

New logistical flows in the inner city

How Groningen can anticipate changing consumer purchasing behaviour in their city logistics policies



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Abstract

The vacancy of stores in Dutch inner cities is increasing rapidly. This is also the case for the inner city in Groningen. More vacancy has a negative effect on the attractiveness and liveability of the inner city. At the same time Groningen is introducing policies to improve the liveability through the establishments of a Zero-emission zone. This policy does however not take into account the increasing vacancy in the inner city. Therefore, this research combines the conditions for a zero-emission inner city, and the measures to prevent store vacancies. It presents insight into how the plan zero-emission city logistics in Groningen can be better prepared for the developments in the function of physical retail stores. In order to answer the research question, multiple research methods are employed. Literature studied to shape the focus of the study. This is used in combination with a document analysis and interviews with experts with different expertises. These different perspectives gave an insight in the various visions and arguments on the topic. A professor retail marketing on the developments for retailers, a researcher from a real estate firm on the developments for logistical real estate, an expert from Ikea to introduce insight in the implementation, and a transport expert on the execution of zero-emission zones. The results show that physical retail stores will have to adapt to new functions, such as a showroom, or a stockholding location. This requires for new types of logistical real estate, such as cross-docking centres and multi-level warehouses. This means that the city of Groningen will have to designate space to develop new types logistical real estate, which are an essential part of the city logistics, and essential for a successful implementation of a zero emission zone in the inner city of Groningen.

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1. Introduction

1.1 Background

1.1.1 Store vacancies

Since 2013 the vacancy of stores in inner cities in the Netherlands is increasing more than anywhere else in the city (see figure 1). More store vacancy will lead to less attractive, and therefore less liveable inner cities.(Evers et al. 2020) The consequences of the Covid-pandemic have lead to an acceleration of this trend. Research by Evers et al. (2020) shows that the city of Groningen could absorb these consequences relatively well. In their research Groningen is labeled as “solid and regional supplying” (see figure 2). This means that the inner city of Groningen is more likely to survive than neighbouring cities like Drachten, Assen and Emmen, whom are labeled as weak and peripheral. However, the vacancy in Groningen is expected to increase from 11.9 per cent in October 2020 to 22.4 per cent in January 2022.(Evers et al. 2020)

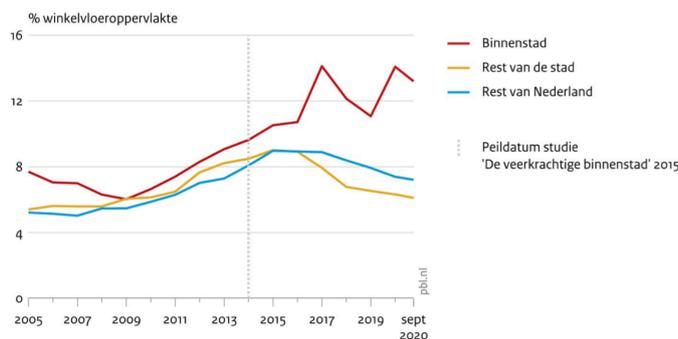


Figure 1: percentage of vacancy per area. Source: Locatus



Figure 2: profiles of inner cities. source: PBL

The increase in store vacancy, which has already been deploying before the pandemic, is the direct result of developments in the consumer behaviour, in which the portion of online shopping has been increasing in the past years.(CBRE,2020) Many retailers have been searching for the right balance between online sales, and sales in their own physical store. This has lead to many retailers making large investments, that can not easily be earned back. Mainly, the logistical costs at which products are delivered directly to the consumer's home, are relatively high.(CBRE,2020) In order to overturn this increase in vacancies, inner cities require to be rethought.

1.1.2 Green deal - Zero emission city logistics

This means that businesses have to come up with logistical solutions to be able to fulfil the consumer's demand. However, at the same time new requirements are set to limit the number of transport movements in the inner city. Various cities in the Netherlands, including Groningen, have made plans to create an emission-free inner city. This has been established in the green deal -

zero emission city logistics (further referred to as GD-ZES). The goal is to increase the liveability of the inner city through limiting polluting vehicles in the inner city.(Rijksoverheid, 2014) These developments in vacancies, as well as the introduction of the GD-ZES do, however, pose challenges for retailers when revising their logistical system.

1.1.3 Societal and academic relevance

The increase in store vacancies and the GD-ZES have consequences for both retailers, and city planners. They have to respond to these developments. The attractiveness and liveability of the inner city is of societal interest. An increase in store vacancy and large amounts of polluting vehicles have negative influence on the liveability. Measures that are taken by local governments in the field of zero-emission contribute positively (Rijksoverheid, 2014), but at the same time it is of significant interest that the inner city remains attractive for retailers.(Evers et al. 2020) It is therefore important to find a balance between these two factors. This thesis will, on the basis of three subquestions, investigate the combined effects of the prevention of store vacancy, and the GD-ZES on the city planning in the inner city, in particular in Groningen.

1.2 Research aim and questions

The aim of this research is to combine the conditions for a zero-emission inner city, and the measures to prevent store vacancies. It also aims to present insight into how the plan zero-emission city logistics in Groningen can be better prepared for the developments in the function of physical retail stores. It introduces the conditions for city logistics and retailers that are necessary to prevent store vacancies in the inner city.

The aim will be reached on the basis of the following main question and subquestions:

What are the consequences of changing consumer purchasing behaviour for retailers and logistics, and how can city logistics companies and policy makers in Groningen further anticipate these developments?

What are the effects of changing consumer purchasing behaviour on the function of physical retail stores?

What effects will the new functions of physical retail stores have on the flows of goods and people within a city?

How can the city logistics policy in the city of Groningen be further improved to increase liveability, while catering developments in retail and city logistics?

The first two subquestions will focus on general developments that are also applicable to the case of Groningen. The third subquestion will elaborate further on the implications that the first and second subquestions have on the policy.

1.3 Reading guide

This thesis consists of six chapters. The next chapter will elaborate on key concepts and theories, that will give an insight in the current developments in retail, specifically in the inner city. Chapter 3 will elaborate on the execution of the literature review, document analysis and expert interviews. The results from this research will be discussed in chapter four. The results are split into 3 subchapters, that each answer one of the subquestion 1 to 3, namely the functions of physical retail stores, the changing city logistics and the case of Groningen. In chapter 5 a conclusion will be drawn to answer the question: "What are the consequences of changing consumer purchasing behaviour for retailers and logistics, and how can city logistics companies and policy makers in Groningen further anticipate these developments?", and a reflection and discussion on the research process, including recommendations for further research. The reference list can be found at the end of the document.

