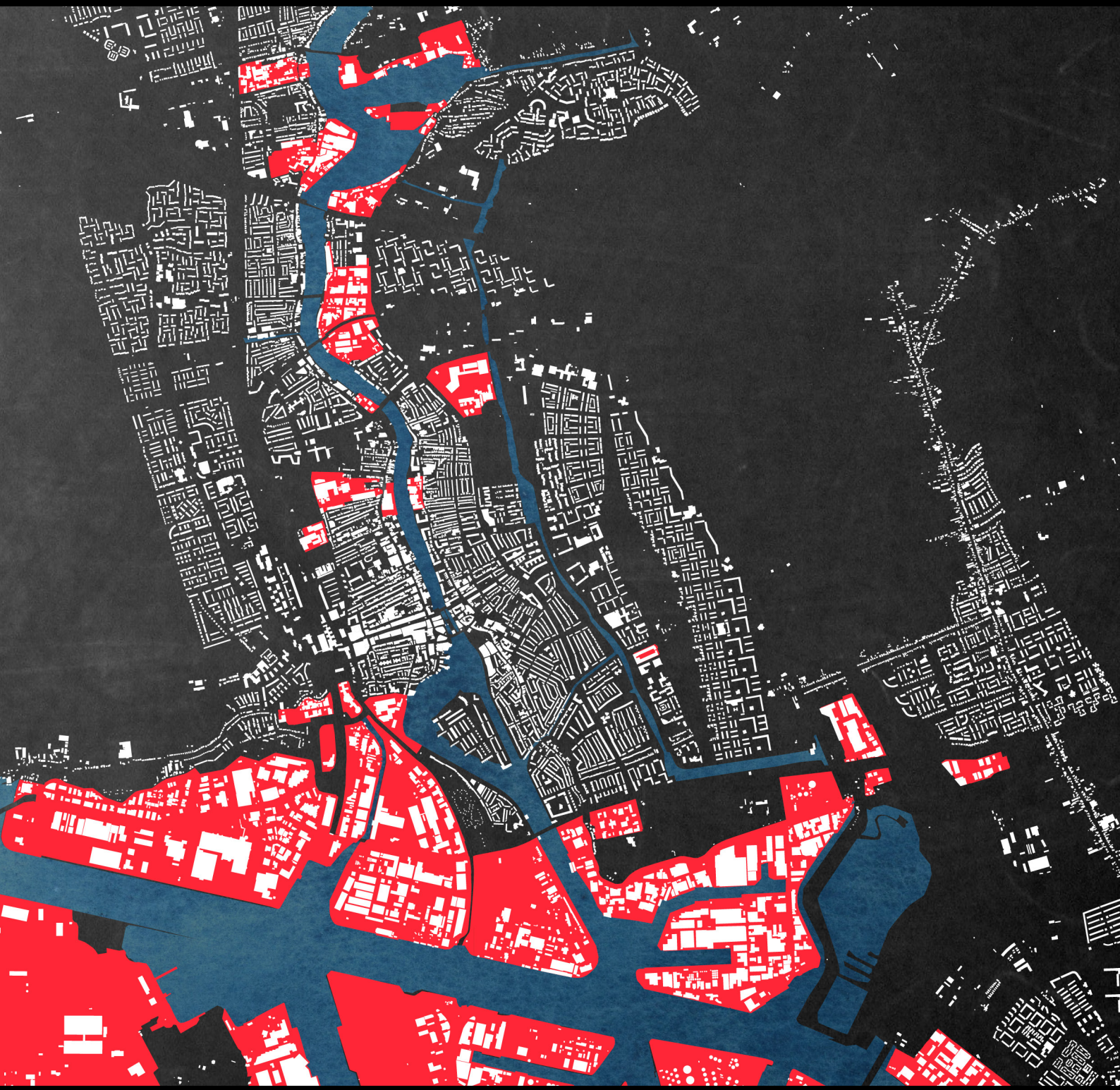
MAKE COMPACT WORK

Patterns of densification and intensification of functions in live work environments: Zaanstad, Metropolitan region Amsterdam.



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Master Thesis

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taking the ferry to Zaandam

source: own photo

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Third, I would like to acknowledge all the inhabitants of Zaanstad with whom I spoke with or have filled in the survey. Moreover, the spatial planner from the municipality and the businesses that I interviewed. Thank you for showing interest in my project and the interesting conversations.



F.1 Tony Garnier Une Cité Industrielle

source: F.1: No author: Tony Garnier from An Industrial City [image] (2016). Retrieved from: https://senacatal.wordpress.com/category/arch-222/

MOTIVATION

In the Netherlands there is no piece of land left untouched. The Dutch are known for the manufacturability (maakbaarheid) of the landscape after decades of polder culture and battling against water. I have not found one country yet that is as structured. I live near the Western harbour of Amsterdam along the Noordzeekanaal, it only takes me 20 minutes to reach the ferry by bike, crossing the canal to Zaanstad. Cycling through these industrial areas, you can feel how impressive and expansive these places are, but also how misplaced you are in that landscape.

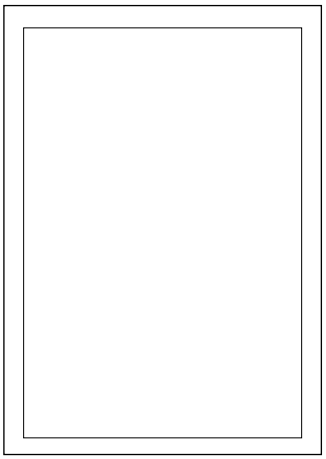
Currently, large industrial landscapes are becoming part of this landscape. It seems like these industrial areas emerge separate from their context. Efficiency and functionality rule, covering expansive areas, disregarding design or the human scale. At the same time, if you do not need to be there, nobody really realises it is there.

Increasingly, a distinction can be seen between the urban core as the front stage zone for human residence and entertainment, while the rural periphery is seen as the backstage zone for production.
The Netherlands is a small country and there is high competition for space; every inch is urbanised. It raises the question, what aspects of the urban landscape do we retain or strengthen and what do we want to change? Where can these industries be pushed further to?

The time to reflect is now. In light of climate change, environmental and social sustainability, we need to start addressing the spatial conflicts created by displacement of industries. If we do not want to live next to it, how can we still justify its existence. We need to take responsibility for the production of the products and services we use. That starts with bringing it closer to home.

This idea is far from new, in 1917 Tony Garnier designed Une Cité Industrielle, a fictional modernist city in France incorporating industries. This design was a great inspiration for many urbanists, including Le Corbusier and CIAM. Influencing the modernist movement and promoting function separation (Wiebenson, 1960). However a hundred years later the world needs a different proposal for an Industrial city, to determine what the new relation will be between industries and cites.

*



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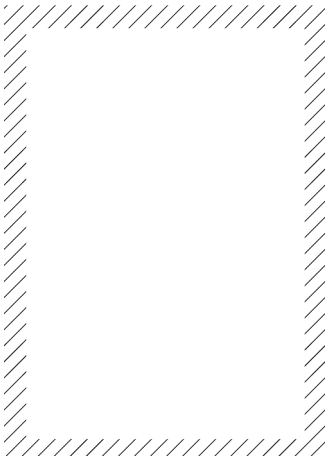
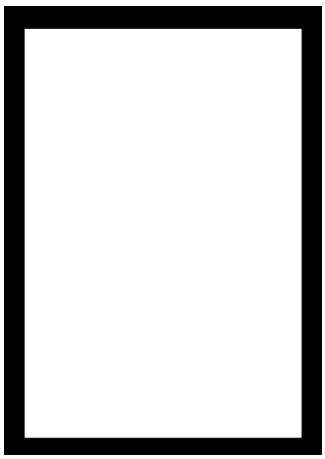


Conclusions



Background Information
Analysis Zaanstad

INTRODUCTION

Welcome to my master thesis graduation report about the densification and intensification of uses, with a particular focus on industrial integration and creating qualitative live work environments. Because the Zaanstreek has considerable experience with living near industrial activities, the design location was chosen in what is now called the municipality of Zaanstad in the Netherlands.

The main research question is: "How can urban industrial integration in cities be combined with other functions to achieve densification and create qualitative live work environments?".

The aim is to reduce industrial sprawl by creating options for cities and municipalities to integrate industries within their existing urban environment in a compact and liveable way.

There is an urgency for a spatial model or framework and urban design rules, that reinvents the connection between cities and industry. Particularly, in a densely built environment that combines industries with other functions in a liveable and vital way, that meets the needs of the twenty-first century, includes technological innovations, and addresses environmental concerns. This research hopes to trigger a more positive perception of industries, as part of identity and opportunity. In the end it is our work, that enables our way of life.

Part I the main concepts and theories involved in this research are introduced. Following, the issue of industrial sprawl and deindustrialisation in relation to the role of urban planning and design. The relevant trends and developments are discussed and why industrial integration is or has become desirable. Subsequently, the selected location is presented. Why this location was chosen and the challenges present in the local context. This part is concluded with the problem statement.

Part II from the relevant theories introduced in Part I, spatial qualities, patterns that inform planning and design to develop live work environments have been collected. A case study of three exemplary mixed use locations from different contexts was used to supplement or complemented the patterns from theory. An analysis of the characteristics of live work environments in Zaanstad have resulted in local patterns. These have been supplemented by spatial qualities found important by inhabitants and businesses, collected from a survey and interviews.

Part III the spatial characteristics and spatial challenges of Zaanstad have been investigated in detail. Together with an analysis of economic profile of Zaanstad two scenarios are presented as two "extremes" of type of work and live environments that are possible. A proposed design for two scenario's is presented for an inner-city location, Koog aan de Zaan, and a transformation location, Achtersluispolder.

Part IV In the framework of the scenarios, the patterns are applied on location to develop qualitative live work environments in an inner-city location and transformation location in Zaanstad. Visualisations on different scale levels show potential qualities.

Part V Finally, the outcomes of the proposed design are evaluated and the use of patterns as a strategic design tool is reflected upon. In the conclusion, the recommendations for future design and planning of live-work environments are presented. For Zaanstad specifically, but also what we can learn and generalise from this contextual research and use for developing qualitative live work environments elsewhere.

*The parts that are indicated by the frames provide background information and do not have to be read to be able to understand the main course of the story. The conclusion frame summarises the relevant outcomes.

I

PART I DEFINITION OF THE PROJECT

1. Key Concepts — *Overview of the main theories relevant for this thesis. Introduction of the knowledge gap.*

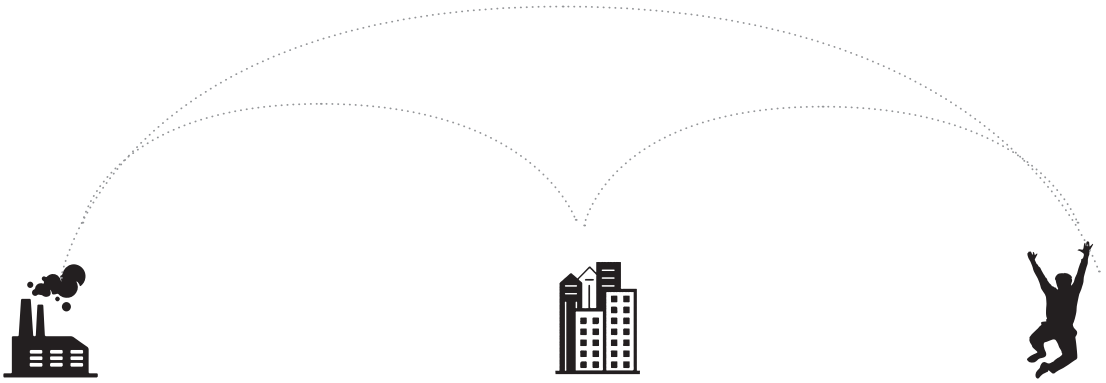
2.1 Problem Context — *Statement of the challenges and opportunities of the issue at a larger scale in the built environment as well as in the practice of urban planning and design.*

2.2 Chosen location — *Explanation of the choice of site and the challenges and opportunities of the chosen location.*

2.3 Problem Statement and Goal

3. Methodology — *Description of the research approach and intended outcomes.*

DENSE LIVE AND WORK ENVIRONMENTS



URBAN INDUSTRIAL INTEGRATION

Urban industrial integration addresses the intensification and densification of uses, encourages diverse uses and activities to create vibrant economic clusters and reintroduce human-centred design to manufacturing.

THE COMPACT CITY

The compact city refers to the compactness of urban form, the intensification and densification of uses or competition of space and the potential synergies between these components.

LIVEABILITY

Liveability is an appropriate relationship between a person and their environment.

Liveable cities are socially inclusive, affordable, accessible, healthy, safe and resilient to the impacts of climate change.

INDUSTRY DEFINITION & FOCUS

production industry, manufacturing

“productive spaces”

production of finished goods from raw materials

involves labour, tools, machines

includes both large and small scale production

includes crafts, highly customised and large scale production

includes hybrid forms of industry and service

involves a local and/or regional network of supporting services and is linked to a market

source: own illustration

1.

1.1 KEY CONCEPTS

Theoretical Underpinnings

Compact city

The compact city paradigm is widely considered to contribute to more sustainable development, in its broadest sense, embracing social and economic sustainability as well as environmental concerns (Mouratidis, 2019). Particularly because of the expected reduction of car reliance and hence fuel emissions, the protection of rural areas, better access to services and facilities, more efficient utility and infrastructure provision and regeneration of inner urban areas (Burton, 2000; Van Der Waals, 2000).

The compact city refers to the compactness of urban form. Important components of the compact city are relatively high density, efficient public transport systems, accessibility, mixed land uses and other dimensions that encourage walking and cycling (Burton, 2000; Mouratidis, 2018; Van Der Waals, 2000). It contrasts with the car oriented urban sprawl with low densities and separate land uses of many modern towns and cities.

The process of achieving urban compactness is usually termed 'intensification', 'consolidation' or 'densification'. It involves the re-use of brownfield land, more intensive use of urban buildings, sub-divisions and conversions of existing development, and an increase in the density of population in urban areas. Often, the term urban compactness refers only to the density of urban form rather than any of the other dimensions (Burton, 2000).

Critics of the compact city concept often question whether densification improves liveability. An increase of amenities, and shorter distances to these, services, and work does make such cities more attractive. However, the availability and access to green spaces is a critical factor for liveability and needs to be balanced well in densified neighbourhoods. Moreover, heavy restrictions on car use limits the appeal of dense environments to wider groups of people. (Kotulla, Denstadli, Oust, & Beusker, 2019). This way, the compact city concept may not be inclusive of all life styles. On the other hand, the argument can be made whether the built environment should still facilitate unsustainable lifestyles.

Although considered more environmentally sustainable, a compact urban environment is often associated with lower liveability. There is the perception that the compact city is less liveable than the dispersed city. This is known as paradox of the compact city. There have been multiple findings disproving this paradox, where residents are actually equally or more satisfied with their neighbourhood than people from rural areas (Dessì, 2015; Kotulla et al., 2019; Mouratidis, 2018). This perceived liveability originated from the idea of the suburban dream. However, newly built compact urban developments are often designed with high standards that actually have a more positive effect on quality of life and as a result, satisfaction.

Densification does have an impact on the heat island effect and water infiltration into the soil in the city. It increases the amount of hardened surfaces in a environment. At the same time, densification also provides the opportunity to invest in efficient measures to alleviate these effects. Such as proper public spaces, rooftop gardens or water storages etc.

In the end, it is the spatial organisation functions and configuration of form, together with living qualities such as access to greenery, housing quality, access to services, amenities and jobs, that determine the liveability and success of compact city strategies.

Mixed-use

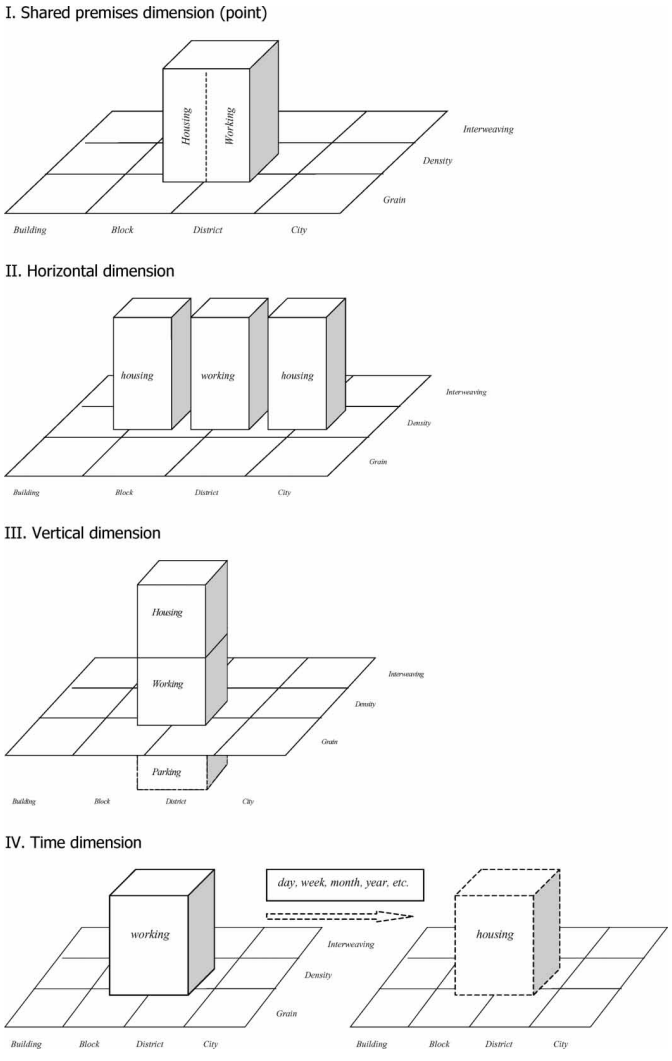
Mixed-use is one of the core ideals of the compact city paradigm (Foord, 2010). It is considered essential for the creation and maintenance of attractive, liveable and sustainable urban environments.

Since the publication of The Death and Life of Great American Cities by Jacobs, the term mixed-use development has frequently appeared in planning literature. However, this term is hardly defined. Without definition considerable confusion can occur, mainly because the issue of scale can be crucial (Coupland, 1997). Functions can be mixed at different scale or spatial levels, but also in multiple use of space in time. Some distinguished spatial levels are, buildings, blocks, districts and city scales (Hoppenbrouwer & Louw, 2005; Rowley, 1996). Hoppenbrouwer & Louw (2005) define four dimensions of mixed-use: the shared premises (multiple use at a particular point in time), horizontal mix, vertical mix and the fulfilment of multiple functions within a certain time-period (the longer the time horizon, the larger the mix of functions).

Therefore, mixed use may be defined as, the fulfilment of multiple functions within a certain space and a certain time.

However, the definition of types of functions – which is dependent on its context – is also determining for the types of mixed-use environments.

In literature, a certain degree of mixed uses is not recommended while compatibility is encouraged between functions and spaces to create synergies. On the other hand, it must be avoided that areas described as mixed-use developments fail because in reality they are not really mixed at all.



F.2 Four dimensions of mixed use

source: Hoppenbrouwer, E., & Louw, E. (2005).

Vitality

In English, the word 'vital' has a dual meaning. First, 'the vital city' implies that the development of the city in general has significant economic, social and environmental implications. Second, a vital city suggests a city full of life, dynamism, cutting edge trends or public health and wealth. It is important both as symbol and as image, but also as something that it is considered possible to measure objectively through urban indexes and ratings (Tunström, 2007). Jacobs was the first to explore urban quality with the idea that activity both produces and reflects quality in the built environment. Lynch (1984) defines a vital city as one which successfully fulfils the needs of its inhabitants within a safe environment, in other words a good city allows maximum scope for activity. Therefore, it may be asserted that successful urban places must provide quality in physical space, sensory experience and activity. As Montgomery (1998) states that "without activity there can be no urbanity", as vitality is what distinguishes successful urban areas from others. Just as biological evolution requires biodiversity, social and land use diversity seem to be preconditions of activity and vitality (Adams & Tiesdell, 2007). Vitality seems to equate to activity. Vital places have a certain pleasantness and liveliness, with vibrant streets and spaces.

