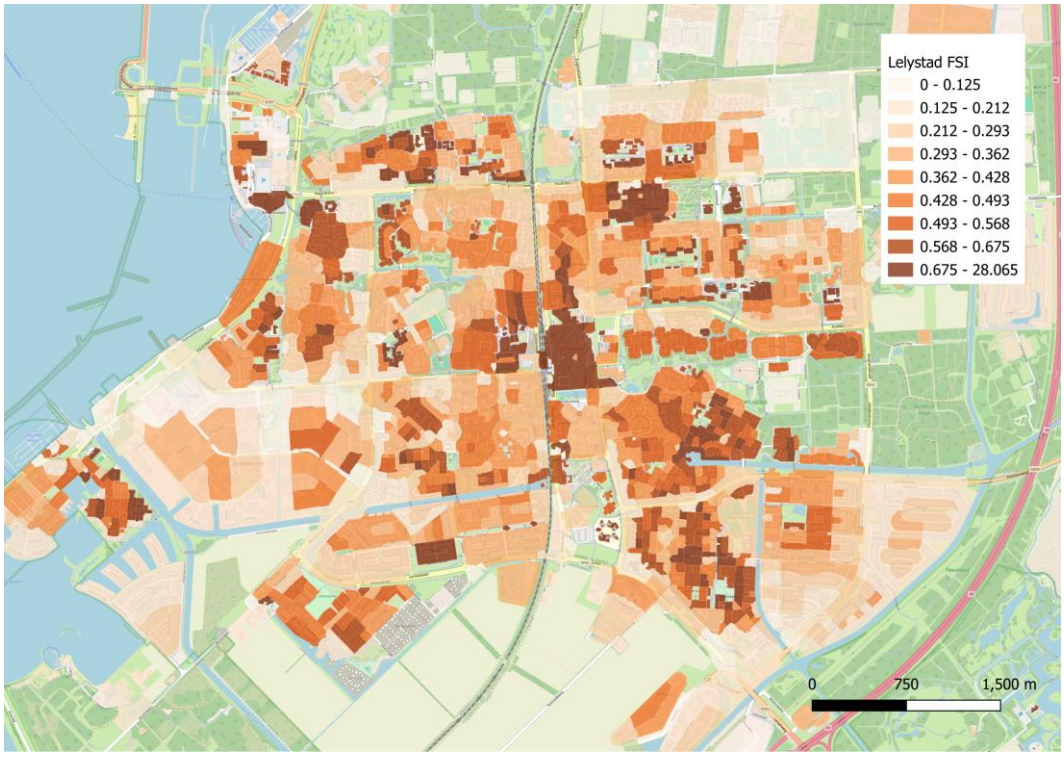


Figure 25 FSI Lelystad Source: QGIS

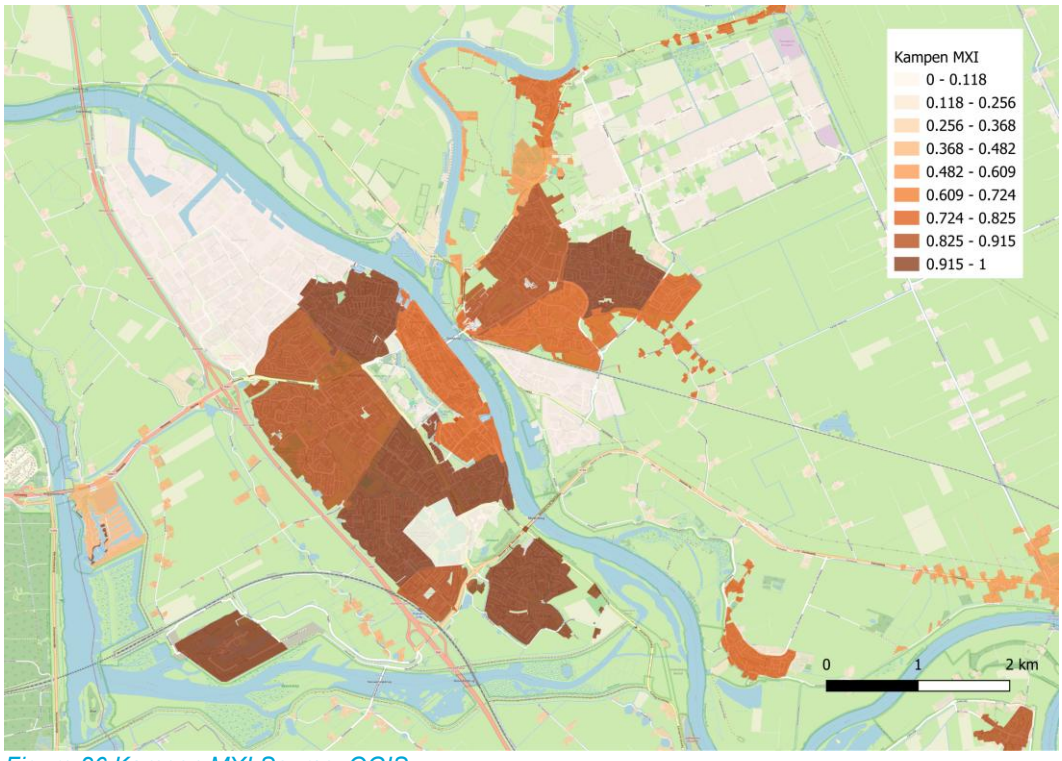


Figure 26 Kampen MXI Source: QGIS

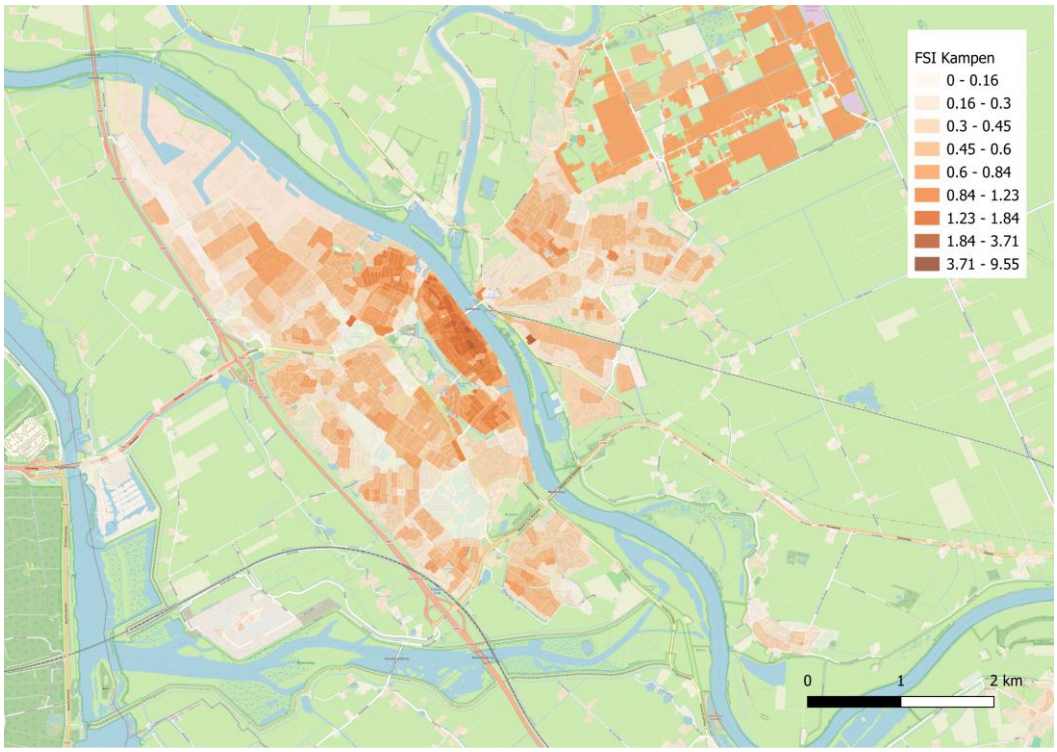


Figure 27 Kampen FSI Source: QGIS

Appendix F Interview questions

Theme 1: Accessibility
How do you perceive the accessibility effects of the railway in the connected municipalities?

What role does station location and speed of service play in accessibility?

How do you see the interaction between train services and other modes of public transport?

What changes have you observed in local or regional accessibility since the line opened?

Theme 2: Economic Development & Employment
In your view, what impact has the railway had on economic activity in the region?

Have you noticed any effects on employment opportunities or labour market dynamics?

How might accessibility improvements influence productivity or business activity?

Theme 3: Attractiveness of a Location
Do you think the railway has influenced the attractiveness of these municipalities for residents or businesses?

What factors, in your opinion, make a place more attractive in connection with railway development?

How important is urban development around stations in this regard?

Theme 4: National-Level Railway Development
How does this railway fit into the broader national transport network?

What role does it play in connecting peripheral regions to major economic centres?

Have there been wider benefits beyond the local scale?

Theme 5: Policy & governance
What conditions need to be in place for a railway project to be successful?

How important is public awareness and service quality for sustained railway use?

What potential downsides or trade-offs should be considered when planning such projects?