2. Theoretical framework

2.1 Developments in physical and online retail

Shopping has in the past centuries grown from a market in which consumers buy products that have been produced by the seller itself, to an international market of physical and online retailers that have made all their products available online for consumers to decide how, when and where it gets delivered. The largest bottleneck for retailers is to fulfil the need for consumers to receive a product on the right moment.(Evers et al. 2005) By visiting a physical store, this need can be fulfilled immediately, because a product can be picked up immediately. The biggest challenge for retailers is to limit the lead-time between the purchase and the physical handover of a product as much as possible. This has led to high requirements for the efficiency of the logistical system. (Evers et al. 2005)

Because physical stores function as a showroom, they must be easy to find for consumers. This has led to stores locating close to each other, so that consumers have maximum choice. This is also the result of Hotelling's Law, because by locating close to each other each store gets the maximum number of consumers, while losing the fewest to the competitor.(Atzema et al. 2014) Result is that consumer flows are concentrated in the direction of a retail cluster. Inner cities and shopping centers have in the past few years been designed to handle the large flows of goods and people that accompany such retail clusters. Various measures have been taken to manage these flows such as window hours for the supply of goods, pedestrian-only areas and loading docks.(Rutten et al. 2006)

Accompanied with the introduction of ordering and paying online originated new forms of consumer behaviour, and new distribution flows, namely the delivery of goods directly from distribution centres to the consumers.(CBW-MITEX, 2010) This means that consumers can buy products from retailers that are not located in direct proximity. The amount of option for consumers increased, but it also led to challenges in the logistics. Online retailers have to deal with a high number of deliveries, that are often small in volume. A major challenge for retailers is therefore the efficiency, and thus cost reduction. This offers opportunities of logistical service providers like PostNL who want to unburden retailers on this aspect.(CBW-MITEX, 2010)

Apart from traditional retailers (who have physical stores), the amount of fully online-retailers in the Netherlands is growing significantly.(CBW-MITEX, 2010) They run their operations from logistical centers and deliver directly to consumers. All efforts are dedicated towards fast and efficient delivery to consumers. Various larger online retailers such as Bol.com and Amazon have created a new revenue model by creating a market place for other retailers. This way other retailers could profit from their platform. A big disadvantage for online retailers is that they can not compete with physical stores on the delivery times. This has led to that large online retailers are focussing on efficiency and are taking measures to reduce delivery times, with the goal of realising same day delivery. This has resulted that they are continuously improving their network of logistical centres. (CBW-MITEX, 2010)

Online shopping is growing rapidly. In the first half of 2020, the amount of online purchases grew by 11% compared to 2019.(CBS, 2019) A major part of this growth is food delivery. Both foodservice, as food retail have seen massive growths over the past years.(see figure 3, FSIN, 2021)

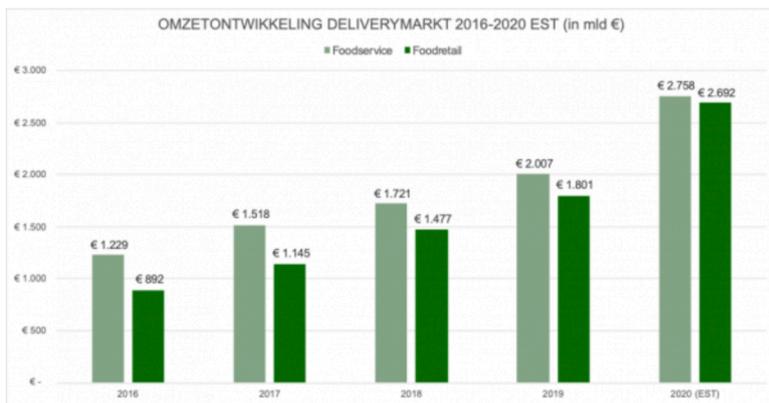


Figure 3: Revenue development in the delivery market. Source: FSIN, 2021

The growing market for online retail will affect the physical retail stores. Physical stores will have to become complementary to online sales. This means that it is likely that the physical stores will become a link in the system for last mile delivery directly to consumers.

2.2 Last mile delivery

According to Zeng et al.(2019) Last-Mile delivery (further referred to as LMD) is defined as “the movement of goods from a transportation origin to the final destination. LMD services are widespread in applications such as e-commerce and food delivery.(Zeng et al, 2019) Retailers can either deliver to their consumers through different distribution channels, either directly from distribution centres or from physical locations (stores), also directly accessible for consumers (See figure 4, Koster, 2003).

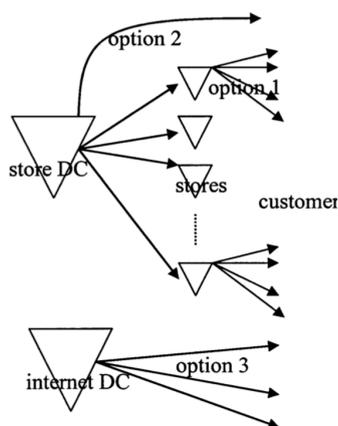


Figure 4: Different distribution channels for online retailers. Source: Koster, 2003

Food delivery operates, almost exclusively from physical locations, in this case restaurants that are also accessible for consumers to dine-in or carry-out. E-commerce on the other hand originates from warehouses, that are not accessible for consumers, while physical stores are only accessible to visit, and are not origins for deliveries like restaurants.(Koster, 2003) The rapid growth of meal and grocery deliveries means an increase of LMD from physical locations. This means that physical retail stores will have to adapt their functions to allow for LMD.

2.3 Logistical real estate

In order for retailers to distribute their product towards consumers, either directly through online orders, or through physical stores, they require a network of logistical real estate. Traditionally, logistical real estate consisted of distribution centers, located close to highways, outside urban areas. Distribution centers are warehouses that hold goods to be redistributed to retailers, or directly to consumers. Only 0.9 percent of all floorspace logistical real estate can be found in the

province of Groningen (See figure 5). This means that most of the goods that are being sold to consumers in Groningen, either via retail stores or online stores, have to be shipped over a large distance from distribution centres elsewhere in the country.(Bak, 2019)

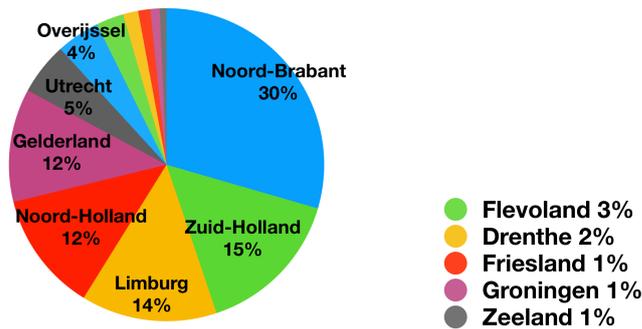


Figure 5: Percentage floorspace logistical real estate per province. Source: NVM, edit: Dallinga

However, these large distances are problematic for developments in LMD. This has led to an increasing demand for alternative locations for logistical real estate, such as smaller properties closer to the city, and therefore closer to the stores and consumers.(JLL,2020) These properties can be operated using the same expertise as traditional real estate. However, currently these properties are found predominantly on in older industrial areas, that tend to be located closer to the city, in the former periphery. This means that there is very limited supply for these properties. (JLL,2020)

2.4 GD-ZES

The GD-ZES introduces a vision on the future of freight vehicles in inner cities. The goal is to realise greener and more efficient city logistics. The GD-ZES focusses on reduction of emissions by creating fewer logistical movements and the use of zero-emission vehicles.(Rijksoverheid, 2018)

The most significant measurement presented in the GD-ZES are the introduction of the zero-emission zones (further referred to as ZEZ). A ZEZ entails that only vehicles that do not emit greenhouse gasses are allowed to enter the area. This means that all freight vehicles that are required to enter these zones, to be switched to new emission-free vehicles, or for freight to be consolidated and cross-docked onto zero-emission vehicles.(See figure 6, Bok et al. 2021)