The transactional quality seems of particular importance (Montgomery, 1998; Rowley, 1996). Activities and land uses differ in terms of 'comings and goings' that they create. Thus, the degree of vitality that it might generate. Allegedly, this leads to a better distribution of demand over the day and is supposed to be capable of producing something greater than the sum of their parts (Jacobs, 1961). Thus, vitality is diverse activity, its resulting movements and transactional quality. However, the desirable degree of vitality and its result in spatial terms may differ significantly in different contexts but also in respect of dealing with various inhabitants or businesses in a particular area.

Liveability

Liveability is an appropriate relationship between a person and their environment. The relationship can be taken from the standpoint of the individuals appreciation his or her environment, perceived liveability; the synergy or match between the organism and the environment, apparent liveability; or the degree to which the living environment meets the alleged conditions for liveability, presumed liveability (van Dorst, 2005). As it all depends on the view of the individual or its presumptions, therefore by nature, it is a subjective concept.

The distinction between the required aspects of liveability and the desired aspect is ambiguous (Ruth & Franklin, 2014). As there is no clear cause and effect relation between having your basic needs met and being satisfied. As a result, the spatial qualities that contribute to liveability do not necessarily create perceived liveability.

Urban liveability refers to liveable cities that are socially inclusive, affordable, accessible, healthy, safe and resilient to the impacts of climate change. They have attractive built and natural environments. Liveable cities provide choice and opportunity for people to live their lives and raise their families to their fullest potential. It goes beyond the physical setting, extending to social interactions (Badland et al., 2014). Spatial qualities that contribute to liveability are firstly, short distances or accessibility and availability of amenities, services, shops, work. Secondly, access to and quality of public spaces, in particular greenery. Third, available public transportation options or connectivity. Furthermore, housing quality (or perceived quality of dwelling) and aesthetic character. Some other important aspects are safety, privacy and social interaction (Kotulla et al., 2019).

Infrastructures and institutions are relatively fixed and hard to adjust to sudden changes. While cities need to adapt to future needs, particularly, current environmental changes. Diversity is key in order to respond to these future needs and therefore a critical factor for achieving liveability (Ruth & Franklin, 2014). However, while interventions focusses on improving environmental sustainability do affect liveability, liveability and sustainability are not the same (Howley, Scott, & Redmond, 2009). Generally, liveability focusses on the local conditions of a certain urban area. Sustainability on the other hand, focusses on large scale implications.

Urban industrial integration & live work environments

Industry has often been perceived in an economic or political context disconnected from geographic, locational, or spatial concerns. However, increasingly this separation from geography and community is becoming unsustainable (Hatuka, Ben-Joseph, & Peterson, 2017) and urban industrial revitalisation becomes necessary. In America, this has become known under the term Industrial urbanism (Hatuka, 2017), which encourages the convergence of users and activities to create vibrant economic clusters and reintroduce human-centred design to manufacturing facilities.

The economy can be divided into different sectors. The 3 sector economic model is a categorisation that represents a certain distance from the natural environment (Rosenberg, 2020). It starts from the use of raw materials or natural resources from the earth such as in agricultural and mining activities. This sector is referred to as the primary industry. The secondary industry produces finished goods from the resources extracted from the primary industry. Also called the processing stage, manufacturing or production. The tertiary industry consists of services of some sort, it facilitates the distribution of good, services and information. This sector sells and distributes the goods produced by the secondary sector and provides commercial services to the population and businesses. Some economic models distinguish 5 sectors, making a further distinction of the service sector, such as intellectual and public services.

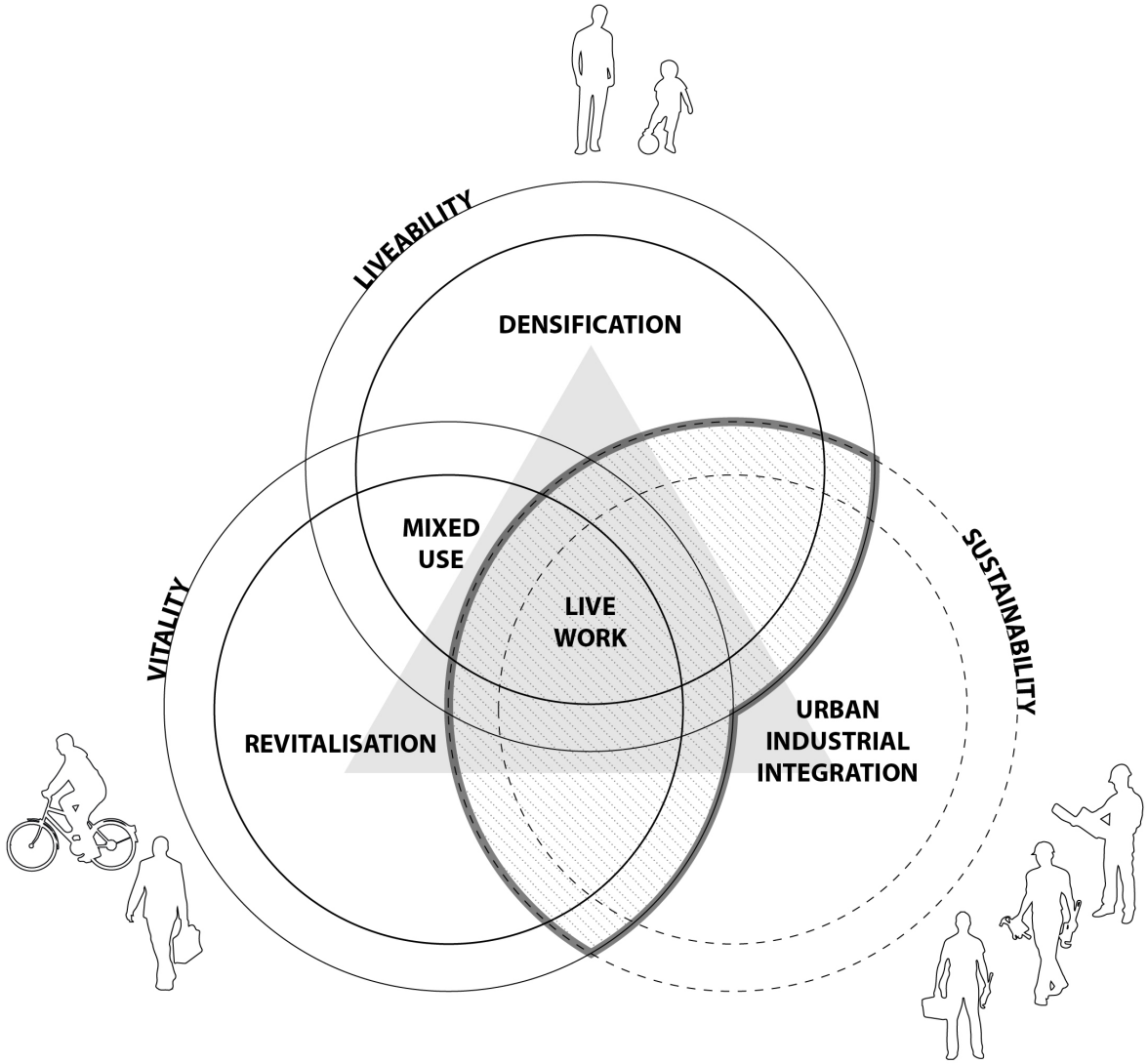
The traditional categorisation of economic sectors is becoming outdated and is being replaced by more open combinations of work activities, creating new types of economic fields and jobs. The economy can no longer be separated into clearly defined sectors, but is expanding and specialising its activities. Many conventional sectors are working together, sharing and becoming interconnected and geographically clustered. This is leading to dynamic economic activity clusters and dynamic cities (Borra et al., 2018). Mixing with other functions is becoming more and more common, which create specific identities and atmospheres.

Borra et al. (2018) defines 3 types of settings for industries, namely hybrid mixed live and work environments, nuisance contour clusters and special knowledge and innovation clusters. In hybrid mixed live and work environments, the accent on live or work can vary to a certain degrees of productive environments. This is possible due to the shifts occurring in the manufacturing sector. From mass production to just-in-time and make-to-order modes of production, from the limited use of expensive robotics to the widespread use of inexpensive robots, from centralized to distributed logistics systems, from polluting and consumptive production to a cleaner and more sustainable process. A shift takes place from unskilled, inexpensive labour to a growing demand for a more educated and specialized workforce (Hatuka et al., 2017). These developments make it possible to integrate these manufacturing industries into the city and living environments.

However there are two settings according to Borra et al. (2018) that are not compatible with residential uses. First, nuisance contour clusters, that have high risk, high nuisance, specific spatial needs or dependence on certain infrastructures. These activities might not contribute to their direct environment, however are crucial for preserving living quality on a regional level, in terms of service or economic performance. Second, special knowledge and innovation clusters. Increasingly, the proximity of education and research to industries is becoming of importance. It encourages knowledge exchange, spill-overs, sharing and fastens the design, testing and production process.

The Cities of Maing report (Dellot et al., 2018) defines urban manufacturing as consisting of the following principles. It involves the transformation of physical materials, uses labour, tools and/or machines, results in a product, involves ‘making’ at scale as part of a business mode. It can involve large scale processes as well as production of low volumes or highly customized products. The activity involves a web of supporting services, such as logistics, finance, design, that is linked to a market and is embedded in its urban context. These factors make it difficult to disentangle the activity from its urban context.

D.1 ◯ COMPACT CITY



1.2 THEORETICAL FRAMEWORK

This thesis focusses on the incorporating production, manufacturing or secondary industries and its web of supporting services, in other words, the industrial ecosystem in the urban environment and what is needed to deliver the densification and intensification of uses. Both large and small scale production* is taken into consideration, but more focus is put on larger industries as these are more difficult to integrate and intensify.

Currently, the compact city concept generally does not include work environments with production activities. There seems to be a conflict between densification and intensification of uses with liveability. The types of functions, ranges and transitions of live-work environments here is crucial, as well as the compatibility. Therefore, this thesis hopes to contribute to reintroducing human-centred design to industrial production environments and develop various scopes of vibrant liveable live work environments. While, addressing the competition of space and contributing to more wholistic compact city strategies.

Even though liveability is subjective and there is no clear or measurable cause and effect relation between perceived liveability and spatial qualities. It is still fruitful to determine the related spatial qualities and investigate its limitations and potentials of contributing to liveability. Especially in relation to urban industrial integration.

In this thesis, mixed-use environments refers to current practices of mixed-use development in the Netherlands**. While live work environments refer to the densification and intensification of uses and the urban integration of industrial functions.

Despite, as described by Borra et al. (2018), that not all types of industries can be integrated into live work environments. This thesis investigates to what degree these industries can integrated into the urban environment.

* Primary industries such as extraction are highly dependent on natural resources directly extracted from its geographical location and are not the focus of this thesis. Even though farming, especially in the Netherlands, is increasingly becoming less site dependent.
** Recent practices of mixed-use development discussed in Chapter 4 Spatial Strategies and Policies.

source: own illustration

2.1 PROBLEM CONTEXT

Compact city vs Industrial Urbanism:
Urban planning and design theory

With the rapidly increasing world population and growing urban populations, in many countries spatial planners have to decide where to develop further. A general assumption is that the compact city is the most sustainable urban form as well as public policy. The compact city paradigm is widely considered a necessity for addressing relevant environmental issues, thus has been recognised as a future development strategy by numerous leading institutions. Mixed-use is one of the core ideals of the compact city paradigm (Foord, 2010). After almost a century of functional zoning, mixed-use development is now fashionable practice. In Europe compact city often focusses on environmental and social sustainability, while in Asian contexts the focus is more on spatial and economic efficiency (Burton, 2000; Tian, Liang & Zhang, 2017). As concluded from the previous chapter, the compact city is not without its critics. There is still lack of studies considering the synergies of several components and there are other characteristics of the compact city apart from high density, which have not been fully examined.

According to Foord (2010) the idealistic ideas of mixed-use, key in compact city strategies, have diverted attention away from the common outcomes in practice. Such as the by-products of one dimensional economies, or gentrification. Moreover, by not including industries, it is actually contributing to industrial sprawl (Louw & Bontekoning, 2007) and thus conflicts with compact city objectives. There seems to be a knowledge gap in how to realise intensification and densification of uses in urban environments (D.2).

Urban planning and design practice

While the mix of residential, commercial, and recreational use is encouraged, the mix of residential and industrial uses is often perceived as troublesome for the living environment (Tian et al., 2017). The focus remains on creating offices or commercial spaces as these functions are easier to mix with housing, produce less environmental nuisances and require less workspace per person. Common perceptions of manufacturing often focus on nuisances: pollution, environmental degradation, and the exploitation of labour caused by growing industry. Or the shrinkage as a consequence of the recent degeneration of manufacturing in cities in the developed world (Hatuka, 2017).

It is an out-dated way of thinking to categorise a company as a manufacturer or a service provider. Increasingly, biotechnology, automatization, robotization and digital fabrication, are changing traditional processes. Some production processes of the service sector firms are capital- and energy intensive and depend on infrastructure in a fixed, physical location. On the other hand, processes of manufacturing companies have diversified. Service options can be offered with their products. This way, some service-sector firms have the appearance of a manufacturer and vice-versa. There are enough opportunities to establish hybrid manufacturing-service firms. Industries are changing to something that has not been properly defined yet. This confusion regarding the terminology is becoming a wide spread problem (Hatuka et al., 2017).
On the other hand, technological developments or changes in industrial production processes are not affecting planning regulations yet. Existing land-use plans, zoning and building codes do not consider the needs of industries of various types. As a result, these practices prevent industries from building factories in cities. Still, factories are obligated to adhere to outdated, one-size-fits-all regulations (Hatuka et al., 2017).

Still, for many businesses, a site with high quality means that there are less restrictions and spatial limitations. In this sense, business districts that are designed would have a low quality for businesses. Thus far, the autonomous industrial park typology is the preferred and leading model for many countries and manufacturers that aspire to create a ‘global’ location. This preference has further contributed to the lack of consideration given to manufacturing in city planning (Ben-Joseph, 2017). The stand-alone industrial or business park hosts large factories or offices that are disconnected, spatially and organisationally from the city.

D.2



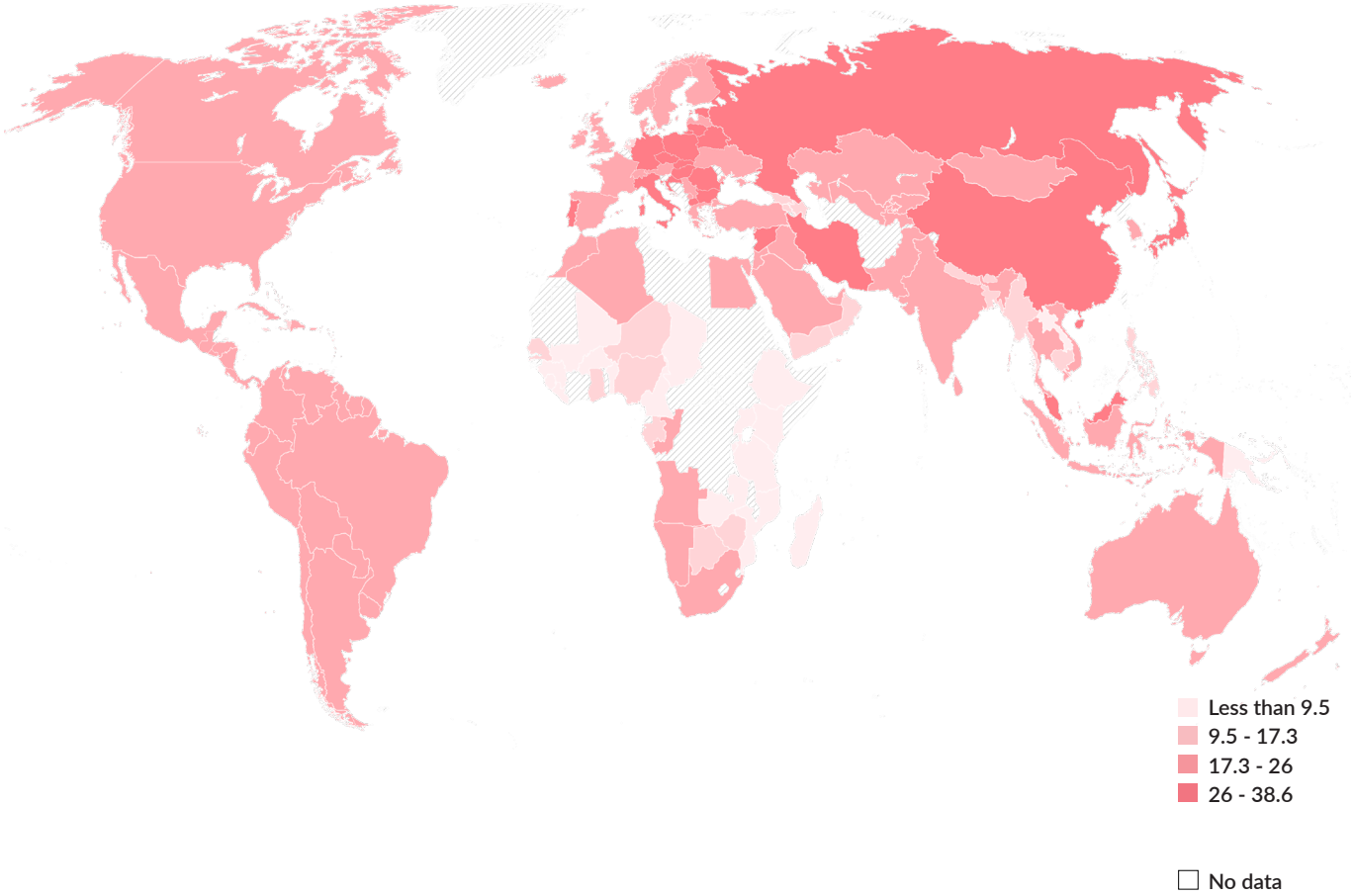
THE COMPACT CITY

- *Asia: spatial and economic efficiency > social inclusion*
- *EU: environmental and social sustainability*
  - *urban revitalisation, mixed-use focus:*
    - *commercial*
    - *residential*
    - *services*
    - ***industry***
- ***synergies of components***
- ***intensification and densification of uses competition of space***
- ***liveability?***