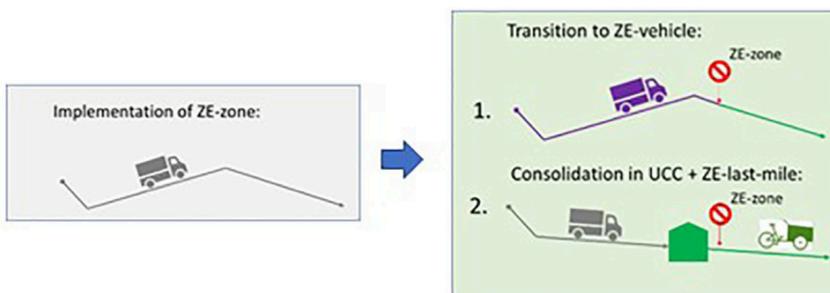


Figure 6: Implementation of transition scenarios. Source: Bok et al. 2021

There are various different Zero-emission vehicles that can be used to implement a ZEZ. Trucks powered on alternative fuels can replace existing polluting trucks, allowing to transition the existing logistical system.(Bok et al. 2021) Another option is the use of smaller vehicles, such as cargobikes or LEVV's (light electric vehicles). Because these vehicles can only transport smaller volumes, an extra step in the logistical process will be necessary to consolidate or cross-dock goods on the edge of the zero emission zone, which will require new forms of logistical real estate to facilitate.(Bok et al. 2021)

2.5 Hypothesis

In order to remain profitable, and therefore prevent vacancy, stores will have to adapt new functions. Given the fact that online shopping is becoming more popular, the hypothesis for this study is that physical stores can become a link in the last-mile delivery trajectory, directly to the consumer. This will result in more logistical movements to and from these stores, by deliverers who collect and deliver online orders. This will have an impact on the city logistics.

2.6 Conceptual model

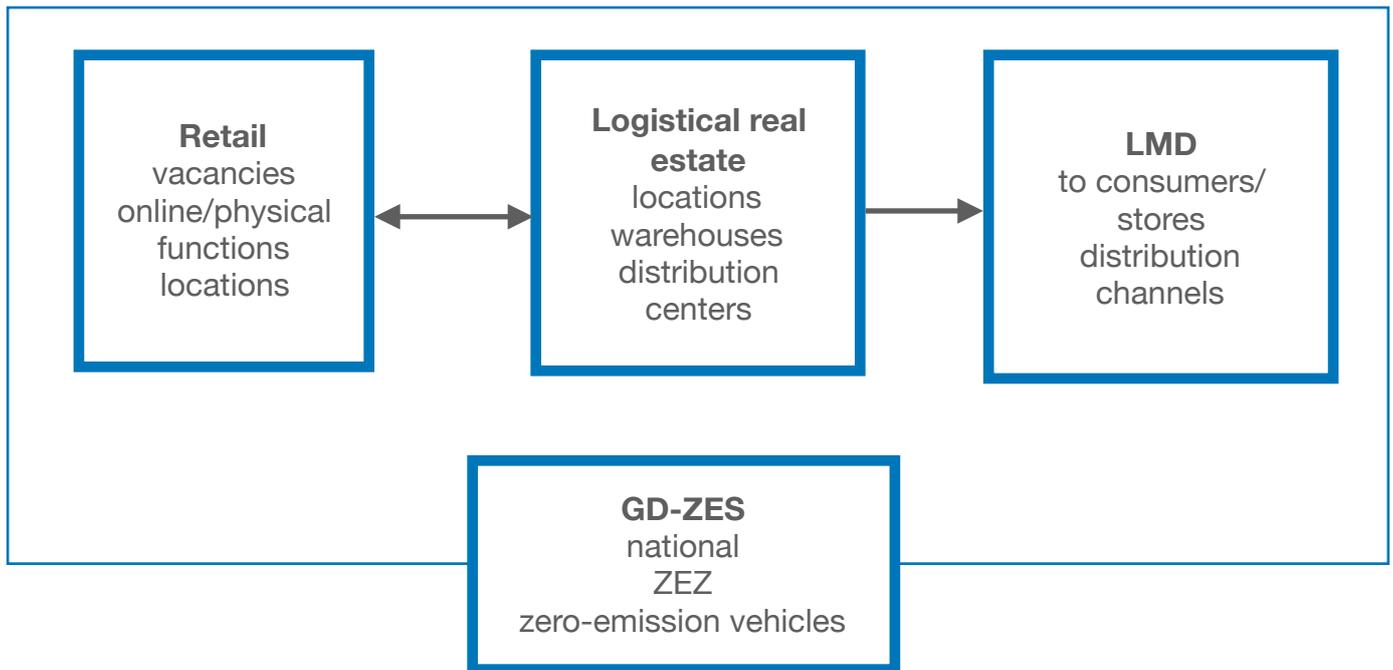


Figure 7: Conceptual model

The conceptual model represents the four key concepts of the theoretical framework. Retail represent the physical retail stores and online retailers. Focus will be on the functions of physical retail stores, their locations and vacancies in the inner city. These retailers will participate in last mile delivery (LMD). Logistical real estate is a link in this process. Major factors are the locations, and forms, currently often warehouses or distribution centers. Various forms of logistical real estate are a necessity for retailers, in order to operate in LMD towards consumers and to supply physical stores, which relies on the design of the distribution channels. At the same time, logistical real estate influences how retailers operate. The entire process is regulated according to the Green deal - Zero emissie stadslogistiek (GD-ZES), which is a national program to promote the implementation of ZEZ's and the use of zero-emission vehicles.

3. Methodology

3.1 Data collection

In order to answer the research question, multiple research methods are employed, to get a more complete overview of all the theories. Literature and a document analysis are used to receive background information, and existing knowledge and theories, as well as quantitative data on the topic. The literature is used in combination with expert interviews in order to receive more qualitative data on the topic, and to especially get an insight in the visions and arguments on the topic.

3.2 Literature review

Throughout the research process, a literature review was conducted in order to shape the focus of the research, and as a source of relevant definitions and theories. Relevant literature was found using various search engines such as Smartcat. Various keywords are used that are relevant to the topic, such as: Last-mile-delivery, Zero-emission-zone, cross docking centres. Terms can be used in combination with general concepts such as “retail”. Relevant publications introduced new relevant concepts that were used as new search terms.

Due to the recency of the topic, most relevant articles are published in the past 5 years, and focus either on the Netherlands, or on general theories. Literature may deviate from these requirements when it introduces theories that are still of relevance to the research.

Multiple articles have been found through the website citylogistics.info by Walther Ploos van Amstel. This website has shared multiple academic publications relevant to the topic in the past years.

3.3 Document analysis

As well as academic literature, Policy documents, market reports and outlooks from various companies are analysed. The cited reports have been gathered from real estate advisory companies such as CBRE, Cushman & Wakefield and JLL. These companies are continuously researching the markets for trends that influence the market, and develop, and describe strategies for investors. Therefore, these reports give an accurate inside into the changing demands in the market, and the types of logistical real estate are expected to be necessary.