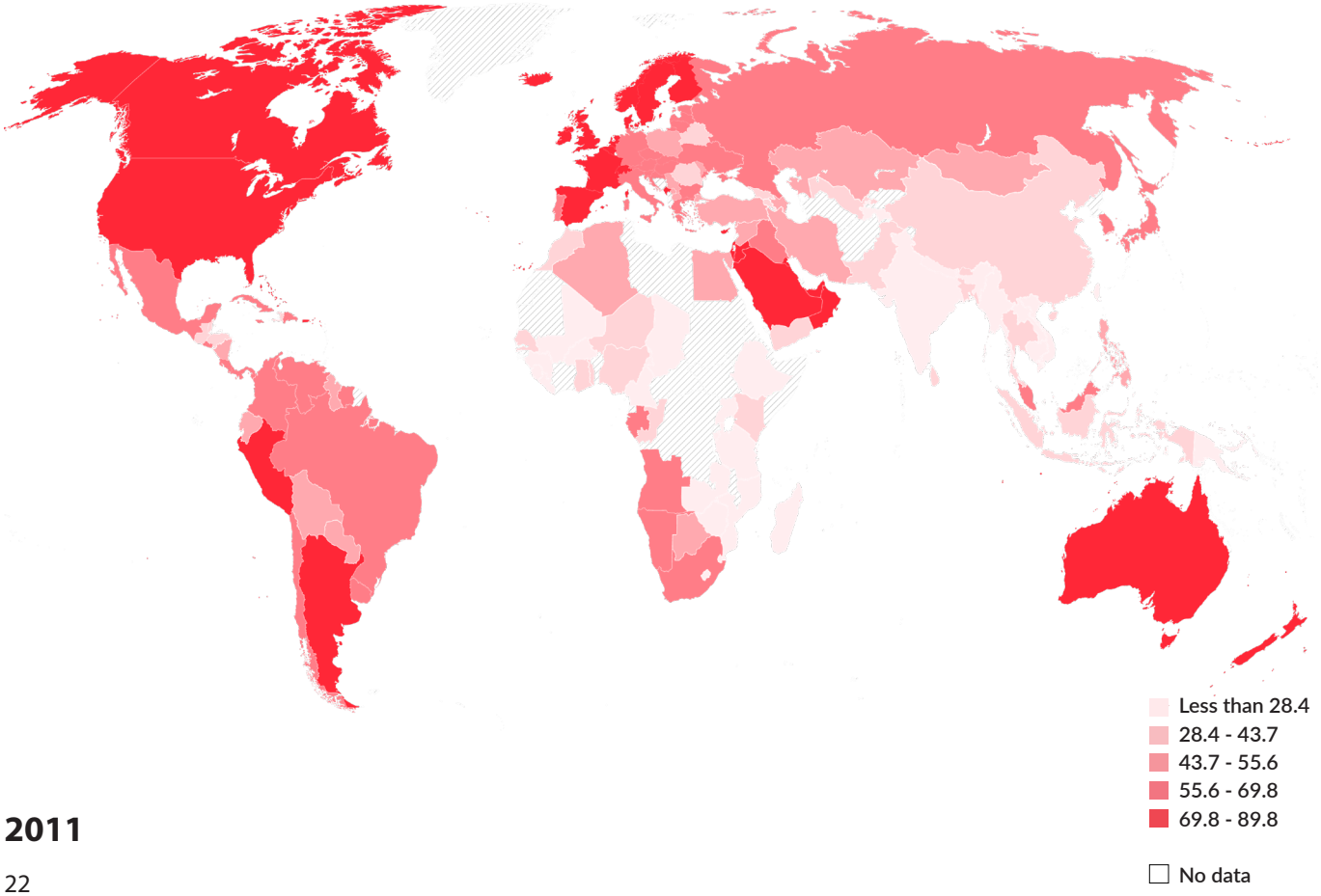
source: own illustration

INDUSTRY

F.3 Global GDP development per country of sectors Industry and Services



SERVICES



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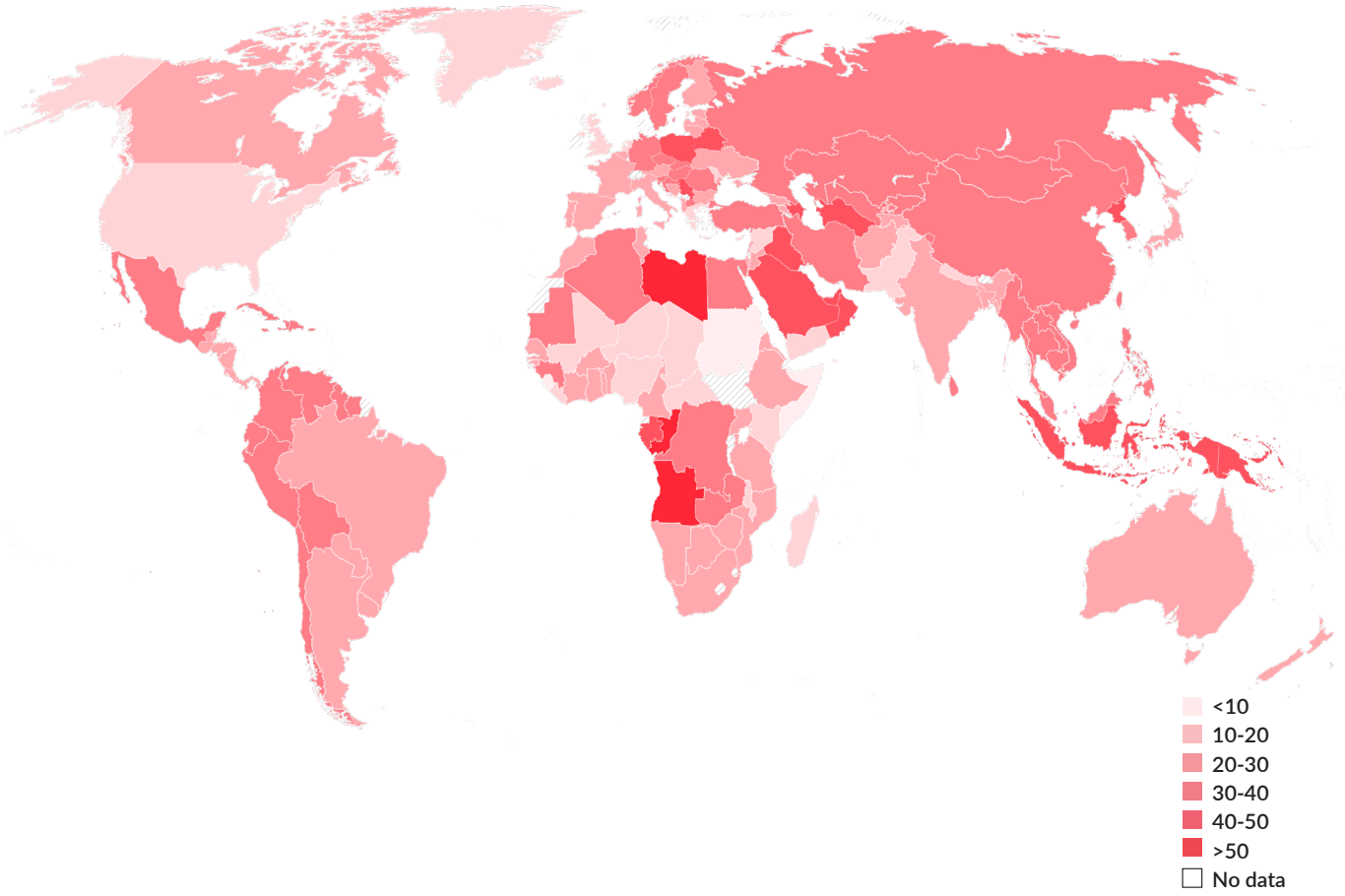
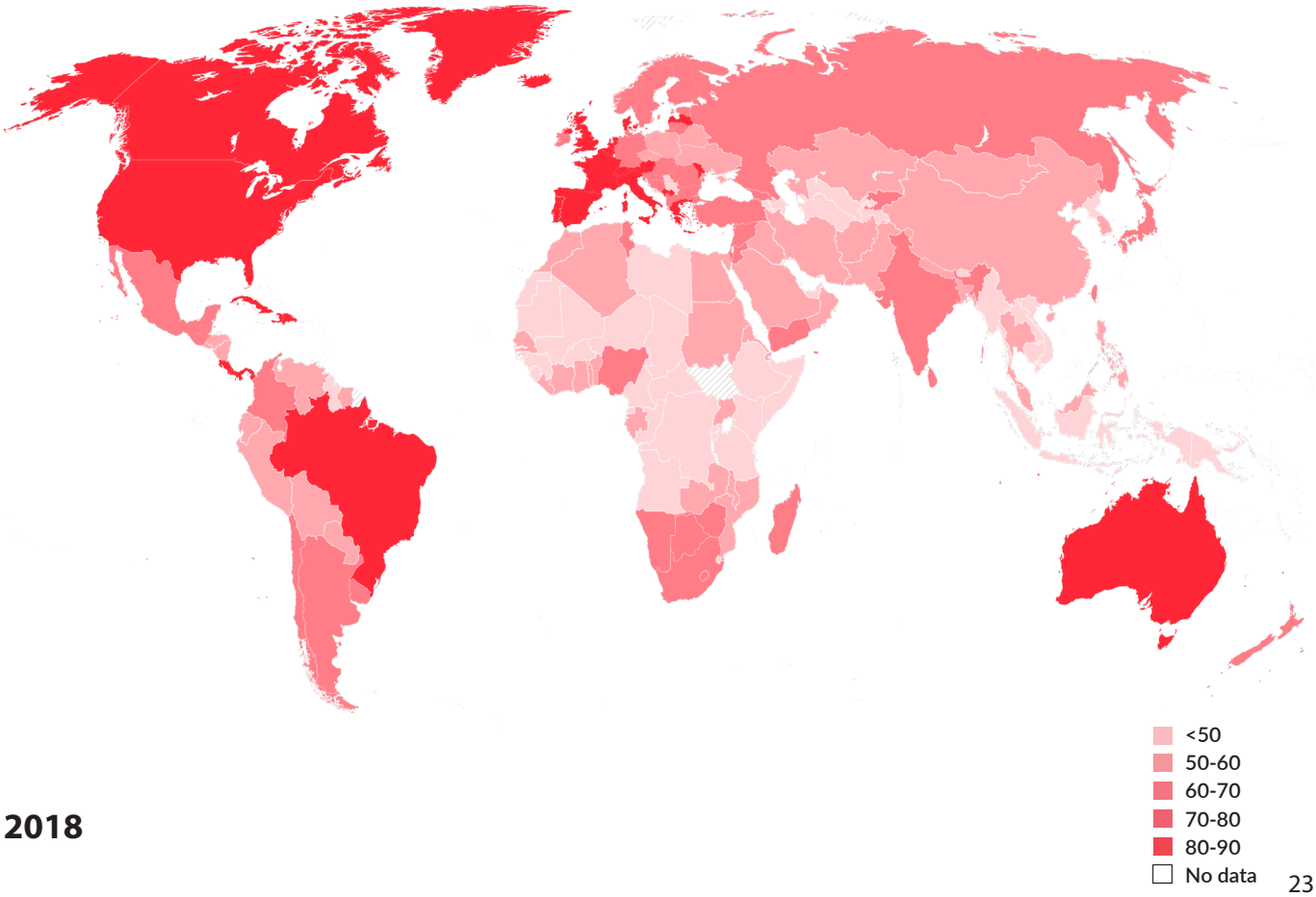




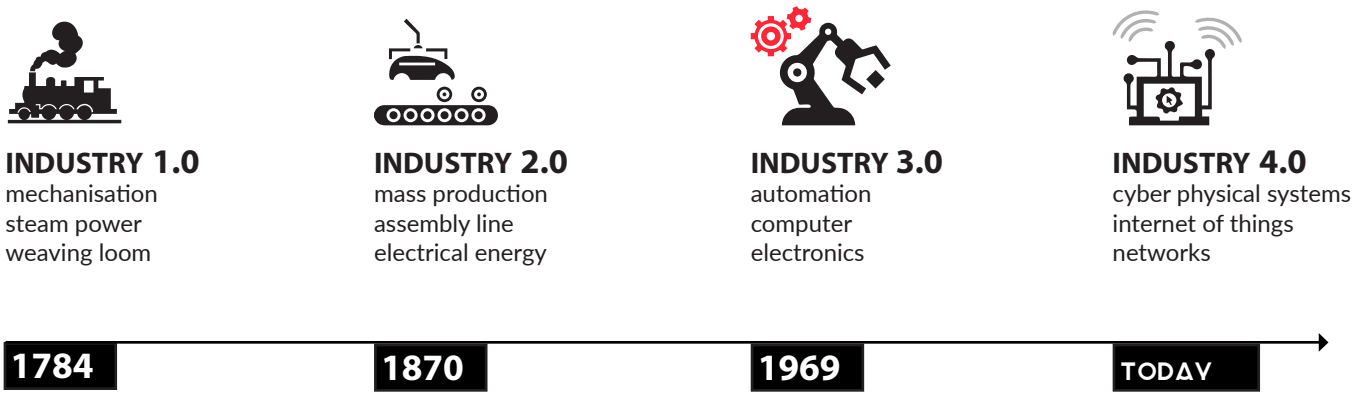
2018

source F.3: StatisticsTimes.com. (2018). List of Countries by GDP Sector Composition Retrieved from: http://statisticstimes.com/economy/countries-by-gdp-sector-composition.php

On the other hand, while mixed-use development has become accepted practice. Often mixing with productive functions is often romanticised. Visualising small craft functions, makers studios, small local workshops. People sitting outside on the terrace of a local brewer, drinking locally brewed beer. In reality garages, factories and workshops produce noise and sometimes smell nuisances, need large spaces to temporarily store goods, while trucks move through the streets to park and load. Thus not desirable to combine with family residences and children cycling to school. There are certain conflicts between residential and industrial movements that are not properly addressed.

Manufacturing contributes to significant share of the total economic activity in the world, large areas of our built environment are used by industries. As industries also begin to see the benefits of an urban environment, better understanding is needed of what production industries need, in particular spatially. Moreover, in relation to other functions, amenities in the city. In other words, to understand the ecosystem of industries. On a larger scale, the city-industry relationship dynamics. There is no single answer that can predict what future manufacturing requirements are. However, cities can start by acknowledging the needs of industries and by establishing the right conditions in city planning (Hatuka et al., 2017). Planners should be involved with and investigate industrial cities in contemporary contexts and the growth of cities and metropolitan areas in an effort to improve the image and redesign the role of industry in the city.

It has been argued that more strategic approaches are needed in which cities carefully consider their existing industrial land supply and match it with the strategic economic goals of the region (Lester et al., 2013). To achieve this, a refined approach to industrial land preservation is needed. Therefore, it is crucial that planners understand what causes and effects of transformation of existing industrial land in cities to other uses. Moreover reflect on the effectiveness of policies or other instruments to preserve industrial land and maintain industries (Lester et al., 2013). The strategies to plan industrial environments need to be revised and upgraded. A comprehensive view of city and its industry is likely to produce a new understanding of the relationship between working and living.



Industry 1.0 – 4.0: Technological change is altering the spatial manifestation of activities

In pre-industrial times, production was based on crafts and agriculture. Activities were part of the home and closely integrated in everyday life. During the first Industrial Revolution from the 18th to mid-19th century, water and steam powered machine production methods were introduced. This phase is also associated with the arrival of the industrial city, that radically changed the urban landscape. Large scale urbanisation was stimulated while cities functioned as centres of production (Ben-Joseph, 2017). At the beginning of the 20th century, the second transition introduced industrial mass production, creating products for mass consumption. This was made possible by the invention of assembly lines, mastered by Henry Ford. Electricity was the primary source of power. Planning models such as the garden city and first zoning regulations were introduced to deal with the nuisances of activities.

Currently, things are changing even faster, since the end of the 20th century electronics and IT were introduced in industrial processes. Digital designs can be adjusted instantly, 3D printers can operate without supervision and make products that are too complex for traditional factories. At the same time, the machines are not bound to a certain location anymore, making products anywhere and at any time. As a result, offshore production is reshored to the country of origin or factories are built in fast developing countries to be closer to its consumers. New materials are lighter, stronger and durable. New techniques let engineers and designers shape objects at small scale. While the internet allows a range of designers to collaborate to develop new and innovative products (The Economist *a*, 2012). Robotization and automatization optimise production lines with machines taking over routine human tasks.

The fourth industrial period will be of Cyber Physical Systems (CPS). In CPS smart machines, storage system and production facilities exchange information autonomously and initiate actions and control each other independently, without human interference. This is also known as The Internet of Things, thousands of sensors work in real time and transfer data to a local (cloud) server. With the use of Predictive Maintenance and Big Data, data is analysed to anticipate irregularities in processes or systems so that action can be taken to adjust or repair it in advance. These developments are also referred to as the Next Economy in the Netherlands, resulting in smart industries and smart logistics.

Some researchers indicate other developments such as the post-industrial city, or deindustrialisation of the city. Where economic development increasingly concentrates on the role of services or commercial activities (Crossman, 2019). Globally, a shift towards more service related industries and decrease in manufacturing can be determined (F.3 p.28). Though in some cities this is the case, it occurs particularly in cities that do not have a dominant industrialised history but focus on services such as finance or institutions. Actually, it does not sufficiently address the changes in manufacturing industries that due to digitisation and automation have blurred the lines between manufacturing and services. The economy can no longer be separated into clearly defined sectors, but is expanding and specialising its activities (Borra et al., 2018). Many conventional sectors are working together, sharing and becoming interconnected and geographically clustered. This is leading to dynamic economic activity clusters and dynamic cities.

source: own illustration

Still, multi-national companies are a driving power behind supply chains and are responsible for more than 50% of world trade. Moreover, they form 40% of the value of the stock markets of the western world and own a significant amount of intellectual property. However the global enterprise is withdrawing (Borra et al., 2018). The redefinition of the relationship between technology, proximity, services, manufacturing, and logistics is evolving further. In particular, these developments are changing the conflict between the competitive advantage of low-wage labour, as wages increase in developing economies. Accordingly, it also impacts the consideration of proximity to centres of research and development, markets, and highly skilled labour (Borra et al., 2018). This way, urban integration of industries is increasingly becoming more relevant.

Robotization, digitisation and automation of industries results in that the demand of unskilled labour is replaced by the need for a more educated and specialised work-force (Ben-Joseph, 2017). The need for talent development, lifelong learning and career reinvention is going to be essential for the future workforce (Ross, 2018). Studies also show that in the future, 50% of all jobs will be lost due to digital technologies. These developments indicate a shift, less people work, wages decrease, even when productivity and profits increase. According to Borra et al. (2018), as a result of robotization and automation, the middle class seems to disappear.

The rise of social media has resulted in that collaboration and sharing of information is more efficient and direct. People are no longer bound to a specific working location. Not only are people connected by a vast network, objects are also connected through digital networks that share data (Borra et al., 2018). Consequently, the conceptualisation of industry as a whole is subject to change and companies will have to transform (Borra et al., 2018; Hatuka, Ben-Joseph, & Peterson, 2017). New demands are fragmenting firms, changing localisation preferences and changes how people receive deliveries and buy products. Together with new transit technology, it may need an entirely new infrastructure (Hatuka et al., 2017). The movement from large industrial scale production and design to small scale distributed systems increases pressure on the city's infrastructure. Still, both large and smaller companies are needed for a healthy economic system, meaning urban environments need to be strategic and provide options to facilitate urban production.

Many cities around the world are ready reassess their relationships with industry. The question of adaptation not only concerns the evolution of manufacturing in the twenty-first century, but also to numerous abandoned heavy industrial sites worldwide. Globally, countries and regions are investing heavily in advanced manufacturing technologies because of their important link to innovation and economic development (Hatuka, 2017). Due to globalisation many companies had shifted production abroad. Consequently, the opportunities to learn from the development process had also moved abroad. As a result, a one-dimensional service-based economy was left. This may reduce the ability of these firms to innovate but also on a larger scale, the ability of the economy to innovate (Ben-Joseph, 2017; Borra et al., 2018).

While technological and market forces have pushed manufacturing outside of the urban core, firms in developed countries are facing both the challenges and opportunities of globalised markets. International trade and communications expose copyrighted content, intellectual property, trade secrets and other exclusive information, are becoming bigger concerns. As free flow of data and information make it easier for competitors to catch up (Ben-Joseph, 2017). Ultimately, it is not a viable strategy for the long term. For this reason, currently reshoring, retrieving (automated) industries back to country of origin is taking place.

However, it does not mean that all activities of large multinational companies will suddenly relocate to their countries of origin. Rather, by building factories in developing economies, large multinationals profit from expanding their markets and being closer to its consumers. This will be more attractive than the benefits of low labour costs. For this reason, according to Hatuka et al. (2017), especially countries with expanding middle classes will need to plan cities and be strategic about their industrial sites.

Environmental Concerns - Sustainability

On another note, scientific evidence makes it obvious that the causes of climate change can no longer be ignored. Continuing business as usual will have drastic and unpredictable effects on environmental systems and our way of life. Climate concerns of transport, resource depletion and pollution grow, as well as risks such as heat island effect and short periods of heavy rainfall. The consequence of the increasing effects of climate change is that cities need to be restructured to prevent, mitigate and adapt the effects of climate change. In 2015 the United Nations introduced a sustainable development framework with global sustainable development goals (SDG's) for 2030, which apply to the 193 countries that signed it. Not only does it address climate change, but also consumption, production, loss of nature and biodiversity.

The global sustainability movement has resulted in that all sectors of society have come under examination for their potential to reduce human-driven climate change (Ben-Joseph, 2017).



F.4 Global Sustainable Development Goals

source F.4: United Nations. (n.d.). Sustainable Development Goals [image]. Retrieved from: https://sustainabledevelopment.un.org/?menu=1300

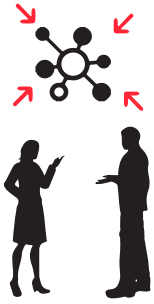
Why is it important to integrate production in the city?



link to innovation
economic development



climate concerns
intellectual property



shift localism
clusters

When factories moved outside the city into windowless boxes, the anonymity was mutual. Manufacturers were as content to exclude the public as the public was to dismiss industries to separated zones or the rural periphery. Gradually, cities are recognising the opportunities that industry can bring, especially in terms of job creation and innovation. Moreover its potential to create more sustainable processes and localised goods and services. While technology is enabling the reintroduction of urban manufacturing (Ben-Joseph, 2017). Hatuka et al. (2017) predicts that less community opposition to the mixing of industrial uses with other uses will exist in the future. She argues that communities will be more concerned with the benefits that will a certain industrial project will bring to the community.

The many benefits of mixed-use environments have been generally recognised. In some cases, even taken for granted. Nonetheless the integration of production industries in cities provides benefits as well, these often are not taken into consideration. Neither should these be romanticized. There are five interrelated goals and opportunities described on the following pages, for a summary see T.1 p.36.

source: own illustration

Compact City (mixed-use, vitality, densification)

Many have emphasised the importance of density, diversity and the mixing of uses. Renowned writers such as Lynch, Montgomery and Jacobs have highlighted the need of diverse activities in urban environments for its vitality (Jacobs, 1961; Lynch, 1984; Montgomery, 1998). Creating mixed-use environments with enough density and accessibility by public transportation provides a multitude of economic and societal benefits on various levels. Such as the opportunity to have specialised businesses, as the density provides enough foundation to reach a higher level of shared facilities and amenities. Moreover, by combining it with multimodal accessibility, it can reduce the use of the car, provide a diverse range of people freedom of movement as well as accessibility to facilities, amenities and work (Alkema, Stootman & Zandbelt, 2019). There are measurable environmental benefits to reducing commuting distances of people as well as transportation of goods (Hatuka et al., 2017). Mixed-use environments are often considered more liveable. Multiple functions provide people on the streets on different times of the day, providing people and eyes on the streets, resulting in safer and vibrant places. Densifying the existing fabric with a diversity of functions could therefore potentially revitalise neighbourhoods. Moreover, it creates the opportunity to share facilities and spaces, that may create new communities that share mobility, energy or materials or products (Alkema, Stootman & Zandbelt, 2019). Likewise, the use of facilities and spaces can be distributed more efficiently, such as combined parking for residences and businesses (Pols et al., 2009). Mixed-use environments are also considered more adaptive. When an area is suitable for various functions it is more adaptive to new developments and less vulnerable (Alkema, Stootman & Zandbelt, 2019). Moreover it results in less vacancy of properties (Pols et al., 2009). Thus, bringing production back into the city can densify and revitalise neighbourhoods, its uses and spaces.

Sustainability

The concept of compact city, instead of further expansion into the landscape with sub-urban or rural development, provides environmental benefits and thus a more sustainable environment. Production industries could play a significant role in more sustainable cities in several ways. Repair and maintenance together with remanufacturing and refurbishing can give products a longer life or disassembling and rebuilding it for new use. Local recycling of waste would reduce the environmental impact and CO2 emissions of transportation (Croxford et al., 2020). This way, recycling models and resource management models can be introduced working together with the city and its factories creating sustainable systems.

Economy and Employment

Croxford et al. (2020) states that manufacturing and services are interrelated and for each to thrive, both need to be present. The state of manufacturing is a significant factor to determine the prosperity of a country. The most commonly used indicator Gross domestic product (GDP) determines the market value in monetary terms of all the final goods and services produced in a specific period. Reports show that the manufacturing sectors in many countries produce most of their exports. In addition, they are responsible for almost all their commercial investment in research and development (Hatuka et al., 2017). Consequently, the indirect impact of production supports related businesses in the supply chain. The induced impact supports businesses that benefit from the spending of the people employed directly or indirectly in manufacturing (Croxford et al., 2020). As a result, a considerable part of the economy is supported by manufacturing and its impact goes beyond its sector, as part of its activities or related activities are outsourced or its activities serve other sectors. Similarly, Hatuka et al. (2017) notes that manufacturing has a significant multiplier effect. For every job gained or lost in this sector, 2 or 3 supporting jobs are affected in the same way. The job multiplier effect of manufacturing exceeds that of the service sector.

Urban manufacturing has the potential to locate jobs in proximity to where people live. When production industries off shored or moved out of the city to reduce costs, it also separated the factories from the city's workforce. This has

T.1 *Opportunities*



COMPACT CITY

- densification of existing fabric
- revitalisation of neighbourhoods
- reduction car reliance
- accessibility to facilities, amenities & work
- promotes sharing
- better distribution of uses and space
- adaptive & reduces vacancies of buildings
- potential mitigation negative effects industrial sprawl



SUSTAINABILITY

- potential recycling models between factories (multi-dimensional resource management model)
- environmental benefits associated with reducing delivery distances



ECONOMY | EMPLOYMENT

- job multiplier effect associated with manufacturing
- integrates a variety of people into the job market
- stimulates SME's and individual entrepreneurs that matter locally to communities
- promoting urban manufacturing is good fiscal policy

SOCIETY



- the intrinsic quality of urban manufacturing is essential to making a place
- enables civic pride in cities with an industrial core
- transparency of production processes



KNOWLEDGE AND TECHNOLOGY

- proximity of industries in the city can strengthen economic clusters
- knowledge spill-overs related to face-to-face interactions
- the industrial commons of a place can attract new businesses and human capital to develop even further
- robust labour market, economic diversity
- connects means of production and the city's creative and constructive spirit

source T1: synthesis of (Alkema, Stootman & Zandbelt, 2019); (Croxford et al., 2020); (Hatuka et al., 2017); (Pols et al., 2009)

resulted in a spatial mismatch between class and income (Hatuka et al., 2017). The costs to travel to work increased and reduced its accessibility to many workers. Many transformation locations are situated near vulnerable neighbourhoods. Due to the impact of manufacturing on employment, a transformation to a mixed-use environment that includes manufacturing may give an impulse to employment opportunities for the local residents. It may mitigate the spatial mismatch between class and income.

Moreover, a large proportion of the production industry consists of SME's (small and medium sized enterprises), these play an important role locally and within communities. These are expected to increase even more in the future. More and more workers will use computers instead of traditional tools. As a result, less workers are required, decreasing the costs of labour in the production process. This development will enable small and medium sized businesses and individual entrepreneurs (Hatuka et al., 2017).

Mixed-use environments are now in demand, by both people as well as businesses who want to locate in an inspiring, attractive, vibrant and accessible places. Encouraging urban manufacturing is a profitable economic approach, profits can be made from facilitating efficient use of industrial land.

Society

Transparency in production processes, the supply chain and its spaces is proven to be successful in improving the value of cities and factories. Manufacturers who take pride in what they do will enable the public to share this pride (Hatuka et al., 2017). Therefore, the quality of urban manufacturing can be defining to place-making and civic pride in neighbourhoods and even cities.

Knowledge and Technology

The knowledge and skills used in manufacturing is also known as the 'Industrial commons'. It can differ from one place to another, leading to different or alternative developments across sectors. In the past decades, many industries have offshored. Recently, new views explain the necessity of placing production and development together. It is argued that highly skilled people develop skills through years of practice, thus developers and manufacturers need to work together closely to understand the technology and innovate (Croxford et al., 2020). Proximity of industries in the city can strengthen economic clusters due to the positive effects of knowledge spill-over and a robust labour market. Because of the different functions and people in proximity to each other, exchange of ideas between the different parties is stimulated and as a result boosts development and innovation. Particularly, the combination of research and education with production stimulates innovation (Alkema, Stootman & Zandbelt, 2019; Croxford et al., 2020). Thus, competitiveness and proximity are becoming interdependent. Face-to-face interactions are key in knowledge transfer and imbeds the industrial commons to particular places. The industrial commons of a place can then attract new businesses and human capital to develop even further (Hatuka et al., 2017). For instance, by creating local alternatives of previously imported goods, also referred to as import replacement, is an important stimulus to innovation and local economic purchasing power (Croxford et al., 2020). This way, production is linked to the city's creative and constructive spirit.

Some conclusions from research on industrial development in Germany and China conclude that strong production industries do not require low-wage labour. Dense ecosystems keep jobs as businesses rather not relocate or shift jobs. Real innovation is the result of up-scaling firms and upgrading the abilities of the industrial ecosystem (Croxford et al., 2020). Therefore, integrating production in the city can contribute to economic diversity of the industrial ecosystem.

Het Parool

Nederland | Wereld | Kunst & Media | Sport | Columns & Opinie

Plus

Steeds minder plek voor bedrijventerreinen in Amsterdam

Over zes jaar is in Amsterdam geen plek meer voor nieuwe bedrijven. Op bedrijventerreinen die worden volgebouwd met woningen moet ruimte blijven voor werkplaatsen en bedrijfsverzamelgebouwen.

Bart van Zoelen 23 december 2019, 12:30



F.5 Less space for business districts in Amsterdam. De Parool.

The Parool, a Dutch newspaper, recently published that there is a shortage of business and industrial districts in Amsterdam. Victor Everhardt, the councillor of Economic Affairs in the Netherlands states that the pressure on the housing market displace businesses because they cannot afford the increasing land prices. As a result lower paying jobs, that are essential for the functioning of the city are pushed out of the city.

source F.5 Zoelen, B. (2019). Steeds minder plek voor bedrijventerreinen in Amsterdam. Het Parool. Retrieved from: https://www.parool.nl/amsterdam/steeds-minder-plek-voor-bedrijventerreinen-in-amsterdam~b52fca69/

Het Parool

Nederland | Wereld | Kunst & Media | Sport | Columns & Opinie

Plus **Achtergrond**

Is Buiksloterham straks echt zo groen en circulair?

Buiksloterham krijgt bijna twee keer zo veel woningen als gedacht. De wijk dreigt daardoor een stuk minder vernieuwend te worden dan de pioniers hadden gehoopt.

Bart van Zoelen 6 januari 2020, 11:02



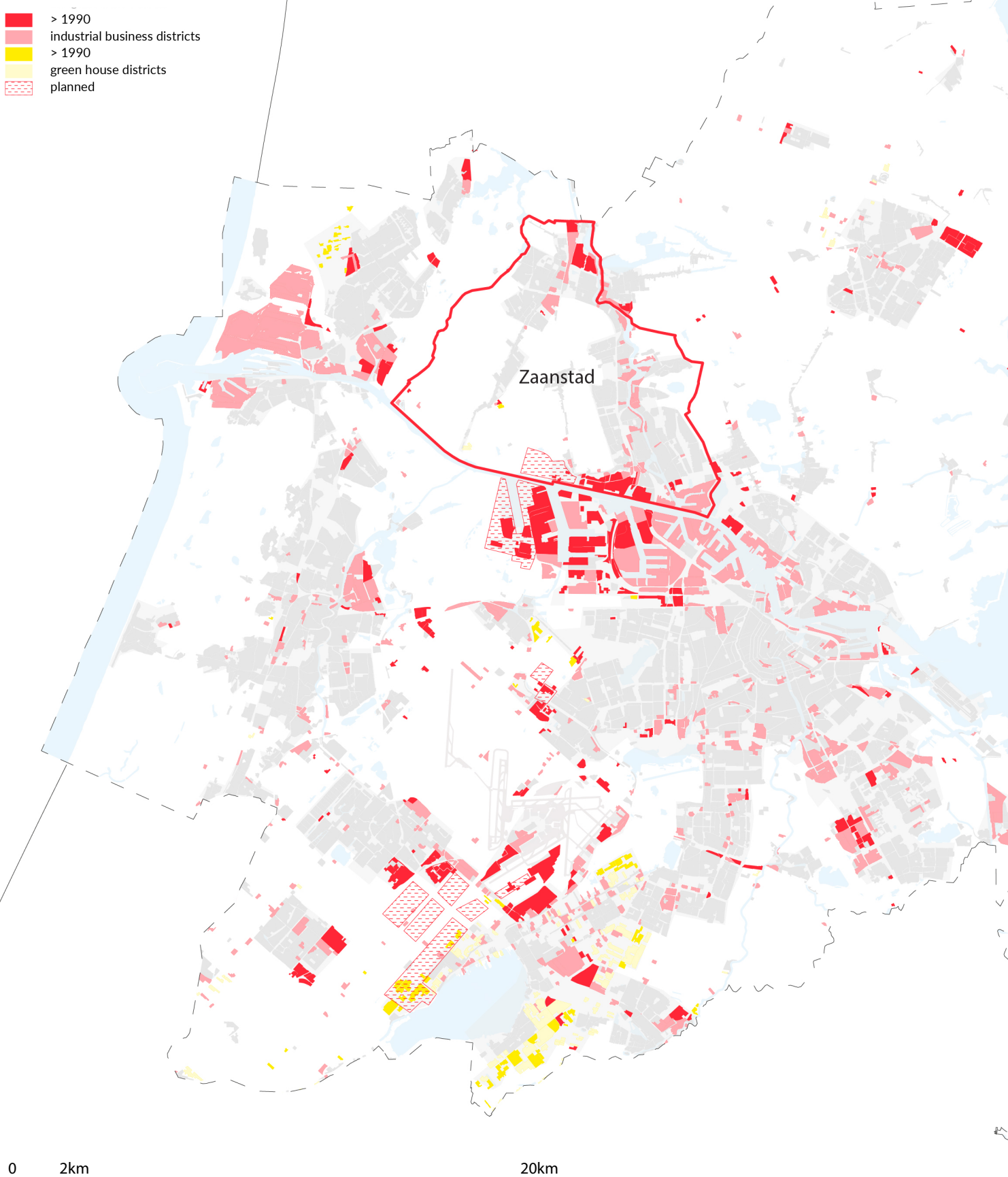
F.6 Will Buiksloterham really become green and circular? De Parool.

Moreover, an article was published that questioned the successfulness of the transformation of former industrial and business district Buiksloterham into a mixed-use environment.
Currently, due to the pressure of the housing demand, the municipality wants to realise twice as many houses than in the initial plans. As a result, the initial balance planned 1 on 1 housing vs businesses. Recently it was adjusted to 3 (housing) to 2 (businesses). While research showed that 90% of the businesses can be mixed with housing. Due to the pressure of housing, the remaining crafts, makers and repair business will possibly need to relocate. The article underlines that these businesses are essential for the city and needed for the transition to a more sustainable environment. Many of these companies are needed for the processing of resources and therefore benefit from a location in proximity of the city.

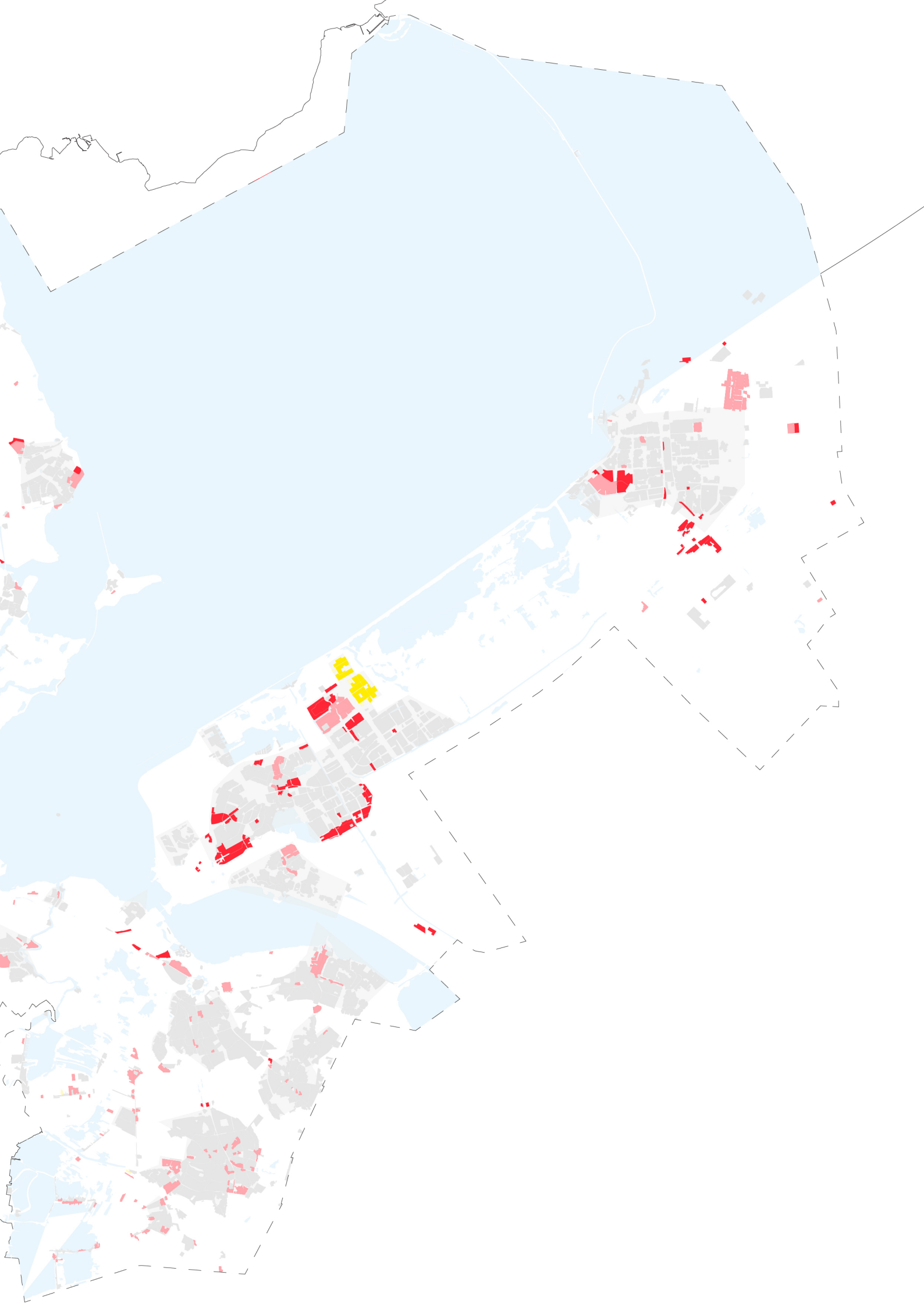
source F.6: Zoelen, B. (2020). Is Buiksloterham straks echt zo groen en circulair? Het Parool. Retrieved from: https://www.parool.nl/amsterdam/is-buiksloterham-straks-echt-zo-groen-en-circulair~bc02943f/

M.1 EXPANSION AREAS OF THE PAST 30 YEARS

The map illustrates that spatially in the past 30 years in the Metropolitan region of Amsterdam (MRA) there has been a lot of expansion of industrial, business districts, harbours and greenhouse districts and there are still several expansion areas planned for the coming years. This is quite contradictory to the city's planning strategies that actually support more compact developments.



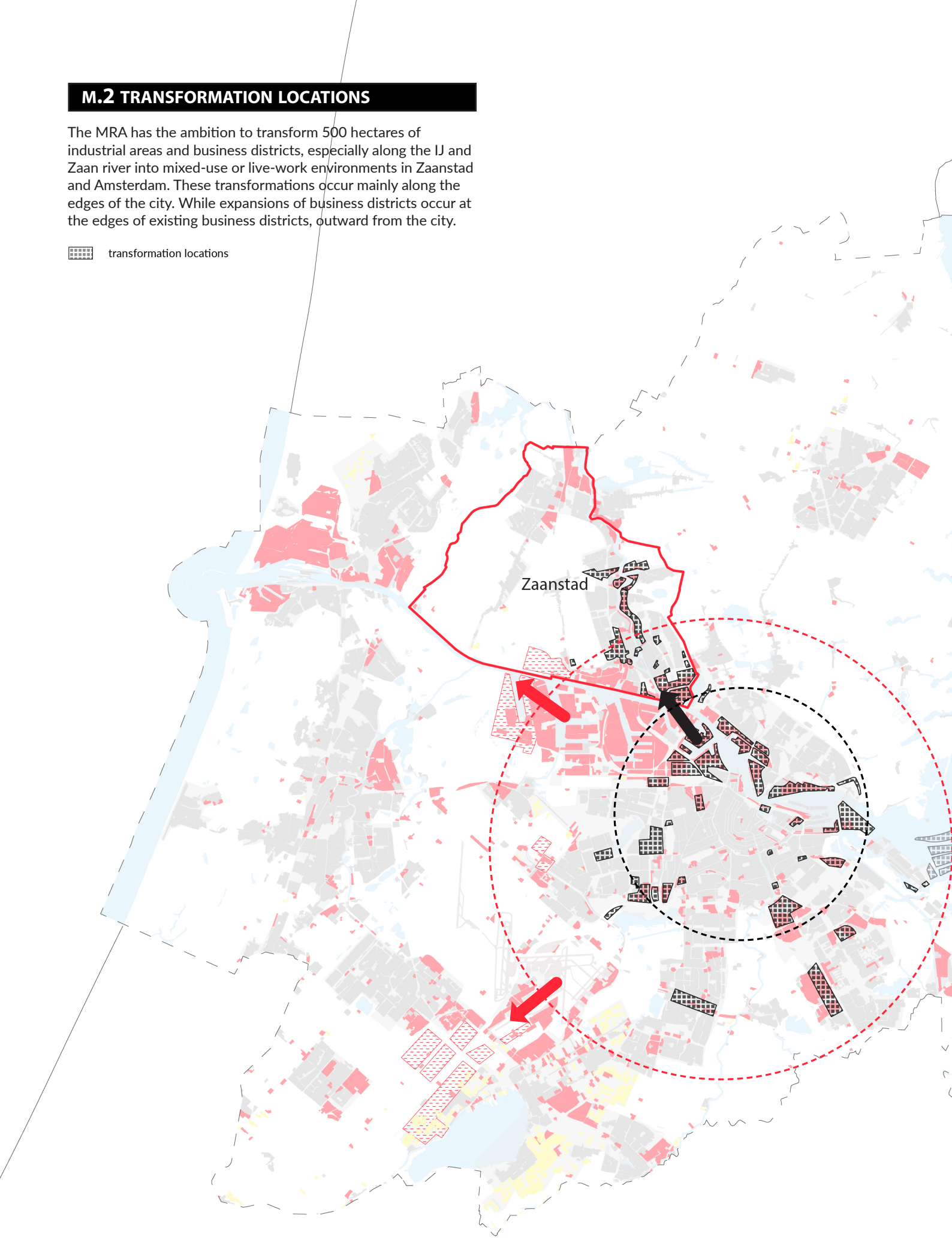
source M.1: GIS mapping, Gemeente Amsterdam. (2011). Structuur Visie Amsterdam 2040. Amsterdam, The Netherlands: Gemeente Amsterdam.