Furthermore this research uses policy documents from the municipality of Groningen. The document “Ruimte voor zero emissie stadslogistiek” provides an insight into the policy in Groningen on the topic of city logistics and its zero emission zone. This document is used as a framework to apply broader theories onto the case of Groningen.

3.3.1 Overview of documents

Title	Organisation	Type	Reference
Urban Logistics: Delivering closer to consumers	CBRE	Research	CBRE,2020
Onderzoek retail 2020: Re'structure	CBW-MITEX	Research	CBW-Mitex, 2010
Outlook 2021 logistics: Fast forward	Cushman and Wakefield	Market report	Cushman and Wakefield, 2021

Title	Organisation	Type	Reference
Groningen goed op weg: Naar een leefbare, schone, gezonde omgeving: conceptversie mobiliteitsvisie	Gemeente Groningen	Policy	Gemeente Groningen, 2020
Ruimte voor zero-emissie stadslogistiek: visie op de toekomst van vracht- en bestelauto's in de binnenstad van Groningen	Gemeente Groningen	Policy	Gemeente Groningen, 2021
Convenant duurzame stadslogistiek Groningen	Gemeente Groningen	Policy	Gemeente Groningen, 2018
Logistical real estate: Dutch market report 2021	Industrial real estate partners	Market report	Industrial real estate partners, 2021
Logistics Buildings of tomorrow: Beyond Covid-19, the impact of demographics, technology, urbanisation and sustainability on future buildings and locations	Jones Lang Lasalle	Research	JLL, 2020
Logistiek vastgoed in cijfers 2020: Statistiek van de Nederlandse markt voor distributiecentra en opslagruimten	NVM	Statistics	Bak, 2020
Detailhandel en beleid: Een continue wisselwerking	Planbureau voor de leefomgeving	Research	Evers, 2011
Winkelen in Megaland	Planbureau voor de leefomgeving	Research	Evers et al. 2005
Veerkracht op de proef gesteld: Een verkenning van de impact van corona op binnensteden	Planbureau voor de leefomgeving	Research	Evers et al. 2020
C-173 Green deal zero emissie stadslogistiek	Rijksoverheid	Policy	Rijksoverheid, 2014
Stronger together: keep the wild west scenario at bay with cooperation	Roland Berger GmbH	Research	Roland Berger GmbH, 2021
Ervaren leefbaarheid in Groningen	Sociaal Planbureau Groningen	Statistics	Haan et al. 2019

3.3.2 Execution and data analysis

The analysed documents are found on the organisation's website. The corporal researches from JLL and CBRE have been provided by the company directly to the author for the use of this research. The documents have been thoroughly analysed by highlighting relevant findings, and comparing these in the results.

3.4 Expert interviews

In order to answer the research questions, primary data is gathered through conducting semi-structured interviews with various experts from the field. Because this research tackles such a recent topic, interviews are held with experts that are, based on their expertise, leading in the discussion, and can therefore introduce a scientific basis on the topic.

Based on the theoretical framework, three areas of knowledge have been identified:

- Developments in retail
- Developments in real estate and logistics
- Developments in policy

After thorough investigation on recent discussions the following experts have been identified:

Name	Field	Explanation	In-text
Frank Quix	Retail	FQ is one of the major experts in the field of retail in the Netherlands. He closely follows new developments, including city logistics and LMD. FQ is professor at the University of Amsterdam, and has published multiple books in the field of retail marketing.	FQ
Sven Bertens	Real estate and logistics	SB is head research and strategies at Jones Lang Lasalle, one of the world's largest real estate advisory firms. JLL recently published the research "logistics buildings of tomorrow" in which attention is drawn for the future of logistical real estate.	SB
-	Local policy	A responsible official for the municipality of Groningen for city logistics. Someone who is involved with Groningen's vision "ruimte voor zero-emissie stadslogistiek".	-

FQ and SB have been interviewed on the topic. Unfortunately, it was impossible to interview an official with expertise on the local policy.

After further research, examples from IKEA came up repeatedly, including their initiative to introduce their formula to inner cities. This was reason to interview an additional expert.

Name	Field	Explanation	In-text
Gerard Groener	Retail, real estate and logistics	Until April 2021, GG was worldwide responsible for INGKA centers. INGKA centers is the real estate branch of IKEA. GG has multiple publications on IKEA's efforts, and is actively involved in discussions and conferences on LMD.	GG

During the process of primary data collection a gap became apparent on knowledge on the execution of city logistics within the framework of this research. An additional expert was interviewed to fill this gap:

Name	Field	Explanation	In-text
Alannah van 't Hoenderdaal	Logistics and retail	AH works as specialist transport expertise at Albert Heijn. She is responsible for researching and consulting on future transport technologies, and alternative fuels, to meet ambitions on creating a save, silent and clean and efficient transport and logistics.	AH

The interviews are semi-structured in order to retrieve the beforehand requested data, but also to explore new arguments that were introduced by the interviewee. The interviews are of an inductive nature. This means that the primary goal is to gather new arguments through the interviewee's experiences. This has been gathered by asking preprepared questions, and by asking probing question to allow the interviewee to elaborate on relevant theories. These experts have been recruited through the author's personal and professional contacts. Interviews have taken place via ms Teams, and are conducted in Dutch. The full transcripts of the interviews, including the questions and probing questions, as well as further elaboration on each expert, can be found in the appendix.

3.4.2 Execution and ethical considerations

Before the interview all interviewees have agreed that the interview was recorded. The recordings are solely used to create a transcript of the full interview. These transcripts have been stored offline on a safe, password or touch-id protected location on the author's computer. All interviewees have agreed that the transcript is used for this thesis, and have agreed that their name is used in this thesis.

3.4.3 Data analysis

From the online interviews, recordings have been made using the recording option in MS teams. These recordings have been transcribed, and thoroughly analysed inductively, by highlighting the relevant arguments, and compare the arguments from the different perspectives in the results. These experts have been questioned to give an insight in increasing specificity. Frank Quix and Sven Bertens introduce a general perspective about the retail and logistical real estate respectively. Subsequently Gerard Groener gave a more specific perspective on the city logistics, whereas Alannah van't Hoenderdaal introduced further knowledge on the execution of the GD-ZES.

4. Results

4.1 Functions of physical retail stores

4.1.1 Stores as a showroom

It is inevitable for physical stores to adapt their functions. Because consumer behaviour is continuously changing, retailers have to adapt to their needs in order to remain profitable. Consumers are increasingly used to online shopping. This means that physical stores will increasingly function as a supplement to online retail (Evers et al. 2020)

SB envisions that stores will increase their function as a showroom. This means that physical stores will designate limited floor space to their stock. Because the prices of commercial real estate in inner cities are relatively high, it is unprofitable for stores to use these locations as warehouses. He argues that stock will be held at alternative locations close to the city. This is necessary because having smaller stock will result in more, but smaller deliveries to these stores.

When stores hold limited stocks, consumers will not always have the option to buy the products they want directly at the store. The purpose of the store as a showroom is therefore to allow consumers to try and see products that can then be bought either online or in-store, to be delivered to their homes. However, consumers want to be able to receive the products immediately. In order to be able to deliver goods within such short timespan, they have to have their stock close to the consumers.(SB)

GG confirms this trend. In order to remain competitive in urban areas, Ikea has in the past years changed its strategy to exclusively open stores in inner cities. The goal is to be able to serve more consumers in urban areas. However, due to the small size and limited accessibility by car of retail stores in inner cities, Ikea can only efficiently use these stores to sell smaller items, and use it as a showroom for larger items, that can be ordered online or in-store to be delivered directly to the consumers house.



Figure 8: Ikea inner city store in Paris. Source: Global retail alliance

Having goods closer to the consumers will require new types of logistical real estate. SB recognises this trend. He sees that investors are currently looking at alternatives for traditional real estate. Especially smaller properties at the edge of the cities. These locations can for large parts be exploited with the same expertises as traditional logistical real estate.(SB)

The advantage of a store as a showroom is that consumer get a chance, to try, and see the products they would like to purchase. Consumers can also get personal advice on the product they want to buy. Even though this need from consumers seems to decrease, due to habituating of purchasing online, but real life contact will remain important for a part of the purchases.(FQ/GG)

4.1.2 Stores as stock holding location

However, FQ argues that it is in the retailers interest to increase the function of physical stores as a stockholding location for online orders from consumers in the nearby area, rather than a showroom. These order can be delivered directly or be picked up from the store. In both cases there is a logistical flow between the physical store and the home of the consumer, comparable with meal delivery from restaurants. In the last few years there have already been large developments in meal delivery by companies like Thuisbezorgd.nl, Uber Eats and independent restaurants such as Domino's. This development is strongly recognisable in the street scene and traffic in cities. The introduction of similar flows to and from stores will result in an increasing need for regulation.(FQ)

This will have physical consequences for infrastructure in a city. For example the necessity for more bike lanes, that are also suitable for smaller electrical vehicles, such as electrical bicycles, cargo bikes and LEVV's. To ensure a city remains attractive and accessible, choices have to be made, for example by keeping cars and trucks out of city centers. This means that directly outside the inner city, space has to be realised for parking, and distribution facilities for trucks to deliver their goods.(FQ)

Delivering goods from stores to the consumer is not a completely new phenomena. According to FQ, this is already common practice in the large urban areas in China. In these cities it is possible to order products online, and have them delivered within minutes by a deliverer traveling between the physical store and the consumer's house using scooters and bicycles. In for example Shanghai, the shopping streets have been design to give space for consumers visiting the store on the front. At the back of the stores are alleyways through which delivery vehicles travel to the stores to collect their orders.(FQ)

GG states that in cities it has become increasingly important for retailers to deliver to the consumer, rather than the consumer visiting the retailer. This poses an issue for retailers who rely on consumers to operate the last part of the supply chain, namely from the store to their home, by consumers them selves. To serve these consumers, an extra step is necessary to deliver the products, preferably while maintaining existing prices.

AH recognises this challenge. She states that the delivery of products is under existing conditions unprofitable. However, delivering to the consumer's home is necessary to retain, and grow the number of costumers. She argues that costumers who have their products delivered, often visit their physical stores as well. This means that physical and online stores from the same chain reinforce each other.

4.1.3 Conflict of interest between parties

FQ notes that if a store also has to hold stock, a location in the inner city becomes too expensive. SB confirms this, stating that it is impossible for retailers to hold their stock in the inner city, because the floorspace is too expensive for that purpose. SB argues that retailers have to keep their stock on cheaper locations, and use the physical stores as a showroom, with as little surface as possible for stock. GG argues, however that locations in the inner city are still too expensive to use as a showroom. Because retailers make less profit on in-store sales, extra investments are necessary to generate sales online. These investments include the need for new logistical real estate close to the city, and new delivery vehicles, as well as computer systems to make online ordering and delivery possible.

FQ argues, from the retailers' perspective that real estate owners will have to accept lower rents, in order for physical retail stores to facilitate new functions. The alternative is that physical stores become unprofitable, which will lead to retail stores closing down. According to SB, however this is hard to accept for the real estate owners, because it will lead to a major loss in value of real estate in the inner city.

However, for the community it is undesirable for stores to close down, and therefore increase the store vacancy. Vacancy has a negative effect on the attractiveness and liveability of the inner city. The Netherlands has heavily regulated zoning laws, called GDV/PDV, to retain these values.

Because of this, it is often impossible for fashion stores to be located on the edge of the city. In other countries, such as Belgium and the United States, less strict regulation have resulted in so-called dead inner cities. The expectation is that in the future, local governments will act in the communities' interest to prevent stores from moving to the edge of the city or closing down entirely.(Evers, 2011)

Together, this has lead to a conflict of interest between the various actors. The community wants to retain as many physical stores in the inner city as possible. This does however mean that retail will have to apply new functions to their physical stores. This is impossible without cooperation from the real estate owners who will require to lower rents. Because these new functions have to allow for faster delivery to consumers, retailers will be required to keep more stock in, or close to the city. Because most retailers currently keep their stock in national or regional warehouses (Bak, 2020), retailers will have to review their city logistics.

4.2 Changing city logistics

4.2.1 Gap in the supply chain

City logistics is currently a missing link in the supply chain for stores who are adapting to new functions. Multiple parties are currently debating on how to fill this gap.(FQ) Traditional logistical real estate, the large boxes close to the highway, have become relatively expensive.(SB) Furthermore, these large distribution centres are less suitable to handle smaller volumes to be delivered to consumers, or single stores in the inner city. This has led to a demand for smaller distribution centers close to the inner cities to cater both consumers as well as the stores in the inner city.(SB)

4.2.2 Micro depots

Intensive city logistics requires an extensive network of so-called micro depots. According to Rosenberg et al.(2021) a micro depot is a logistics facility that is usually located inside, or close to an urban area, in which a logistics service provider can load, unload, sort, store and deliver parcels to the end receiver. The employment of micro depots is to consolidate deliveries, and to employ cleaner vehicles. SB confirms the demand for micro depots. AH, however argues that for retailers it is undesirable to employ micro depots for the supplying of stores. For large volumes, such as the supplying of stores, it is much more efficient to use one large truck, that travels directly from a distribution center, than to employ multiple smaller vehicles and a micro depot in between. However, for the last-mile delivery directly to consumers, the use of micro depots can be advantageous, because the smaller volumes allow for the use of smaller vehicles, and the use of local drivers, who are often cheaper to employ.(AH)

SB observes a major problem for cities to facilitate these kinds of logistical real estate, due to lack of space. Potential locations are often designated as residential areas, to be able to meet future housing demands. When cities have zero-emission policies, and with this keep out larger trucks from the inner city, they have to take into account to create space for city logistics. In Hong Kong, Singapore, South Korea and Japan this has led to the realisation of multi level warehousing. Expectations are, given the current situation, that such concept will be realised in the Netherlands. (Cushman & Wakefield, 2021) To facilitate new forms of city logistics, cities have to take in to account to designate space for city logistics. These locations have to be well accessible, for both trucks from distribution centres elsewhere in the country, as for smaller vehicles to supply the city.