M.2 TRANSFORMATION LOCATIONS

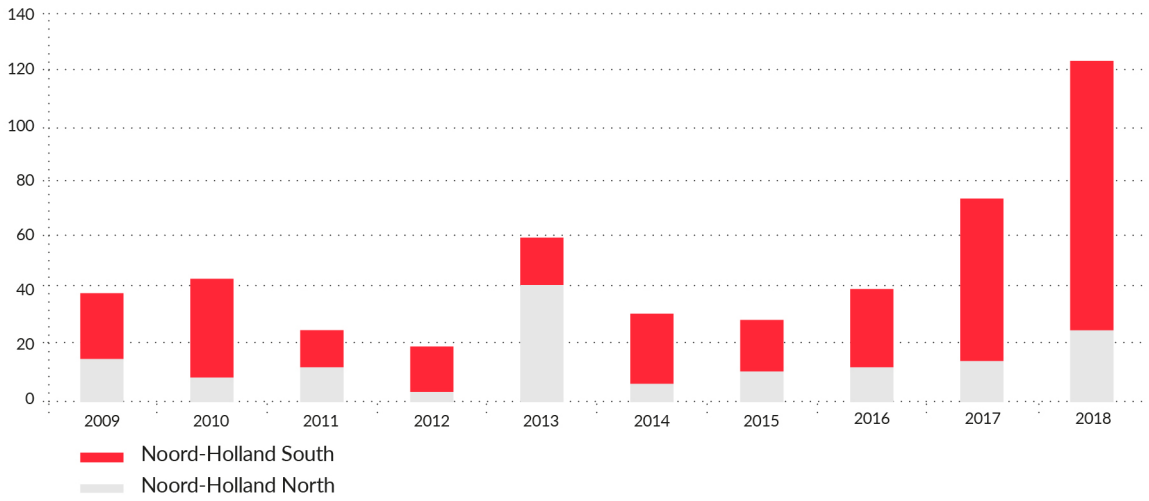
The MRA has the ambition to transform 500 hectares of industrial areas and business districts, especially along the IJ and Zaan river into mixed-use or live-work environments in Zaanstad and Amsterdam. These transformations occur mainly along the edges of the city. While expansions of business districts occur at the edges of existing business districts, outward from the city.

transformation locations

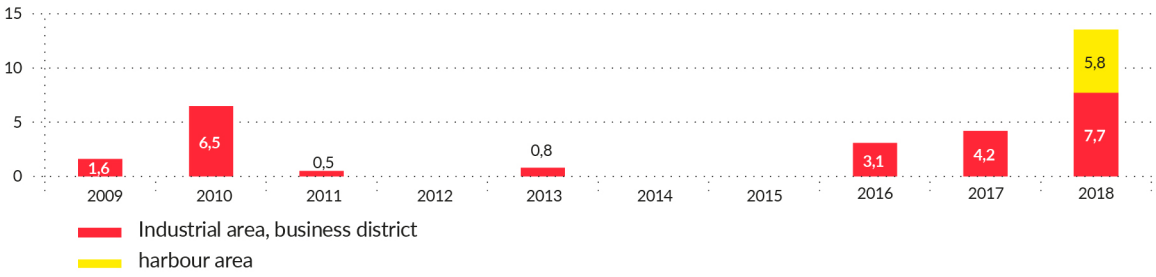


source M.2: GIS mapping, Gemeente Amsterdam. (2011). Structuur Visie Amsterdam 2040. Amsterdam, The Netherlands: Gemeente Amsterdam. Maak.Zaanstad. (2016). Maak.Zaanstad. Retrieved from: https://doi.org/10.1017/CBO9781107415324.004.

F.7 Issued business and harbour areas in North Holland 2009-2018 (net hectares)



F.8 Issued business and harbour areas in Zaanstreek Waterland 2009-2018 (net hectares)



2.2 CHOSEN LOCATION

This research focusses on the municipality of Zaanstad in the Netherlands. It is the oldest industrial region of Europe and the city and villages have always known industries in close proximity to housing. The city even promotes and attracts tourists with its industrial history. For this reason there is great potential for this region to develop successful live work environments and integration of industries in the urban environments. As there is already a base for cultural and societal acceptance and tolerance for industries.

On a larger scale, the MRA has the ambition to transform 500 hectares of industrial areas and business districts, especially along the IJ and Zaan river into mixed-use or live-work environments in Zaanstad and Amsterdam (Copping, Hagens, & Kruger, 2017; Maak.Zaanstad, 2016; Zanen, Ponteyn, & Keijzer, 2011) (see M.2). This addresses both the restructuring of old business districts and the demand for housing. Recently, in relation to compact city and next economy ambitions, there has been an increasing interest to develop mixed-use environments. These are often translated into central mixed-use environments at public transportation node locations. In contrast to monofunctional business districts or office areas. The increase of start-ups, creative and maker companies has also given a new impulse to mixing living and working spaces.

On the other hand, while compact city strategies are promoted, in the past 30 years the amount of industrial areas and business districts have increased significantly (see M.1). In 2018, the amount of industrial and harbour areas issued in the Zaanstreek and Waterland region has even peaked (Versteegh, Copping, Maat, & Dirkse, 2019)(see F.7 and F.8). The food industry, strongly present in the Zaanstreek and Waterland region and related logistic companies are expected to maintain the need for business districts. Especially logistic activities need big plots and accessible locations. The construction sector is also a big and spacious sector in the region. Moreover, the nautical industry is expected to grow, which need plots along waterfronts and harbours. On the other hand, the amount of employment opportunities have increased the fastest in mixed-work environments, particularly in more central locations. Thus, an increasing need for large industrial plots as well as more central mixed-work environments can be observed.

As the Zaanstreek-Waterland has a surplus of industrial areas and business districts available, the region is expected to supply for the supra-regional demand of industry, logistics and nautical business activities. In able to meet the demand of housing, industries in transformation locations in the city of Amsterdam or Zaandam that are assumed not to be mixable

source: F.7: Provincie Noord-Holland. (2019). *Monitor Werklocaties Noord-Holland 2019*. Haarlem. F.8: Versteegh, B., et al. (2019). *Monitor Plabeka: Ontwikkelingen werk-locatie markt MRA 2018-2019*. Metropool Regio Amsterdam.

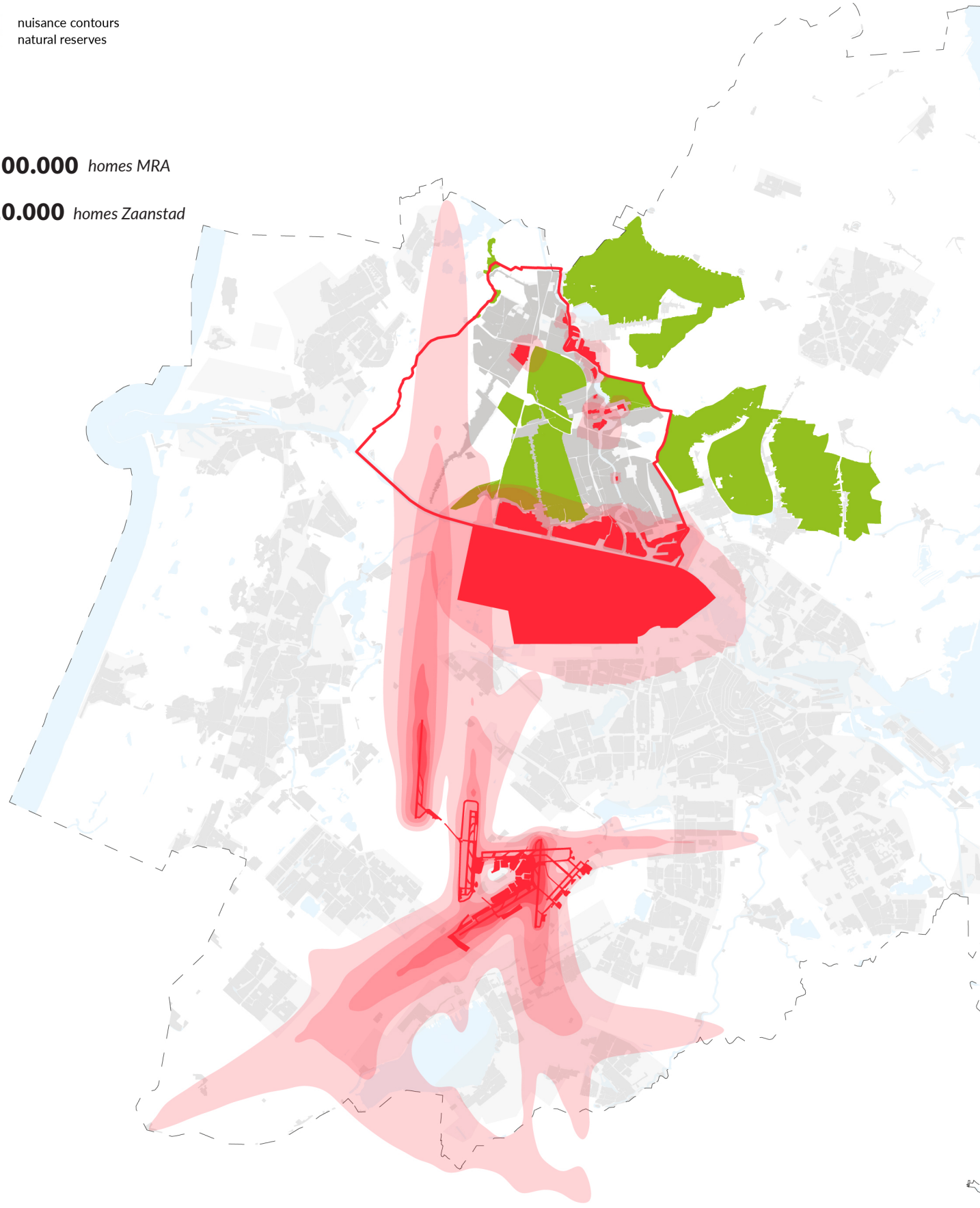
M.3 NUISANCE CONTOURS & NATURAL RESERVES

The city of Zaandam is surrounded by Natura 2000 natural reserves, and parts of the municipality Zaanstad are covered by the Schiphol airport and Noordzeekanaal harbour and industrial districts nuisance contours.

nuisance contours
natural reserves

+300.000 *homes MRA*

+20.000 *homes Zaanstad*



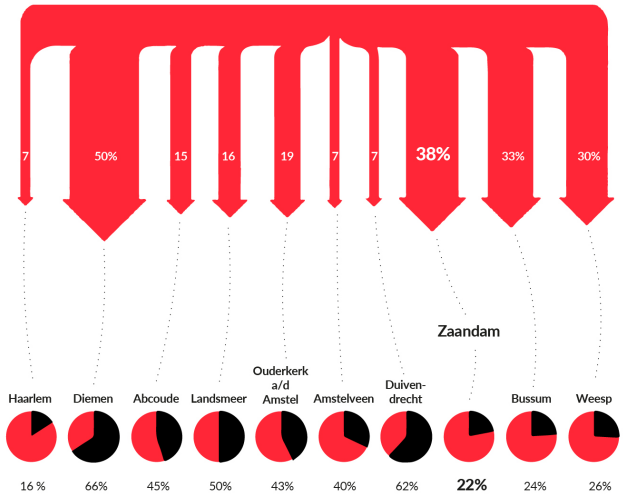
source M.3: GIS mapping

with housing can relocate to new business districts. Some choose to stay within the metropolitan region (Copping et al., 2017). Industries often cannot compete with housing developers for land prices, need to adjust their activities too much to locate on a more dense and urban site and are often reluctant to deal with future residents complaining about nuisances. Hence, prefer to relocate. What is more, in general municipalities still refer businesses to business districts when they ask for a location to settle (Heebels, Ten Kate, 2019). Therefore, the risk of industries relocating and creating industrial sprawl is present in the MRA and municipality of Zaanstad.

The city of Zaandam is surrounded by Natura 2000 natural reserves, and parts of the municipality Zaanstad are covered by the Schiphol airport and Noordzeekanaal harbour and industrial districts nuisance contours (see M.3). Every part of land is used, increasingly developable land is becoming more scarce. Nevertheless, urbanisation is still taking place. More and more people want to live in cities in the metropolitan region and also look at the Zaanstad region for housing (see F.9). Zaanstad has the second highest housing shortage of the region, Amsterdam being the first. The pressure on the housing market in Zaanstad is rising, which will affect the housing prices. The MRA aims to have added 200.000-300.000 homes by 2040. Accordingly to supply for the demand, the municipality Zaanstad has to create 15.000-20.000 homes. Consequently, the municipality has stated in its aims to increase the production of 600 homes per year to a minimum of 1000 homes per year (Gemeente Zaanstad, 2019*a*; Maak.Zaanstad, 2016). At the same time, it is their ambition to supply for this demand within the existing built-up environment. Compact city strategies in Zaanstad are thus very relevant as they have a high demand for housing but no space left to expand to.

With the increasing housing pressure in Amsterdam, it becomes clear how industries are pushed more to the edges every time, while housing replaces the industrial and business districts closest to the centre. Even though, the municipality of Amsterdam there is the intention to keep the existing industries on site in their plans. At the same time, they also provide the choice for industries to relocate (within the MRA). It remains questionable how successful the ambitions are to keep industries on the transformation locations.

F.9 Increase of inhabitants coming from Amsterdam per municipality (2015 compared to 2014)



Therefore, because of the history, changing demands of industries, increasing housing demand and lack of space in Zaanstad, investigating integration of industries in cities, competition of space and intensification and densification of uses is very relevant here.

source: F.9: Damen, T. (2016). Amsterdammer trekt naar de regio. Retrieved from: https://www.parool.nl/nieuws/amsterdammer-trekt-naar-de-regio~b40ff408/



F.10 The skyling along the Zaan river with Industrial architecture from different periods

source F.10: Zoom.nl. (2015). De Zaanstreek in volle glorie - water houten huizen, molens en industrie [image]. Retrieved from: https://zoom.nl/foto/overig/de-zaanstreek-in-volle-glo
F.11: IFIZK. (n.d.) Festival Zaanse Industriecultuur [image]. Retrieved from: https://www.ifikz.nl/



rie---water-houten-huizen--molens-en-industrie.2503725.html

F.11 Day of Industrial Culture Poster in Zaanstad

2.3 PROBLEM STATEMENT

What is the future of urban industrial land? This is a challenge urban design and planning field has only just started to undertake. A recent trend in developed cities around the world is that they have been experiencing deindustrialisation (Xian & Chen, 2015). Currently, the differentiation between the urban core as a front-stage zone for human residence and entertainment versus rural peripheral back-stage zones for automated agriculture, manufacturing, logistics and energy harvesting is becoming more distinct (Young 2018). The restructuring of urban economies away from manufacturing and toward services has resulted in divided labour markets that generate few moderate income jobs and has generated new demand for urban living (Lester, Kaza, & Kirk, 2013). This is putting pressure on the diversity and the social inclusiveness of cities. The increasing housing demands in cities drive up land prices, making it difficult for businesses to find affordable work spaces. Often the housing demand is met by the transformation of former industrial land into residential areas or mixed-use environments. This way suitable industrial land in cities remains unaddressed and becomes increasingly scarce.

Furthermore, the rural landscape comes under pressure because as industries expand into the landscape due to industrial sprawl. Even though industries have become cleaner and safer due to new technological developments, for many cities and planners, adopting compact city strategies and urban revitalisation is associated with mixed-use of commercial and residential redevelopment only. While the mix of residential and industrial uses is often perceived as troublesome for the living environment (Tian et al., 2017). By not including industries, current development is contributing to industrial-sector suburban sprawl (Leigh & Hoelzel, 2012). Not to mention, it is just the relocation of nuisance, instead of addressing the spatial conflicts that it generates. The autonomous, standalone industrial or business district, which hosts large factories that are disconnected, spatially and managerially from the city, is still a leading model in developing, contemporary industrial areas (Ben-Joseph, 2017). Because of this, it has a dominant presence in the landscape of many metropolitan regions.

It raises a fundamental question about value. What aspects of the urban landscape do we deliberately want to retain or strengthen and what to change? Industry has often been perceived in an economic or political context disconnected from geographic, locational, or spatial concerns. However, this separation from geography and community is becoming increasingly unsustainable (Hatuka, Ben-Joseph, & Peterson, 2017). On the one hand, there is the movement of industries to the peripheries and its impact on the landscape. On the other hand there is the need to maintain liveable urban environments in the city. Finding out what roles industries should have in the city and also in the transition to more sustainable environments is a new challenge relevant in many metropolitan areas. The question refers not merely to the evolution of manufacturing in the twenty-first century, but also to many abandoned heavy industrial sites worldwide (Hatuka, 2017). At the moment, industrial land is at risk in cities. Yet, a vital industrial presence in urban neighbourhoods is as important as a dynamic commercial and residential presence (Leigh & Hoelzel, 2012). Manufacturing and services are interrelated and for each to thrive, both need to be present (Croxford et al., 2020;). A considerable part of the economy is supported by manufacturing and its impact goes beyond its sector. As the multiplier effect of manufacturing has a significant impact on employment, and prosperity is largely determined by the total amount of produced and exported goods. Moreover, incorporating industries could help provide potential synergies with other functions in the city to create more sustainable environments. New hybridity, spatially and economically might lead to more productive and vital cities.

At present, there is not enough knowledge on how to incorporate industries in dense urban environments in a socially acceptable, liveable and sustainable way. The perception of industry needs to change in the mind of people, especially of those involved in urban development, if the aim is to welcome back industry to the city and for it to regain its role as a good, productive member of the city.
There is still a lack of studies considering the synergies of several components and the other characteristics of the compact city apart from high density. At the same time, the outcomes of mixed-use developments are often taken for granted and urban manufacturing often romanticised. Moreover, a better understanding is needed of the spatial requirements of industries now, and the consequences new trends will have on the spatial manifestation of industries. Research addressing the competition of space and the intensification and densification of uses is therefore critical.

TESTING CASE:

This research focusses on the municipality of Zaanstad in the Netherlands, as it is the oldest industrial region of Europe. The city and villages in the region have always known industries in close proximity to housing. There is potential for this region to develop successful live work environments and integration of industries in the urban environment, as there is already a base for cultural and societal acceptance and tolerance of industry. On the other hand, the city of Zaandam is surrounded by natural reserves, and parts of Zaanstad are covered by the Schiphol airport and Noordzeekanaal harbour nuisance contours. Compact city strategies in Zaanstad are thus very relevant, as there is a high demand for housing but no space left to expand. On a larger scale, the MRA has the ambition to transform many industrial areas and business districts to mixed-use or live-work environments, particularly in Zaanstad and Amsterdam (Copping, Hagens, & Kruger, 2017; Maak. Zaanstad, 2016; Zanen, Ponteyn, & Keijzer, 2011). While compact city strategies are promoted, the number of industrial areas and business districts have increased significantly in the past 30 years. Simultaneously, in order to meet the demand of housing the municipality has presented an excess of industrial areas available in the Zaanstreek and Waterland area, so industries in transformation locations can relocate but still stay within the metropolitan region (Copping et al., 2017). Even industries that are potentially mixable with housing prefer to relocate rather than compete with housing developers for land prices, adjust to the many restrictions put on their work activities, or wait for future complaints from nearby inhabitants as a result of densification. In general, municipalities still refer businesses to business districts when they ask for a location to settle (Heebels, Ten Kate, 2019). Therefore, the risk of industries relocating and industrial sprawl is present in the MRA and municipality of Zaanstad.

Despite this, mixed-use environments are becoming an increasingly attractive settlement location for businesses. Both an increasing need for large industrial plots and more central mixed-work environments can be observed. Industries require a lot of space and infrastructure for logistics while housing needs a liveable environment. This can result in conflicts while seeking to achieve compact city strategies and development of mixed-use environments. Therefore, integration of industries in cities, the competition of space, and the intensification and densification of uses, is clearly relevant in Zaanstad.

RESEARCH AIM

There is an urgency for a spatial model, framework or urban design rules, that reinvents the connection between cities and industry especially in a densely built environment. How to combine these industries with other functions in a liveable and vital way, that meets the needs of the twenty-first century, includes technological innovations and addresses environmental concerns. To achieve this, human-centred design should be introduced to industrial facilities. Moreover, a change in the perception of industries is needed. Towards something more positive, as part of identity and an opportunity. In the next chapter the intended outcomes are defined and how the outcomes of this research contribute to this need.

Special note
Urban industrial integration cannot prevent industrial sprawl. Not all industries benefit from an urban environment. Sustainable options for rural industries also need to be explored and developed. Still, a large proportion can be integrated in the city. To be able to prevent sprawl, spaces within the existing built environment need to be made more compact and efficient. The competition of space is an issue that can be addressed by spatial planners and urban designers.

D.5 CURRENT SITUATION

RURAL PHERIPHERY
back-stage

Manufacturing
Production
Automated agriculture
Energy harvesting
Logistics

URBAN CORE
front-stage

Human residence
and entertainment

Deindustrialisation
Shift to service industry





industrial sprawl

reshoring

urban development:
densification
revitalisation



LEADING MODEL
autonomous, stand alone
industrial/ business park

industries
(re)located

mixed-use of
commercial, services
residential

conflicts:
large factories, space demanding
disconnected, spatially managerially
from city
resource and infrastructurally
demanding
nuisance contour?

uncertainty
policies, instruments tools missing
spatial planning
industrial land preservation
real estate
profits?

economic or political context

*separated from **geographic, locational***
*or **spatial** aspects*

source: own illustration

D.6 VISION OF A VIBRANT COMPACT LIVE AND WORK CITY

RURAL PHERIPHERY
environmental remediation



Eco Industrial park

URBAN CORE
compact city



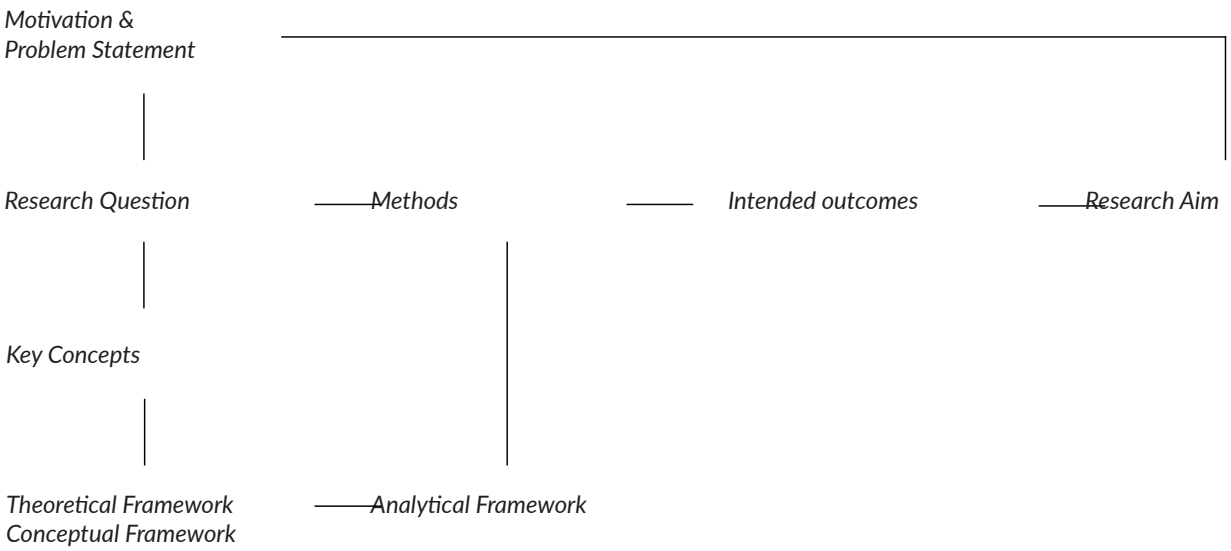
Connecting means of production with the city's creative and constructive spirit

needed:

- *complex socio-political project*
- *regional, city and local scales, in both existing and new settings*
- *positions within broader regional economy*
- *city-industry dynamic/relationship*
- *innovation-production ecosystem*
- *refined industrial land preservation approach*
- *evolution of manufacturing*
- *address abandoned heavy industrial sites*

conflicts:
densification
industrial integration
liveability

source: own illustration


Motivation &
Problem Statement
Research Question
Methods
Intended outcomes
Research Aim
Key Concepts
Theoretical Framework
Conceptual Framework
Analytical Framework

3.

3. METHODOLOGY

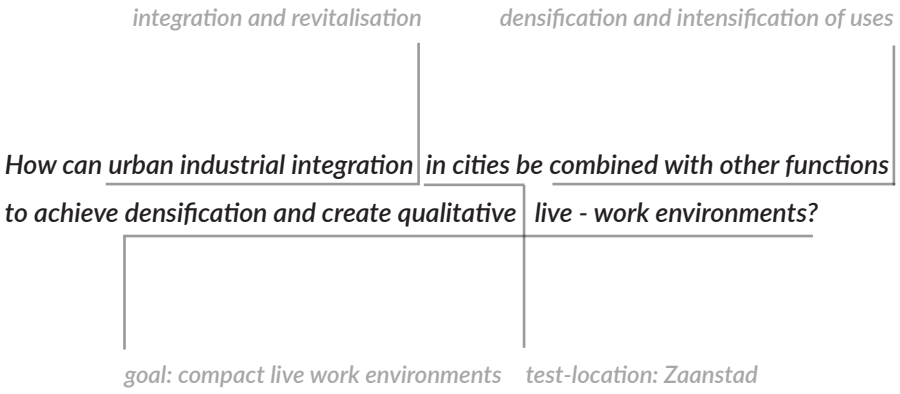
This chapter presents the overall research approach of this master thesis. How the overall research approach aligns with the problem statement - *deindustrialisation and industrial sprawl* - and research objectives - *urban industrial integration and qualitative live work environments*.

The key concepts and theories used in this master thesis have been presented in chapter 1, along with the theoretical framework showing how the concepts are linked together. A knowledge gap exists in how to harmonise these different concepts - together. This chapter focusses more on the research aim, methods and intended outcomes.

First, a general description is given of the overall research approach. The main research question is presented together with the sub questions. The questions are shown in relation to the used methods and expected outcomes to the individual questions (see T.2).

The interrelations between discourse, theories, trends, the physical environment and paradigms are shown in the conceptual framework. Next, the methods used in this research are discussed, and shown in relation to each other in the analytical framework.
An overview of the time-line of this graduation thesis shows when the different parts of the research were done in relation to one another. Finally the chapter is concluded with the intended outcomes. The evaluation of these outcomes provide an answer to the main research question.

RQ


integration and revitalisation
densification and intensification of uses
How can urban industrial integration in cities be combined with other functions
to achieve densification and create qualitative live - work environments?
goal: compact live work environments
test-location: Zaanstad

SUMMARY OF THE RESEARCH APPROACH

The thesis starts from deductive research. At first, a more generic analytical approach explains the phenomena of industrial sprawl and its spatial impact. Moreover, what the benefits are of achieving urban industrial integration. Thereafter, existing ways of spatial planning and its instruments have been studied by means of a literature, documents and reports review. As a result, an assessment has been made which spatial planning approaches are theoretically preferable in dealing with reduction of industrial sprawl, promoting mixed-use development and integrating industries. As increasingly more strategic approaches are used and relatively flexible frameworks have been developed, compared to the traditional land use plan. For this reason it has been chosen to work with patterns - interrelated principles that connect space with activities on different scale levels and level of detail. As a means to guide strategic development.

Existing rules and patterns have been collected from a literature review, analysis of documents and reports on dealing with the integration of manufacturing, industrial intensification or the development of mixed-use or vital environments. The aggregate of these principles have been presented in a qualitative framework. Accordingly, the exemplary mixed-use cases have been analysed in a case study according to the themes of the qualitative framework. The different contexts have been used to study successful existing approaches that deal with the spatial challenges of contemporary industries in urban development. Similarities and differences have been studied between the cases and theoretical principles. Finally a set of patterns are concluded from the cases, that better support incorporation of industries in cities and create attractive live work environments. However, additional patterns or concretisation of more abstract theoretical patterns from the case study, are tested on site in Zaanstad to determine the transferability to this context. As a result some patterns are more suitable than others for urban design application in Zaanstad. These patterns form the basis for the spatial model or urban design on the test-location.

To achieve the aim of this research, overall, an exploratory approach is needed as little is written about or experimented with how to combine types of 'heavy industry' with other functions in urban environments. The requirements of types of industries are studied carefully, with a particular focus on manufacturing industries. This information has been acquired through interviews, a spatial analysis of existing industries in Zaanstad and a projection of how these are expected to change according to relevant trends in the Netherlands. Interviews with inhabitants and businesses are used to determine what spatial qualities each party finds important for their living or working environment. Moreover, what is needed to facilitate desired activities. Together with a contextual spatial analysis, the conclusions from this have resulted in more concrete patterns, relevant for Zaanstad.

Moreover, this research also encompasses a predictive approach. Desirable developments and current trends have been summarised into two scenario's to sensibly speculate the future possibilities and plausibility of integrating certain industries in cities. The two scenario's represent the two "extremes" that can be chosen for ways to 1. densify and develop housing, and 2. the type economic activity that is desired and stimulated by the local government.
To support this predictive approach, scenario testing and research by design is used to explore potential design outcomes. The explorations on the chosen test sites in Zaanstad made use of the patterns to investigate the spatial possibilities in different circumstances.

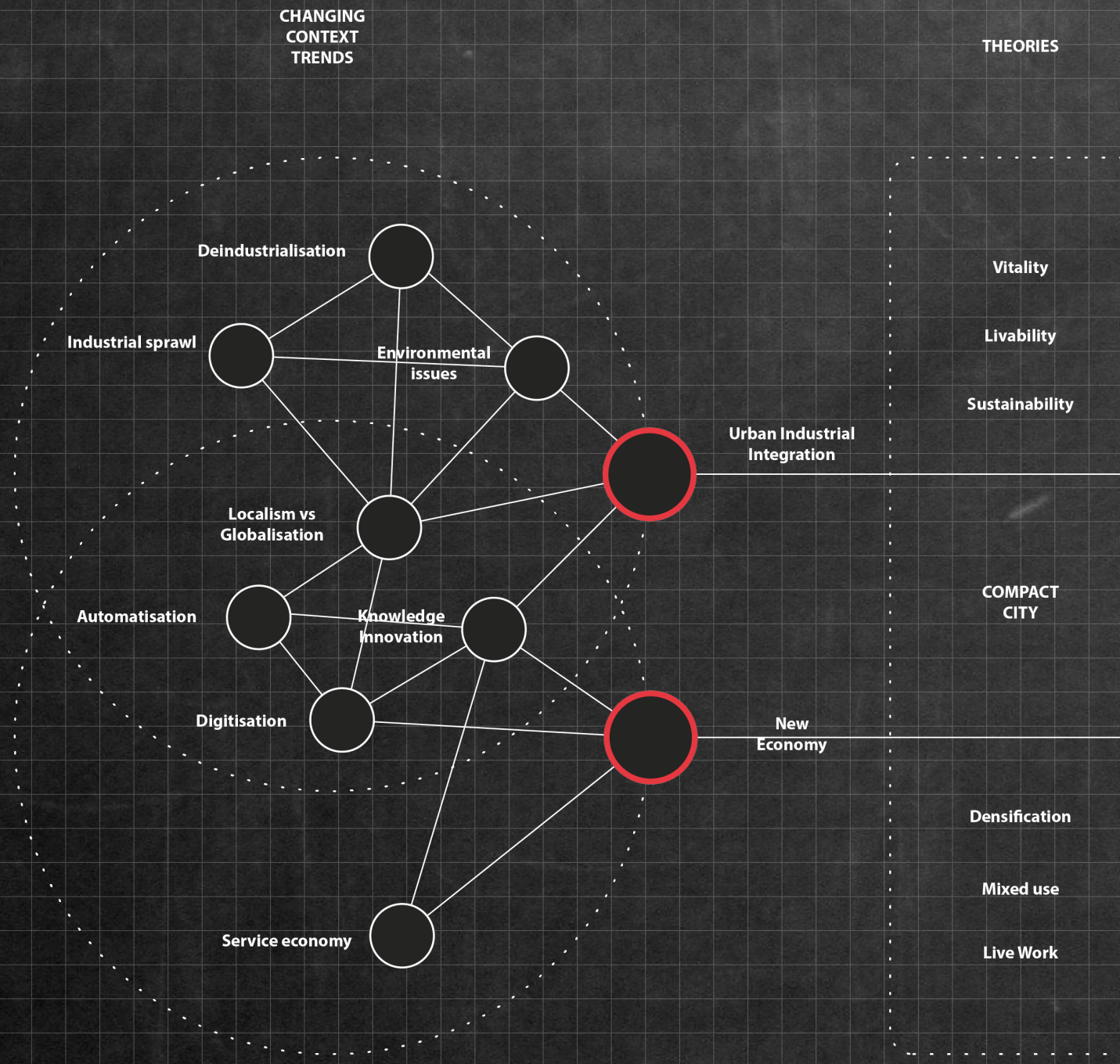
An evaluation of this part has presented the adaptive capacity of the proposed designs and revealed design choices that are desirable for this location. From research by design, it has been concluded what choices can be made now, that still leave enough flexibility for the possibility of both scenario's.

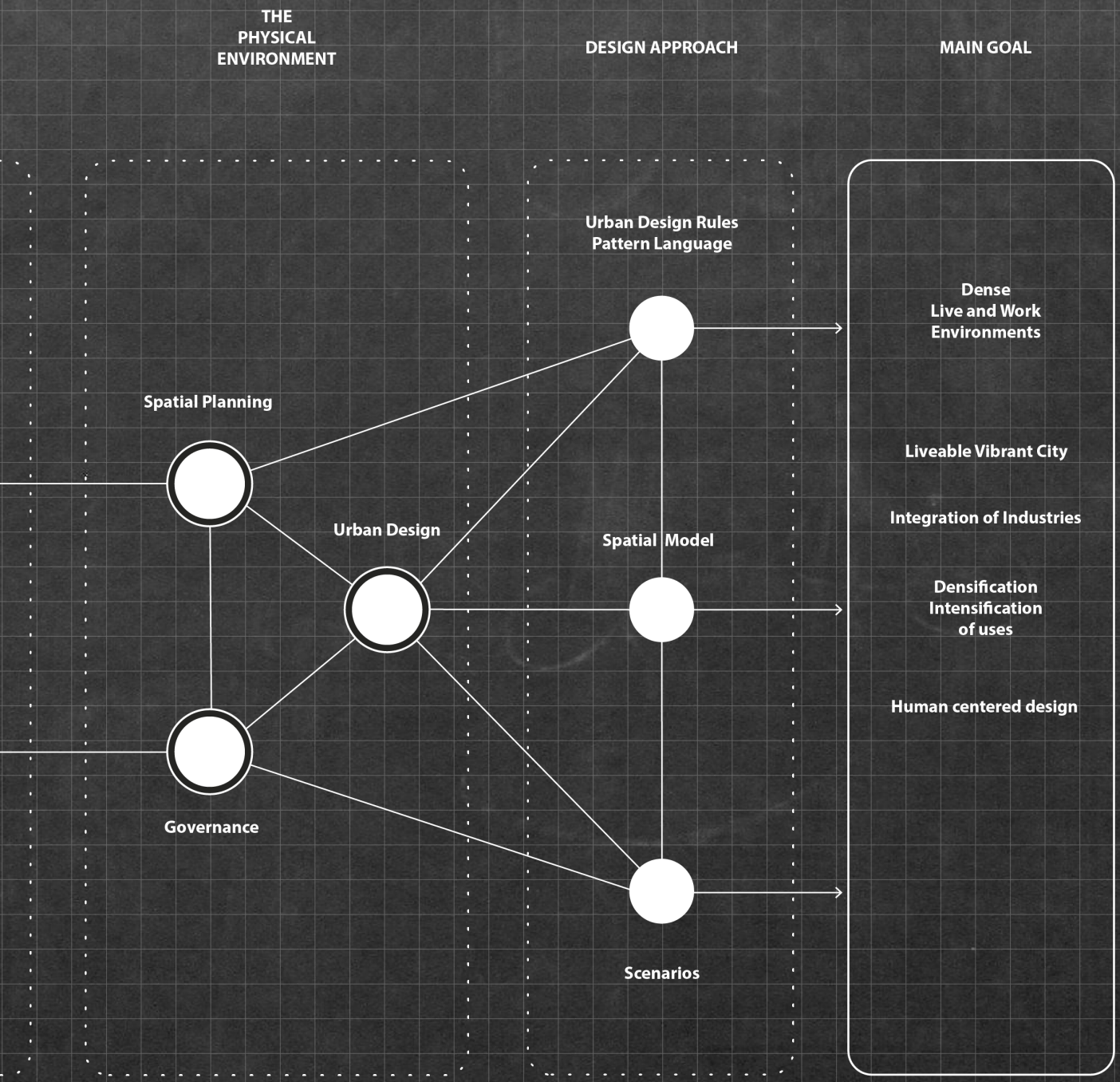
This research has demonstrated a way to integrate industries in cities in a liveable way. The patterns are presented as a means to guide developments in a desired direction that enables a qualitative mixing, transitions, densification and intensification of uses. With certain patterns that are more transferable to other context than others. Moreover, interrelations between certain patterns were determined. The patterns are linked to each other on different scales as well as their positioning in the city and network. These have revealed a framework that can be used for guiding development.

T.2 RESEARCH QUESTION	SUB QUESTIONS
How can urban industrial integration in cities be combined with other functions to achieve densification and create qualitative live - work environments?	*Problem field*
	What is the future of industry (manufacturing), its spatial manifestation and its impact on the built environment? • What global economic and technological trends and developments are affecting the spatial manifestation of industries and the subsequent changes in life/work-style?
	What are the benefits of urban industrial revitalisation and integration?
	Design Methods
	What are current strategies, policies and guidelines regarding the spatial positioning of industries and mixed use development? • Are these effective?
	What spatial qualities, principles, rules or patterns can be found in theory and contemporary practices to create live work environments?
	• Which theories are relevant for the densification and intensification of uses?
	• What qualities of liveability are relevant for this context?
	• What spatial qualities are present in successful mixed-use environments that are transferable?
	Context
	What are the existing spatial qualities, opportunities and challenges of live and work environments in Zaanstad?
	What future developments are desirable in Zaanstad? (irt creating live-work environments)
	What spatial qualities do inhabitants of Zaanstad desire for their living environment? What spatial requirements do industrial activities in Zaanstad have?
	Live - work environments
	How can urban design patterns be used to mediate conflicts between industry and other functions, in particular housing?
	What is the adaptive capacity of the proposed design?
	To what extent can industry be integrated in the city with regard to liveability? What are the spatial limits?
	What criteria should guide contemporary compact and mixed-use spatial development and transformation?