4.2.3 Cross docking centres

According to research by Cushman and Wakefield (2021), last-mile-delivery to the end consumer accounts for about 50% of the total logistical costs. This leads to the necessity for service providers to create more efficient urban logistics. Strategic locations in larger urban areas in the Netherlands have gotten plenty of attention to become cross-dock centres.(Cushman and Wakefield, 2021) Cross docking means that incoming shipments are immediately transferred onto outgoing vehicles, without storing them in between (Figure 9, Belle et al. 2012). The advantages of cross docking centres over traditional warehouses are that they reduce costs and delivery time, because products do not have to be stored. The disadvantage of cross-docking centres is that they are a relatively poor investment, due to large surface area, necessary for limited floorspace. (SB)

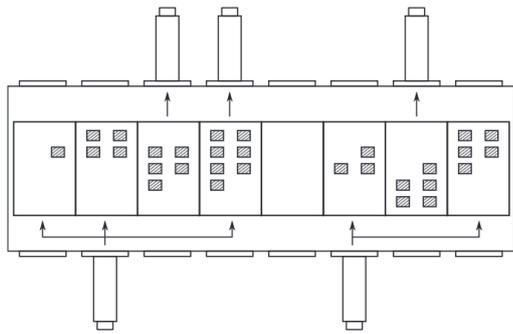


Figure 9: Representation of a cross-docking center (source: Belle et al. 2012)

Cross docking centres will be necessary for stores that hold stock, to transfer products from larger vehicles, that are not allowed to enter the inner city, to smaller zero emission vehicles. AH however, argues that it is undesirable for retailers to cross-dock their stock designated for physical stores. Adding this extra step will add costs and take time. Larger vehicles are much more efficient to supply stores, than smaller vehicles. An average truck can transport a volume of 80 cubic meters, significantly more than cargobikes, LEVV's and even smaller trucks.(AH) This conflicts with the vision of zero-emission city logistics, in which the use of these smaller vehicles is heavily promoted.(Rijksoverheid, 2014)

4.2.4 Multi level warehousing

According to Cushman and Wakefield (2021) concepts as multi-level warehousing (figure 10) are becoming reality in cities in the Netherlands. Multi level warehouses are similar to traditional warehouses, but existing out of two warehouses on top each other, making it much more economically viable (Blouin, 2019)



Figure 10: 3D-model of a multi level warehouse. Source: Warehouse automation Canada, 2021

An example of such multi-level warehouse in Europe can be found in Gennevilliers, in the Paris, France metropolitan area. This multi-layer warehouse has currently been leased to IKEA. However, the property has been designed to hold up to 15 tenants, with flexible surfaces. This means that if the wishes and needs of tenants change, floor-plans can easily be adjusted when needs and wishes change. Ikea uses its Gennevilliers warehouse to deliver to its customers in the Paris urban area. Ikea has opened a store in downtown Paris that functions purely as a showroom. Because consumers often want to buy their product immediately, it is necessary to be able to deliver larger products within minutes in larger cities.(GG)

Demand for distribution centers that can be used for multiple retailers, such as the example from Genevilliers, is growing. SB argues that there is great demand for such facilities, both from investors, as potential tenants. However, he argues that policymakers have to little knowledge about logistical real estate to allow for such problems. Zoning laws in industrial areas do in most cases not allow for more than one tenant or user in a distribution center. FQ indicates similar objections. Due to competition laws it is not possible for retailers to cooperate in the last link of the supplying of stores. This will lead for the necessity of a third party to exploit on behalf of

multiple retailers. This is currently hard to accept for retailers, because they will lose grip on an important part of their logistical process.(FQ) SB, does however, see large potential in for example a campus in which the city logistics of various retailer, and other parties such as hotels, webshops and parcel deliverers can be combined. All these parties ask for similar characteristics for their logistical real estate, so it would be possible to realise such campus. (SB) Policy makers will have to anticipate on this demand by allowing for multi-level warehouses by allowing for multiple tenants, as well as allowing cooperation between retailers.

4.3 Case of Groningen

4.3.1 Vision city logistics in Groningen

Based on the GD-ZES, Groningen has developed a vision on the future of freight vehicles in the inner city. The goal is to create a cleaner and safer inner city. The municipality is taking various measures to reduce the number of freight vehicles in the inner city. The vehicles that do enter the inner city will have to be cleaner and more fuel-efficient. They employ strict rules for the supply of retail stores.(Gemeente Groningen, 2021)

Groningen is currently already executing window times. This means that larger vehicles may only enter part of the inner city between 5 and 12 in the morning. Starting in 2022, this area will be expanded to include the entire inner city.(See figure 11, Gemeente Groningen, 2021) The municipality is currently investigating possibilities to reduce these window times to be between 5 and 11 in the morning. However, according to AH these window times are challenging for retailers. Some stores receive multiple deliveries per day, making it challenging to schedule these deliveries. At the same time, limited window hours are likely to cause congestion within these periods, having a negative effect on the safety and liveability.(AH)

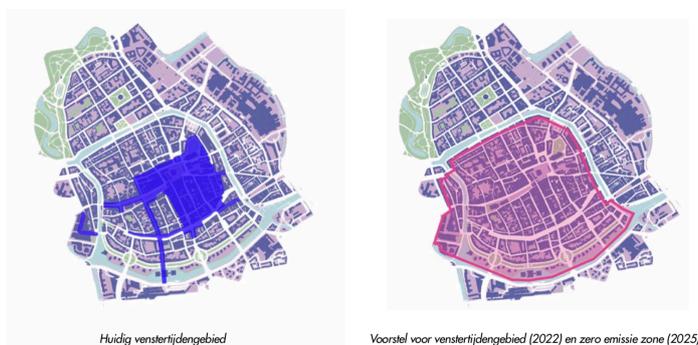


Figure 11: Current and future window time area. Source: Gemeente Groningen, 2021

4.3.2. The effects of the ZEZ for retailers

Groningen has announced the introduction of a ZEZ in the inner city in 2021. Because the policy allows for a 4-year transition period in which businesses get time to adapt their logistics, the ZEZ will go into effect in 2025. This means that starting in 2025 all gas- and diesel powered vehicles will be replaced by zero-emission vehicles powered by for example electricity, hydrogen and manpower. The ZEZ will go into effect in the same area as the window times.(Gemeente Groningen, 2021)

However, FQ argues that the current plan by the municipality of Groningen is problematic for retailers. Because most retailers currently supply their stores in Groningen using large trucks, traveling from distribution centres in the western- and southern Netherlands. Replacing these trucks with electrical alternatives is extremely costly, if not impossible. This means that goods will have to be cross-docked onto smaller electrical vehicles on the edge of the city. In order to do this efficiently retailers will have to cooperate. This means that one store would also deliver the goods to other stores. Such cooperation is however not allowed due to fair competition laws. If stores can not cooperate between each other this means that there will be need for 3rd parties to operate the last mile delivery for these stores. However, every party that gets added in a supply chain will add extra cost to the products. In this case a 3rd party would have to build distribution centres outside the city, which would add significant extra costs for retailers.(FQ) In order to successfully implement a zero-emission zone, additional policy is necessary to allow retailers to adapt their logistical infrastructure accordingly.