METHODS	INTENDED OUTCOMES
literature review, search for relevant news paper articles, review of (policy) documents and reports, mappings	mappings of the displacement of production industries out of cities/ core urban environments; gap in current urban planning and design theories and practices and compact city strategies; key trends influencing the spatial manifestation of industries
literature, documents and reports review	recognition of industries as integral part of cities and opportunities created as a result of its integration
review of literature, documents and reports, of past mixed-use developments or of preserving or integrating industries in the city, analysis of its policies and urban planning strategies	theory paper recommended planning strategies and policies to integrate industries in cities and facilitate mixed use development
review of urban design or planning literature, documents and reports dealing with mixed-use, compact city, industrial intensification, manufacturing, vitality and liveability	classification of block types for each case, design tests of mixed use block types and associated spatial qualities of each case on site, assessment of transferability of patterns
literature review study of practical references	key concepts relevant for live work environments knowledge gap
literature review, demographic data, interviews	necessary spatial and environmental qualities for liveability
case study, mappings, GIS mappings, SPSS clustering of data to compare block densities and mix, a qualitative analysis to compare and determine spatial qualities	qualitative framework for case study comparison and analysis, list of patterns
local analysis, fieldwork, historical maps, mappings, GIS mapping, SPSS clustering of data, Space Syntax	live- work typologies in Zaanstad and associated spatial qualities, Zaanse patterns, local opportunities and challenges
local analysis, visions, master plans, policy documents, reports analysis	formulation of two live work scenarios
interviews conducted with inhabitants and businesses in Zaanstad	local contribution to assessment criteria for design
mappings, design exploration, research by design	spatial model of live work environments in an existing urban environment and a transformation location in Zaanstad
development and testing of two scenario's, assessing similarities and differences of the two scenario's on site	conclusions on the adaptive capacity of patterns and the resulting design interventions
assessment of the environmental qualities of the proposed scenario designs	conclusions on the spatial limits of intensification and densification of uses
assessments of the proposed designs, critical reflection on use of patterns on applicability, transferability, interrelation and exclusion	recommended design interventions that allow for multiple futures in Zaanstad, essential patterns that enable spatial qualities for future live work planning strategies and design

D.8 CONCEPTUAL FRAMEWORK





The conceptual framework identifies the key concepts and shows the relationship among those concepts involved in the research. The links between the changing context, theories, approach and aim.
The most important trends contributing to the concepts of Urban Industrial revitalisation and New Economy are shown left. What elements of the Compact City concept are relevant are shown in the middle. These theories and trends influence spatial development of the physical environment through governance, urban design and spatial planning. Governance guides the course of economic growth of cities, while spatial planning and urban design give physical form to these ambitions.

The design outcomes are linked to governance, planning and urban design. The scenarios help inform decisions made by the government. The pattern language can be used as a tool to guide planning and urban design. While the spatial model demonstrates the potential of live work environments. These outcomes guide towards the aim of the research, to create dense, liveable and vibrant, live work environments and the integration of industries, in particular manufacturing.

METHODS

Literature review

The aim of a literature review is to identify and define the key theories related to this thesis. Moreover explore what has already been researched, to gather opinions, findings and information. This informs the problem statement, supports the formulation of the knowledge gap and defines the course of the research. Articles, books, documents and reports are consulted. The key theories used are the compact city concept, liveability, vitality, urban industrial revitalisation, industrial intensification, mixed-use. In terms of spatial planning strategies the pattern language and scenarios are considered.

Documents and policy review

This method is used to investigate the main spatial planning instruments at the regional, metropolitan or municipal level such as strategic frameworks or land use regulation, that are involved in creating mixed-use areas or live work environments. Moreover, the existing limitations, restrictions and conflicts in current spatial planning that stand in the way of creating successful mixed-use or live work environments. Furthermore, the existing plans and visions of Zaanstad have been investigated.

Mappings

Mapping allows designers and planners to see possibilities in the complexity of what exists but also to realise that potential. In other words, these mental constructs enable change. Mapping is a crucial instrument for effective construction of new worlds, while analytical research through mapping enables the designer to construct an argument. Moreover, it has the ability to reformulate what already exists, it is not an actual representation of reality. The abstractness of maps, as a result from omission, isolation, distance and organisation, reveal hidden characteristics. This ability is particularly important, as what exists is more than its spatial characteristics, but it includes the hidden forces that lie beneath the mechanisms of a certain place. Mappings can describe and visualise these interrelationships and interactions (Corner, 1999). This method is particularly important to reveal the urban system of industries its spatial characteristics and requirements and how this can adjusted to integrate more efficiently in cities and together with other functions. Geo data resources are used and other information sources to draw maps.

Case Study

Abattoir Kuregem, Brussels Belgium
Maker Mile Hackney, London UK
Huaqiangbei, Shenzhen China

These districts or areas are selected for the case study. A spatial quantitative and qualitative analysis has been done to compare the spatial characteristics of these exemplary cases that have integrated various types of (manufacturing) industries. Such as densities, footprints sizes, degree of variation, public - private transitions, dispersion of functions etc. Various types of imageries support this analysis, such as photos, maps or sections. The acquired knowledge of the results from the analysis is used to formulate patterns or refine ones acquired from theory. Moreover, these cases serve as reference projects for the spatial model to be designed. As these cases are from very different contexts, similarities between the cases can be generalised to a certain extent and form a pattern. Unsupported patterns by either theory or the case study are tested on location in Zaanstad to assess the transferability of the particular pattern.

Fieldwork

During the fieldwork study, information and first impressions are gathered from the test location. A site visit allows the visitor to experience the dynamic, scale and atmosphere of a place more intuitively. Pictures, sketches and maps are used to record the experience, characteristics and the main urban issues of the place. Patterns are identified based on observation.

Interviews

The interviews contribute to the formulation of the necessities and requirements of live and/or work environments by its inhabitants and businesses. The interviews may reveal spatial qualities that have not been written about yet. It can also give an indication of how the built environment is used and perceived. Interviews with local residents and businesses reveal existing qualities and conflicts in the location. Moreover, their spatial preferences and how they expect it to change in the future. This way, it helps to understand the values and perceptions of people and businesses, in particular manufacturing industries, towards live work environments.

Scenarios

Scenarios are defined as descriptions of actions and settings over a certain amount of time. There is a necessity to discuss desirable futures and defend positive images of the future without being accused of having ideological or unattainable visions. To shape the future, planners should analyse major interrelations that continue to exert influence in the future. Decisions should aim at the key drivers of the social system to guide development into the desired direction. Scenarios support a disciplined way of thinking, provide a base for discussion and help to see relations, threats and potentials, as a cognitive tool.

Scenarios are an inherent part of research by design, generating hypothetical solutions for comparative analysis in order to gain insights into possibilities and scale of the task. Such research helps to recognise limits and crucial decision points (Salewski, 2010).

This research mainly uses the exploratory trend or framing scenarios (described in Chapter 1 Key Concepts), as the consequences are described and visualised of certain contemporary trends and associated choices on the spatial manifestation of industry in the future. The multiple possibilities help to gain insight into the conflicts and potentials of creating live work environments on location. Moreover, help to understand which design choices fix the course of development or are more flexible to future adaptation.

Research through/ by design

Research through or by design is described as a systematic exploration to increase understanding by describing problems and potentials in visual and spatial terms. This method is used to explore opportunities and to generate solutions by taking advantage of the freedom of design thinking. The key question asked in this process is not whether it is true, but whether it works. It is goal oriented, transparent and practical.
As this research also encompasses a certain predictive approach, research by design is used to explore the potentials and expected changes in the future on the test location in Zaanstad. To increase understanding of the mechanisms involved in live work environments. Moreover, to reveal the interrelation of the patterns that guide design choices.

Planning and design methods

Pattern Language/ Rules

The pattern language was introduced by Christopher Alexander in 1977 (Alexander, C., Ishikawa, S., Silverstein, M. 1977). The rules of Lehnerer (2009) were based on this concept.

"the idea of a diagram, or pattern is very simple. It is an abstract pattern of physical relationships which resolves a small system of interacting and conflicting forces, and is independent of all other forces, and of all other possible diagrams. The idea that it is possible to create such abstract relationships one at a time, and to create designs which are whole by fusing these relationships – this amazingly simple idea is, for me, the most important discovery ... "

These abstract relationships are infrastructural, in an abstract and immaterial manner, they represent the connection between the built structure, land and its use. They link the physical with the social city, connecting quality with quantity and hidden characteristics to clear ones. At the same time, the interacting and conflicting forces show that they are embedded in a complex network of relationships. The idea of a pattern or rule is that it is has an innate character that can be transferred with the adoption of that rule (Lehnerer, 2009). This makes them useful within multi-layered contexts.

What is essential, is that the potential of patterns lies in their space of tolerance or interpretation. It is about consciously applied freedoms, rather than sharp fixations like regulations. According to Lehnerer (2009), these freedoms are critical for the generation of qualities such as urban diversity, difference and vitality. As patterns produce both precise and unambiguous formulations, yet they generate a multiplicity of alternative realities to confront an unpredictable future.

The activity of urban design, in other words the linking together of various design visions via the negotiation of a diversity of private and public interests, consists more of the conscious formulation of rules than the drawing up of plans. The aim is to set thresholds in such a way that the city can enforce them as the representative of the public interest without restricting private intentions. This determines whether an urban plan is to be successful, productive and generally accepted. Its relevance to its context and its flexibility in dealing with uncontrollable behaviour determines its potential to generate valuable outcomes. As a result, it is argued that patterns might provide a way to address the shortcoming and conflicts of restrictive land use planning that is characteristic of current spatial planning practice (Lehnerer, 2009).

Patterns can be used as integrated, operational tools in planning and design, that possess special qualities. Patterns can be helpful instruments in structuring the work of design itself. It forms the guidelines for producing a design as well as criteria for evaluating it. Patterns supply design principles that can represent alternatives and expansions of the conventional plan. Design control is therefore adjustable. This adjustability is one of the key preconditions for contemporary city planning and design.

The method of rule or pattern based steering can be generalised, but the appliance requires customisation to address specific contexts (Lehnerer, 2009). Even though patterns can be universal, its application need to be adjusted to the local context. Diversity in levels of prosperity, economic development, cultural and societal values, such key differences impact the ability to generalise and to transfer research.

On another note, the question remains whether a plan will be successful through the application of patterns only*. It has been argued that land-use planning can be successful, especially in the preservation of existing qualities. Moreover that a more strict plan can provide certainty for parties to invest and develop in certain locations. In the end, urban planning and design is all about balancing freedoms of its users and ensuring spatial qualities by protecting the public interest.

*This matter is investigated further in Chapter 4. Spatial strategies and policies

Scenarios

Scenarios are defined as descriptions of actions and settings over a certain amount of time. It supports a disciplined way of thinking, provides a base for discussion and helps to see relations, threats and potentials, as a cognitive tool. For planning and design, the description of the last step is often the most important, the image of a plausible future. It has to result credibly from development over time, starting from the present constructed by a narrative that supports the imagination of a future with rational and logical argumentation**. As Salewski (2010) describes, scenarios are speculative by nature. The future is unknowable and cannot be proven or falsified. Therefore its values should be transparent right from the beginning.

Scenarios allow to think about issues in a way that can be as informative as misleading, as they are constructed from inconclusive knowledge. As thinking tools, scenarios can be very useful for analysis, testing, option generation and opinion forming. Therefore scenarios are an inherent part of research by design, generating hypothetical solutions for comparative analysis in order to gain insights into possibilities and scale of the task. Such research helps to recognise limits and crucial decision points (Salewski, 2010). On small scales, scenario studies can serve for option generation and new spatial plans to study further options. However, working with references and their analysis can sometimes be more effective and transparent. The best application for scenarios on small scales is to think through the use and the interaction of smaller sites within their surrounding structure and situation.

For long range, large scale developments that are too uncertain and comprehensive to be translated into options or alternatives, urban models in the form of ideal cities are better choices, as these have transparent underlying values and mechanisms that can be easily communicated. Scenarios about larger and longer societal and spatial developments need to avoid statements about concrete and detailed situations to allow for flexibility. As research shows, most small scale situations are not firmly attached to one or another. Large scale development can exist in both worlds and coexist with other with completely different small scale situations.

Salewski (2010) distinguishes a typology of scenarios, explorative and anticipatory, with as main difference the chronological course of the study. Explorative scenarios, follow development from the status quo into the future and can be divided into trend and framing scenarios. Trend scenarios are based on the strength of the inertia of the system, or the permanence of substantial trends. The purpose of framing scenarios is to uncover the space of possible futures by making variations on the premises of the present trends in a parametric and extreme way.

Anticipatory scenario starts with a desirable hypothetical future and works back to the present to construct a conceivable development. There are normative and contrast scenarios, depending on how extreme they are. A normative scenario defines a set of given objects to be realized, together these would form a possible and desirable future and describes a way to connect this future to the present. A contrast scenario sketches a desirable future which is located on the border of many possibilities. Contrast and normative scenarios can be merged into a combined scenario to remind of a desirable vision.