AH confirms this. Albert Heijn currently uses large diesel trucks to supply the stores. Groningen is further away from a distribution centre, than anywhere else in the country, making it impossible to replace these vehicles with fully-electric alternatives, due to short range. Cross-docking is for food-retailers undesirable, because of very strict HACCP, or food-safety laws. A solution for

Groningen would be the use of Plug-in-hybrid trucks. These trucks would be driving on diesel between its origin, and the edge of the city, where they switch to electric driving.(AH) Currently the use of plug-in-hybrids is being studied by the municipality, but has not yet been allowed in the plan.(Gemeente Groningen, 2021)

Both SB and FQ see that new players are making use of the developments, such as the introduction of online Grocery store Gorillas in Dutch cities, including Groningen. Gorillas makes use of so-called dark-stores. They are currently trying to occupy as many vacant stores as possible, in order to create a large network of micro-hubs, which is necessary to fulfil their promise to deliver to the door within 10 minutes.

4.3.3. Challenges for city logistics in Groningen

The local government offers subsidies for retailers to finance the purchase of electric vehicles. (Gemeente Groningen, 2021) However, only swapping vehicles is not enough. In order to supply the inner city with electric vehicles, new logistical real estate such as cross-docking centers and multi-layer warehouses on the edge of the city will be necessary.(FQ/AH) To realise this new city logistics, all actors have to cooperate by taking necessary measurements and investments. (Gemeente Groningen, 2021)

Locations close to the inner city have to be designated and developed, to allow the cross docking of smaller volumes onto smaller electric vehicles. Larger volumes, that can not efficiently be transported using cargo-bikes or LEVV's, will have to be cross-docked onto smaller, electrical trucks. Space for the necessary cross-docking center will have to be realised in, or close to the city.(FQ)

In order to realise the necessary improvements in delivery time to consumers, retailers will want to keep their stock as close to the city as possible. This means that retailers will hold their stock either in the physical stores, or in warehouses close to the city. The available floor space suitable for warehouses in or close to the city is currently very limited.(SB) This means that the municipality will have to allow for the development of new solutions, such as multi-level-warehouses.(SB)

When retailers want to deliver their products directly from their physical stores to consumers, the stores will have to be accessible for delivery vehicles, such as electric bicycles. Part of the inner city, such as the Herestraat is currently only accessible by pedestrians. In order to allow retailers to use their store as a stockholding location, the entire city should be made accessible to bicycles. An example of how to implement bicycle lanes into shopping streets is the Grote Marktstraat in Den Haag. Here cyclists are separated from pedestrian through a bike lane in the middle of the street. This allows for pedestrian to safely visit the stores on either side of the street, while cyclist are able access the same stores to collect their orders.(FQ)

Due to the increasing regulation on city logistics in Groningen, and the necessary investments in vehicles and new logistical real estate, keeping a store in the inner city of Groningen is becoming increasingly unprofitable. In order to keep stores in the inner city, and prevent the increasing vacancy in the inner city, real estate owners will have to accept lower rents, which will result in a decline in real estate value in Groningen.(FQ)

5. Conclusion and discussion

5.1 Conclusion

In order to overturn the current trend of increasing store vacancies, physical retail stores will have to adapt to new functions. Online sales are of increasing importance for retailers. Stores will increasingly have to focus on faster delivery to the consumers. Either through using physical stores as stockholding location for online orders, or as a showroom for consumers, who can then order the products to be delivered to their houses. In either way, retailers will have to keep their stocks close to the city.

A conflict of interest exists between the retailers, real estate owners and community. The community wants to retain an attractive and liveable inner city, but this requires retailers to adapt new functions to their stores in the inner city. This means that real estate owners will have to accept a loss in value, and lower the rents for retail space. If rental prices drop, physical stores will continue to be located in the inner city. The new functions will, however have an effect on the necessary city logistics. In combination with the GD-ZES, retailers will require to adapt their logistical system in the city.

Logistical real estate is a necessary link in the execution of last-mile-delivery by retailers. Currently, most logistical real estate entails large distribution centers further away from Groningen, from which stores are supplied using larger trucks. This is the most efficient method of executing Last-Mile delivery in large quantities. This system does, however, clash with the future policies that facilitate the introduction of a ZEZ. Replacing these trucks with similar-size electric alternatives before the start of the ZEZ in 2025 is technically impossible. Furthermore, these vehicles are too large to enter the ZEZ outside the window times. This makes it inevitable for retailers to construct alternative types of logistical real estate, such as cross-docking centers, to load goods from larger to smaller zero-emission vehicles that can supply stores in the inner city, and multi-level-warehouses, to be able to hold stock close to the city, to allow for smaller vehicles to supply stores, and quick delivery to consumers within the city.

In order to successfully execute the plan zero-emission city logistics in the inner city of Groningen, while at the same time allowing retailers to adapt to the changing consumer purchasing behaviour, retailers will have to adapt their logistical system in the city. All retailers have to create a plan to operate their store using zero-emission-vehicles, as well as research the necessary logistical real estate to operate this system. This requires close cooperation with the local governments and policymakers, who will have to designate and develop space for new forms of logistical real estate on the edge of the city.

The result largely match the findings in the theoretical framework. It is expected that online shopping will continue to grow, and physical stores will have to play a complementary role to online orders. Physical stores will play an increasing part in the last-mile delivery to consumers. This requires new forms of logistical real estate to be realised close to the city, rather than on a national scale. The introduction of a ZEZ in the coming years is an extra incentive for retailers to review the function of their physical stores and their logistical network, to adapt to the vision on zero emission city logistics.

5.2 Discussion and reflection

This discussion discusses the strengths and weaknesses of the research, followed by recommendations for further research and a reflection on the hypothesis. The strength of this research is that it extensively reflects on the policy zero-emission city logistics by the municipality of Groningen. This policy has been reflected against a broad set of experts. These experts have given insight in increasing specificity. Unfortunately the thesis is lacking the perspective of an expert from the municipality. This is made up for by the input from FQ and AH, who are both also working, and have extensive knowledge on the case in Groningen. It will also be interesting to get

a perspective from individual retailers. This research made a start with contacting various retailers. The results were, unfortunately, too limited to include in the research.

Because this research investigates a current issue, the framework is continuously developing. Multiple sources are published during the scope of this research, such as the final vision on city logistics in the Gemeente Groningen. Another interesting response to this topic is the rise of Gorillas, who opened in Dutch cities in the past few months. For further research, it will be interesting to compare the findings with Gorillas' model.

It is recommended that the municipality further investigate the conditions for the execution of the plan zero-emission city logistics, especially for the necessary logistical real estate within the municipality. Close cooperation between the municipality and retailers is necessary, in order to allow retailers to create an extensive plan on the execution of city logistics under the conditions introduced in the GD-ZES. Both parties have to stay in close contact in order to monitor if sufficient progress is made by retailers to be able to successfully implement the ZEZ in 2025. This research has shown the complexity of the city logistics when implementing the ZEZ, it is therefore recommended for other cities that wish to implement a ZEZ, to investigate the consequences for retailers.

Returning to the hypothesis, it turned out that the role of physical retail stores in the last-mile delivery trajectory was more complex than thought beforehand. The research, however, gave a lot of new insights in the complex puzzle of city logistics. In the end, the results are satisfying, because the right set of experts helped complete this part of the puzzle.

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Appendix 1: Interview Frank Quix

Date/Time: 31 March 2021, 20:00
Location: MS Teams
In-text reference: FQ

Frank Quix is the owner, and managing director of Q&A. Q&A is known as the main consultancies in the retail sector in the Netherlands. Frank Quix has more than 20 years of experience in consulting retail companies, as well as lecturing in retail strategies & marketing at various universities. Frank Quix has also published the book "Retail marketing (2019)".

Interview questions:

J: Wat is uw functie en hoe krijg jij in uw dagelijkse leven te maken met stadslogistiek?

J: Hoe zie jij de ontwikkelingen van dit moment, nu steeds meer steden willen naar een zero emission zone in de binnenstad. Ben jij daar al enigszins mee bekend, of mee bezig?

J: Dus voor winkels met maar een beperkt aantal leveringen, is het een behoorlijke investering als je daarvoor speciale voertuigen moet aanschaffen?

J: Zie je ook al dat daar op dit moment zorgen over bestaan, onder bijvoorbeeld een Blokker?

J: Wat zijn dan de bezwaren daartegen?

J: Het risico is dus eigenlijk dat je oneerlijke concurrentie krijgt?

J: En dan is de noodzaak eigenlijk dat derde partijen de distributie gaan doen. In elk geval voor het laatste deel, direct aan de winkels.

J: Maar als je dat gaat centraliseren, loop je dan niet het risico dat je het probleem gaat verplaatsen. Dat iedereen met vrachtwagens naar zo'n overslagpunt gaat.

J: Heel beperkt, zeker als je het ook betaalbaar wilt houden

J: Wat nu ook veel genoemd wordt, zijn de bevoorrading door ZEV's en cargobikes, dus dat betekent dat alle bevoorrading in binnensteden, dus Groningen, met 7 andere steden wil dat voor 2025 alle bevoorrading, op een paar uitzonderingen na daardoor wordt gedaan. Hoe schat je de haalbaarheid daarvan in?

J: Het betreft met name ontwikkelingen binnen de stad

J: En dan hub aan de buitenkant, zou aan een ringweg dan zijn, of echt aan de rand van de binnenstad?

J: Wat verwacht u verder dat er voor ontwikkelingen gaan plaats vinden op het gebied van logistiek, anders dan die zero-emission zones?

J: En dan gaan ook fysieke winkels daarin een belangrijke rol spelen

J: Als inderdaad die winkels daar een belangrijkere rol in gaan spelen, denk je dat dat nog probleem gaat opleveren. Stel nou dat iedereen die nu naar een winkel gaat, wordt vervangen door fietskoeriers die heen en weer moeten rijden...

J: Dat is in bestaande winkelstraten natuurlijk lastig

J: Ik kan me ook voorstellen dat dat niet wenselijk is qua veiligheid, als je daar gangetjes krijgt.

J: Denk je dat de ruimtelijke planning in het algemeen hierop in kan spelen in de Nederlandse binnensteden

Due to privacy reasons the full transcript is not included in this report

Appendix 2: Interview Sven Bertens

Date/Time: 6 April 2021, 10:00
Location: MS Teams
In-text reference: SB

Sven Bertens is specialised in research and consultancy in the real estate section. On behalf of real estate service company Jones Lang Lasalle, Sven Bertens has set up and guided various researches, relevant to real estate, including retail and logistical real estate. Sven Bertens has experience with guiding investors, developers, governments and users with researches, data-analyses and substantiated advice.

Interview questionsL

J: Wat is uw functie, en hoe krijgt u daarin te maken met stadslogistiek?

J: Het eerste wat je noemt is eigenlijk: bestaande logistiek is relatief duur geworden. Waar komt dat door?

J: Als je kijkt naar die veranderende markt, zie je dan ook dat er nieuwe wensen ontstaan onder investeerders?

J: Jij noemt dus al de zero emission zone, je ziet dat steeds meer Nederlandse steden die gaan invoeren. Zie jij daar problemen in?

J: En worden daar nu ook vanuit die steden zelf oplossingen in voorzien? Dat er bijvoorbeeld specifiek plaatsen worden aangewezen voor bijvoorbeeld cross-docking.

J: Zie jij daar wel ontwikkelingen?

J: Zie je ook dat de vraag verandert? Bijvoorbeeld naar kleinschaliger logistiek vastgoed, juist dicht bij de steden

J: Verwacht jij ook dat er andere partijen komen die vraag hebben naar logistiek vastgoed?

J: Je zegt dat er meerde huurders in een pand komen, wat voor huurders hebben we het dan over?

J: Wat is dan het bezwaar dat gemeenten hebben?

J: Denk jij dat steden hier nog beter op kunnen inspelen met betrekking tot de inrichting?

J: Jij noemt net dat we verwachten dat producten steeds sneller bezorgd worden, verwacht jij ook dat fysieke winkels hierin een rol gaan spelen?

J: Verwacht jij dat winkels dan ook als voorraadhoudende plek gaan functioneren voor online bestellingen?

Due to privacy reasons the full transcript is not included in this report

Appendix 3: Interview Gerard Groener

Date/Time: 4 may 2021, 18:00

Location: MS Teams

In-text reference: GG

Gerard Groener is advisor, and former managing director of INGKA centres. INGKA centres is the real estate company of INGKA, the largest franchiser of Ikea stores in the world. He is responsible for the development of so-called INGKA centers. These are larger shopping centres, developed to also hold an IKEA-store. INGKA centers can be found in urban areas all over the world.

Interview questions:

J: Wat is uw functie, en hoe krijgt u daarin te maken met stadslogistiek?

J: Herkennen jullie dat jullie nu ook meer te maken hebben met nieuwe vormen van stadslogistiek?

J: Zien jullie ook nieuwe complexiteit in de levering aan winkels in de binnenstad?

J: Zien jullie dan ook nieuwe complexiteiten in de aanvoer aan de consument?

J: Hebben jullie ook een plan om de levertijden in die steden te verbeteren?

J: Zijn nieuwe vormen van distributie, zoals in Parijs, ook onderdeel van de strategie?

Due to privacy reasons the full transcript is not included in this report

Appendix 4: Interview Alannah van 't Hoenderdaal

Date/Time: 6 may 2021, 14:00

Location: MS Teams

In-text reference: AH

Alannah van 't Hoenderdaal works as specialist transport expertise at Albert Heijn. She is responsible for researching and consulting on future transport technologies, and alternative fuels, to meet ambitions on creating a save, silent and clean and efficient transport and logistics.

Interview questions

J: Wat is uw functie, en hoe heeft u te maken met stadslogistiek?

J: Je ziet dat veel binnensteden maatregelen nemen om juist die vrachtwagens te beperken. Zien jullie daar ook uitdagingen in, of hoe spelen jullie daarop in?

J: Zien jullie dat jullie ook het netwerk van distributiecentra daar op aan moeten passen?

J: Kijken jullie ook naar alternatieve vormen van voertuigen, hoe haalbaar is het gebruik van bijvoorbeeld LEV's voor de winkelier?

J: Over die online tak, hoe is dat netwerk ingericht?

J: Zien jullie ook een verandering in de verhouding tussen het fysieke winkelen, en de delivery tak.

Due to privacy reasons the full transcript is not included in this report