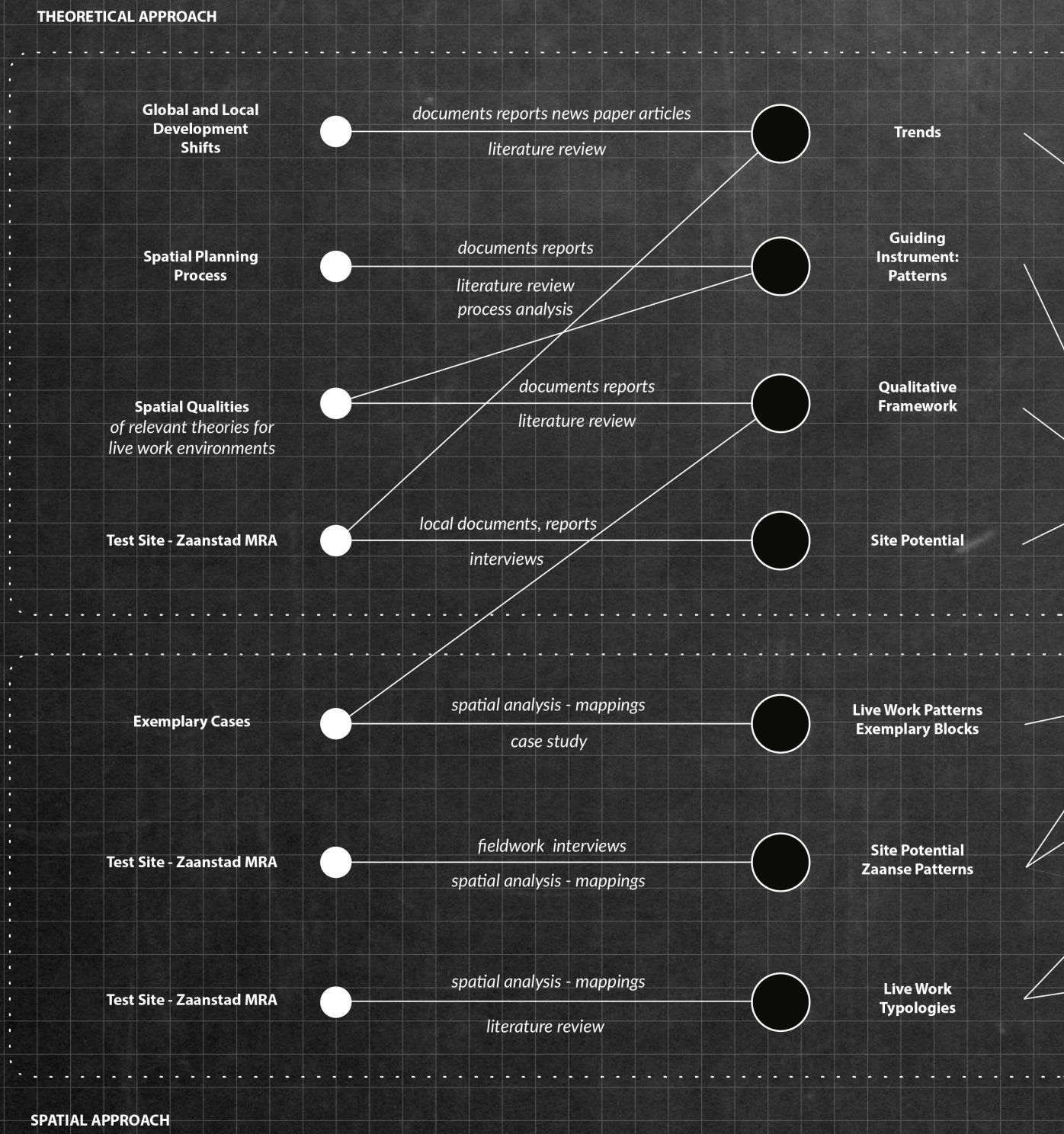
-->

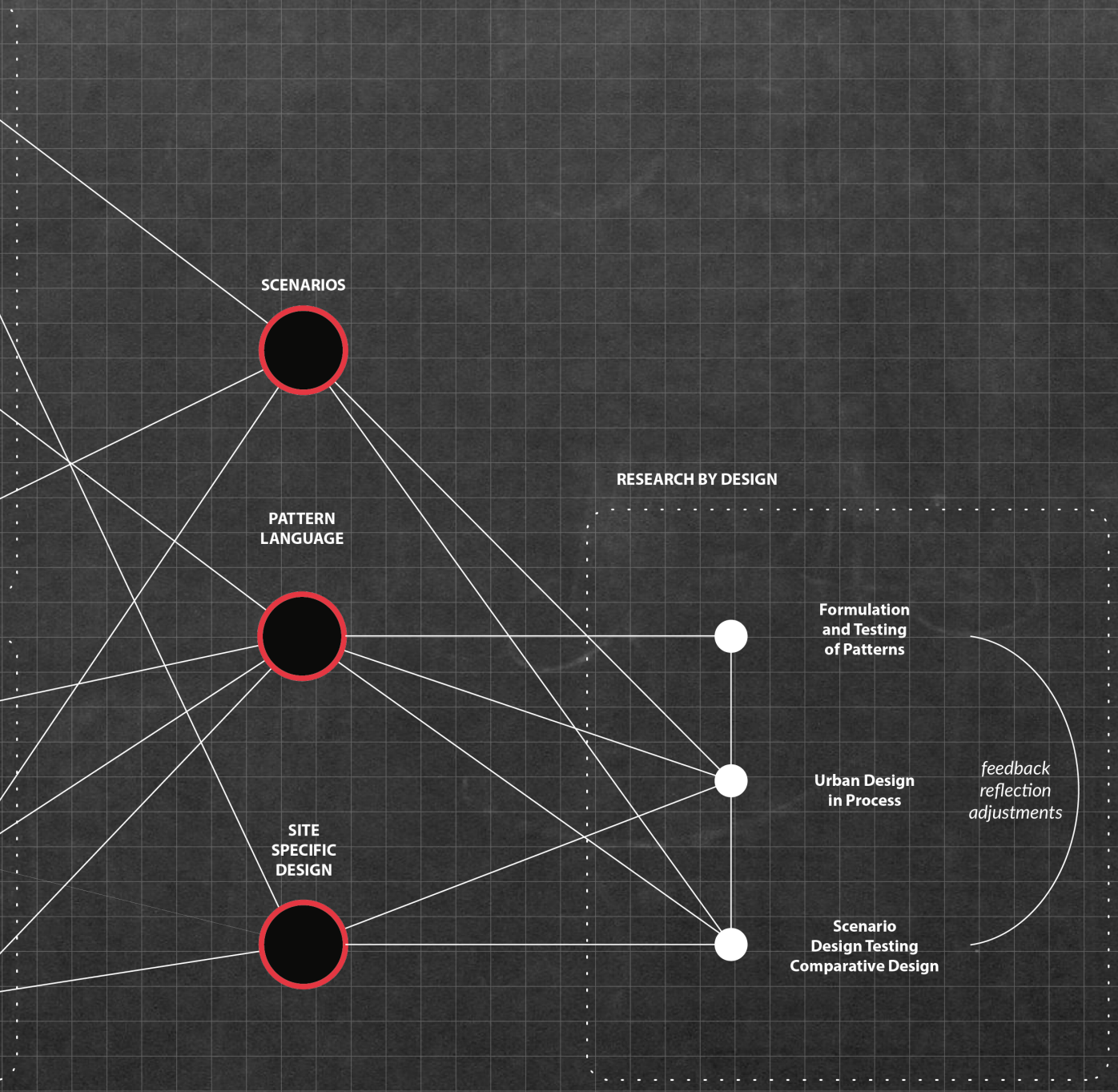
Extreme

Explorative Scenario	Trend	Framing
Anticipatory Scenario	Normative	
Contrast		

**The scenarios of Zaanstad are developed in Part III.

D.9 ANALYTICAL FRAMEWORK

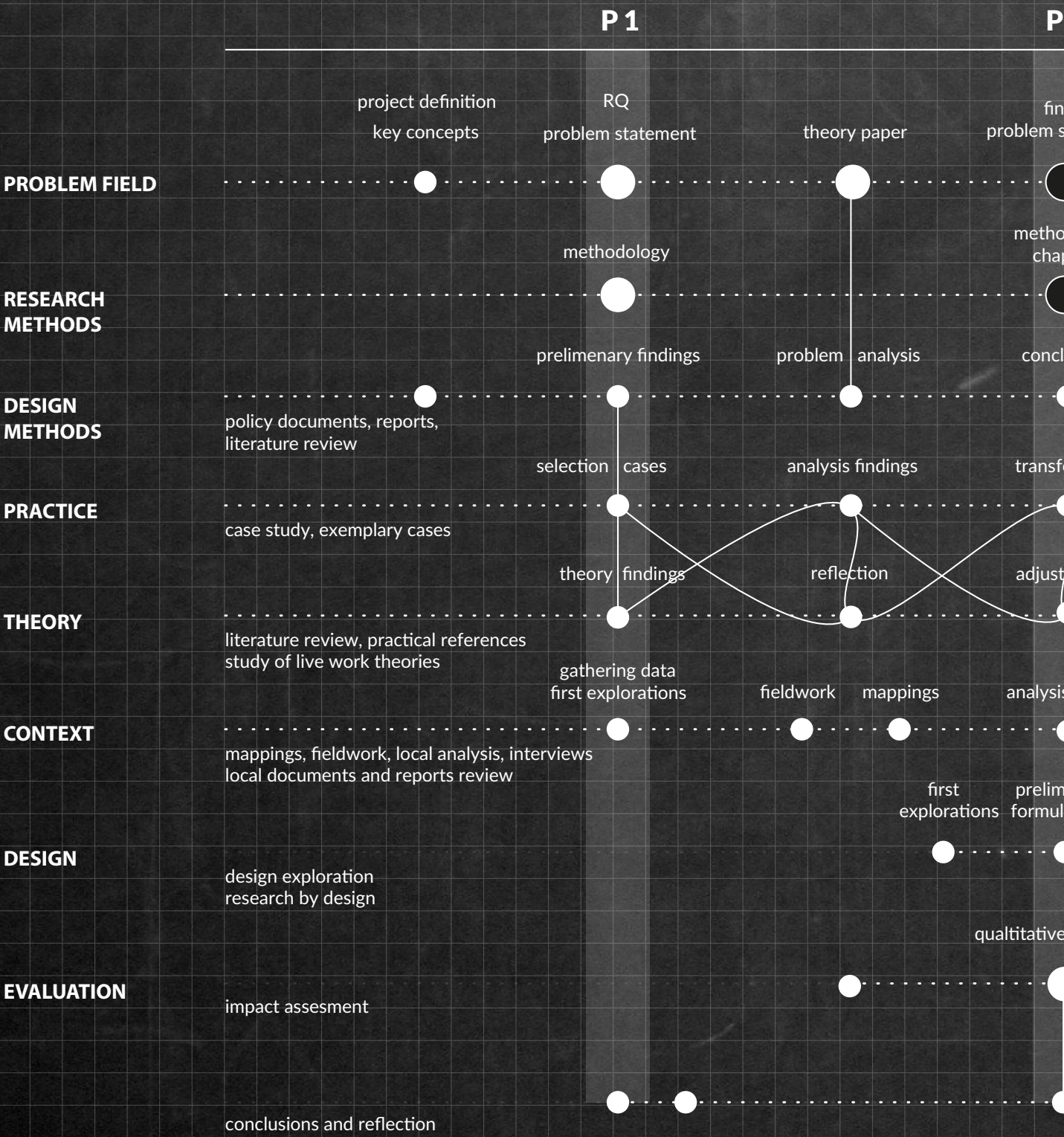


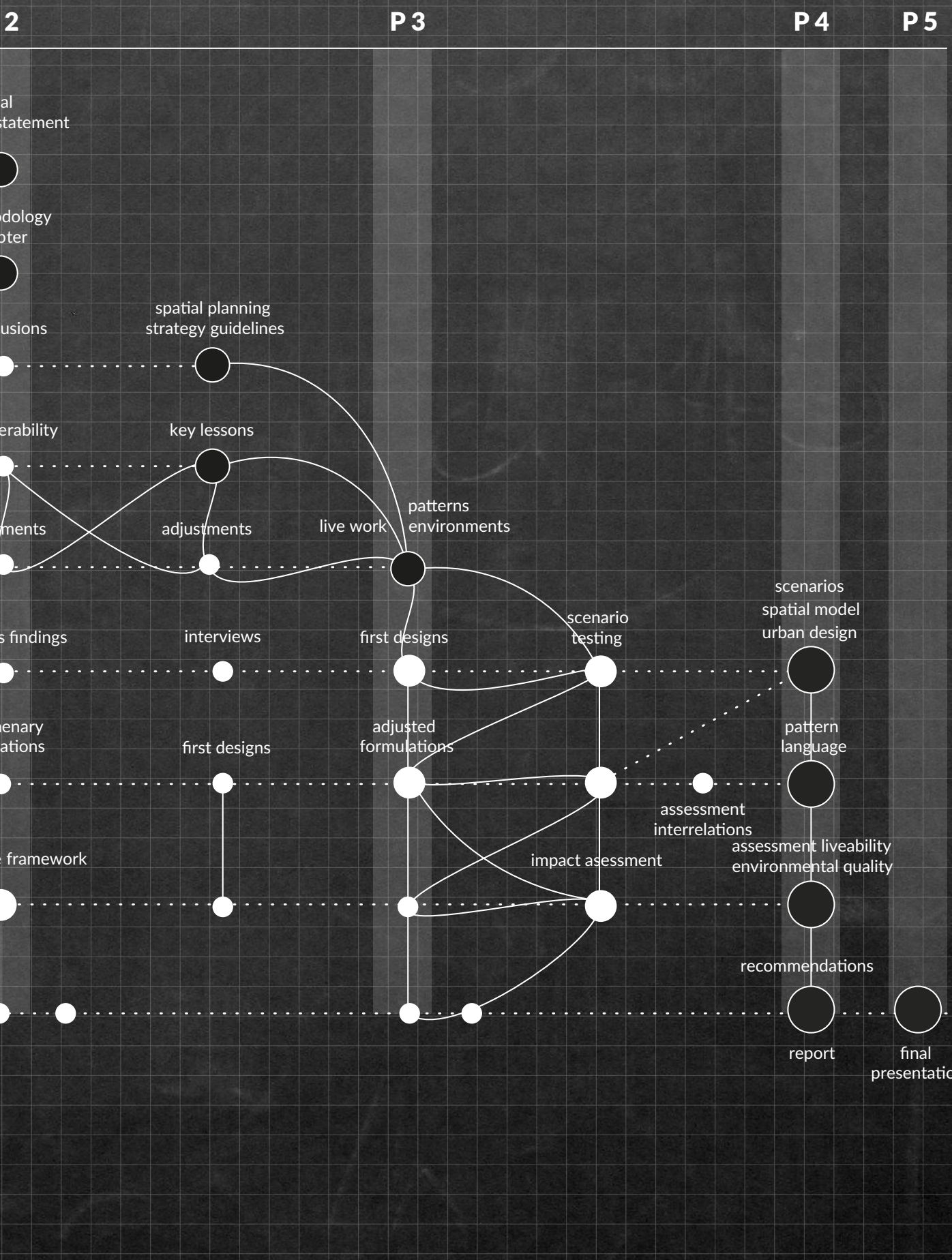


The analytical framework presents the research approach. The methods used that lead to the desired products and outcomes of research. The relation between the different approaches, theoretical, spatial and research by design. How the results of methods contribute to the development of the outcome products. Moreover, how the development of the products are an iterative process of research by design. The different approaches are not used in a linear way, but next to each other. Each new finding provides new insights in the other phases. This is also reflected in the time-line on the following page.

The scenarios, pattern language and site specific design, as well as the comparison and evaluation of the two scenario's and assessment of the interrelation of the patterns from the research by design are the outcomes of this graduation thesis.

D.10 TIME LINE

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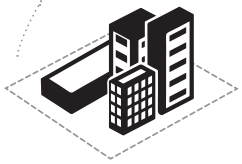


SPATIAL MODEL

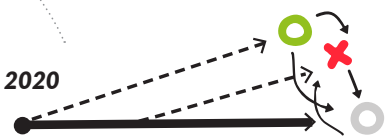
spatial model: liveable, vital mixed-use development that includes tech-innovations and addresses environmental concerns and re-establishes the connection between cities and industry



URBAN RULES PATTERN LANGUAGE

spatial planning guidelines & instruments supporting incorporation of industries in cities, preventing industrial sprawl

** Grand Urban Rules*
** City of Making*

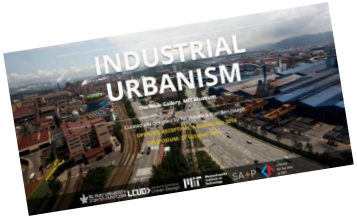


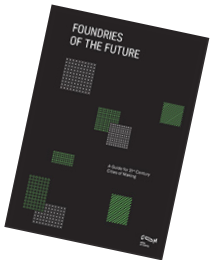
SCENARIOS

speculate on the future plausibility of integrating industries in cities

responding to global trends, technological developments, political decisions

MAIN SOURCES









source: own illustration; Industrial Urbanism; Foundries of the Future Report; Grand Urban Rules; Dutch New Worlds

INTENDED OUTCOMES

This research aims to reduce industrial sprawl by creating options for cities and municipalities to integrate industries within its existing urban environment in a compact and liveable way. To investigate the possibilities, this research produces three main products that are connected through research by design.

First, this research aims to add to the body of knowledge of spatial integration of manufacturing, mixed-use environments and contribute with strategic urban design patterns that help generate a spatial model. It builds on the knowledge of Foundries of the Future: a Guide to 21st Century Cities of Making, Grand Urban Rules of A. Lehnerer and others. The patterns are guiding instruments for spatial planning as well as urban design to integrate manufacturing industries in cities with other functions. The spatial model demonstrates the potential qualities of live work environments when these patterns are applied.

Second, the design focusses on how to integrate production in a compact, qualitative and liveable way. Many patterns are developed from a certain perspective and involve the concerns of that perspective. For mixed-use development and integration of manufacturing, its impact on liveability is rarely assessed. Moreover, the effects and conflicts between the various patterns, when applied, is not clear. Therefore, using research by design on the testing location this research test the patterns and evaluates its outcomes and interrelations. Supplementing and enriching the existing pattern language related to developing live work environments and industrial integration.

In Zaanstad, the design focusses more specifically on two particular locations. One, an inner-city location where and accumulating conflict exists between the remaining industries and the growing housing demand. Second, an industrial zone or business district which is planned to be transformed into a mixed-use area. As the future is unknown, this research developed scenarios that deal with the unpredictable, trends, technological developments and political decisions. In this way, function as communicative images to promote a desirable future and can give insight into the decisions that need to be made.



source: own photo



Zaanse Schans Zaandam, the Netherlands

II

PART II SPATIAL QUALITIES

4. Spatial strategies and policies	*What needs to be more strict and what flexible in planning strategies for live-work environments? framework/ plan vs patterns.*	*Choice to work with patterns*
5.1 Patterns from Theory	*Spatial qualities from theories* Set up of qualitative framework for case study analysis. Collection of patterns from existing practices.*	*8. Pattern Language*
5.2-3 Case Study	*Synthesis of the spatial analysis of 3 selected cases using the Qualitative Framework. Collection of patterns from empirical observation.*	
5.4. Transferability of the Patterns	*To what degree are the patterns derived from the cases transferable to Zaanstad.*	
6.1 Industrial Epochs	*The historical analysis of the geography of production in the Zaanstreek - Collection of patterns from Zaanstad.*	
6.2 Spatial manifestation of industries	*Characteristics of the spatial organisation of industrial premises and other functions - Collection of patterns from Zaanstad.*	
6.3 Spatial profiles	*Characteristics of Zaanse live-work typologies - Collection of patterns from Zaanstad.*	
7. Perceptions	*Interviews with inhabitants and local businesses.*	

4. EVALUATION OF SPATIAL STRATEGIES AND POLICIES OF MIXED USE DEVELOPMENT IN THE NETHERLANDS

Revising the role of spatial planning and design in guiding effective mixed-use development on the one hand and urban integration of industries on the other.

Land-use planning and regulations are seen as the main obstacles to develop successful mixed-use environments (Hatuka, 2017). Similarly, many critics blame planning for the separation of uses in modern cities (Rowley, 1996) and question the value of planning. To date, activities are still required to follow outdated, one-size-fits-all regulations (Hatuka, Ben-Joseph, & Peterson, 2017) and planners still consider industries undesirable in combination with other land uses (Grant, 2002). Despite the fact that industry has changed, units have become smaller, more flexible and technology has reduced pollution risks and nuisances (Angotti & Hanhardt, 2001). It has been argued that contemporary practice avoids political controversy and uses overly strict and conservative regulations (Klosterman, 1985). There seems to be gap between spatial planning's potential and its performance.

Therefore, this chapter aims to answer 'To what degree does spatial planning guide successful mixed-use development and the integration of industries in urban environments of the Netherlands?'. First the context is framed, shifts taking place in views on planning's value and spatial planning types. An overview of the planning practice in the Netherlands is presented. Following, the Eastern Docklands (Oostelijke Haveneilanden) and Buiksloterham cases are reviewed. Insights are gained about the link between spatial planning approaches and the successfulness of mixed-use development and integration of industries. It concludes with what role spatial planning needs to play to uphold the public interest including economic values and vice versa.

The value of planning

The value of planning has been questioned regularly since the 1970s. While the post-war social democratic ideals supported public involvement in the free market to uphold social and environmental values. Gradually, these have been replaced by neoliberal values and a depreciation of planning interventions in a free market. Instead, advocating economic growth and competitiveness (Davoudi, 2016). Arguments against planning and regulations claim that it may suppress initiative, innovation and create unnecessary financial and administrative complications (Klosterman, 1985). Nevertheless, a large body of knowledge favours planning. Used appropriately it can achieve desired qualities, such as adapting to climate change, protecting spatial qualities, battling sprawl and many others (Albrechts, 2004; Davoudi, 2016; Kim, 2011). According to Klosterman (1985), planning can achieve stability more successfully compared to unpredictable market forces and only the government can ensure that long-term ambitions, effects of individual and group actions are considered. Likewise, Davoudi (2016) asserts the original purpose of planning is to realise social and environmental qualities, despite the struggles of quantifying them financially. Planning is needed to correct market failures to protect spatial qualities from opportunism (Faludi, 2000; Klosterman, 1985). In other words, the more general objective, is to promote public interest. However, as stated by Lehnerer (2009) "The core problem of every urban design action is, to begin with, the definition of the public interest" (p. 74). In relation to planning often social and environmental values are mentioned. Yet, economic values are just as important for planning though it is rarely seen as a public interest.

To achieve these objectives different planning types and instruments can be applied. Faludi (2000) and Albrechts (2004) describe two types, strategic planning and project planning.

	Project plans	Strategic plans
Object	Material	Decisions
Interaction	Until adoption	Continuous
Future	Closed	Open
Time-element	Limited to phasing	Central to problem
Form	Blueprint	Minutes of last meeting
Effect	Determinate	Frame of reference

F.12 Two types of plan from Faludi (2000)

4.

Lately, a lot of strategic planning is taking place at the level of the city and urban agglomeration. It is already accepted practice in Europe (Albrechts, 2004; Healey, 2006). Strategic spatial planning is becoming fashionable to deal with increasingly complex urban regions. Urban development can be rapid, random and create the problem of fragmentation (Breheny 1991, in Albrechts, 2004). Urban regions have to respond to dynamic and unpredictable changes while maintaining some stability. Frames are needed that guide development beyond considerable time-spans without losing relevance. Rise of environmental concerns have emphasised this need for long-term thinking. Moreover, a significant increase in interests at all scales can be seen in development. Governments want to address these issues in an integrated way, resulting in an interest in strategic approaches (Healey, 2006). A shift in planning style is taking place in which stakeholders are more actively involved in the process.

However, according to Albrechts (2004) co-production of plans with major stakeholders and the involvement of vulnerable or under represented groups is generally absent in land-use planning practices. Stakeholders are not provided with complete information, are involved at a late phase in the process and their input is often seen as advice rather than given real weight. At the same time, it is regarded necessary and something positive to subject some form of steering to private desires to uphold public interests (Lehnerer, 2009). Albrechts (2004) argues there is enough reason to suggest that planning systems should become more open and flexible to create a more resilient system that can adjust to social, economic, environmental and even political changes.

Economic activity has changed, but also social and cultural perceptions and actions. It may need a new more open type of government structure that allows for strategic approaches, incorporates short-term actions with long-term visions and involves stakeholders in the planning process. Suitably defined and managed performance standards, building codes and development requirements may guide the land development process more effectively than traditional master planning, zoning techniques and strict land use regulations (Klosterman, 1985). These shifts in planning style on a European level can be seen in the Dutch planning system as well.

The effects of regional spatial planning on the spatial distribution of urban industrial land

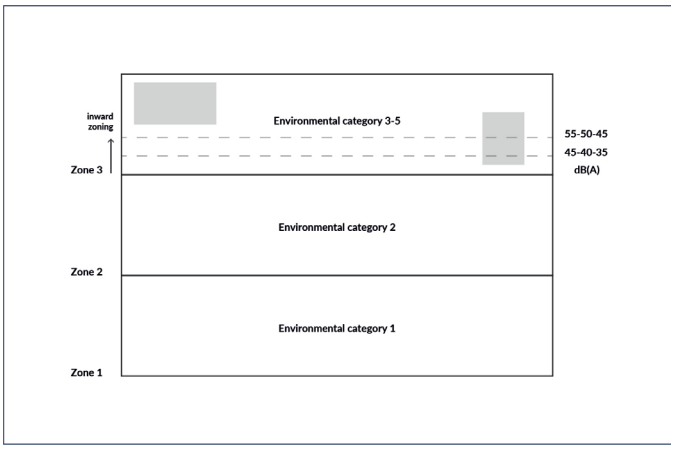
In the Netherlands, on a regional level, strategic structural visions lay out where business or industrial sites may locate. Based on the more detailed land use plan, the municipality can develop these sites. The local government tries to buy all the necessary land and prepares the basic services. Afterwards, it can be sold or leased to businesses or property developers. The Dutch policy for providing industrial land seems successful. Demand is met by developing new industrial districts, mostly at the edges of cities and infrastructural nodes. Overtime, a lot of businesses have relocated there.

However, there are several related issues. Louw & Bontekoning (2007) raise two main issues, namely industrial sprawl and revitalisation of left-behind out-dated sites or brown fields. It is practically impossible to establish a site outside of a business district. Businesses from other regions can only choose to relocate to a business site. Sometimes firms cannot expand on their initial location due to scarcity of land or restrictions in land use, forcing them to move. Some regions are experiencing scarcity of land to develop business sites (Louw, 2000). Studies claim that land use regulations and real estate pressure on developing housing can constrain the supply of developable land and result in the increase of land prices, making it too expensive for businesses to locate in urban environments (Kim, 2011). Moreover, out-dated sites that do not meet the needs of businesses anymore are rarely redeveloped. It is difficult, time consuming and its costs are often higher than property revenues (Korthals Altes & Tambach, 2008). As a result, businesses often have no choice but to relocate.

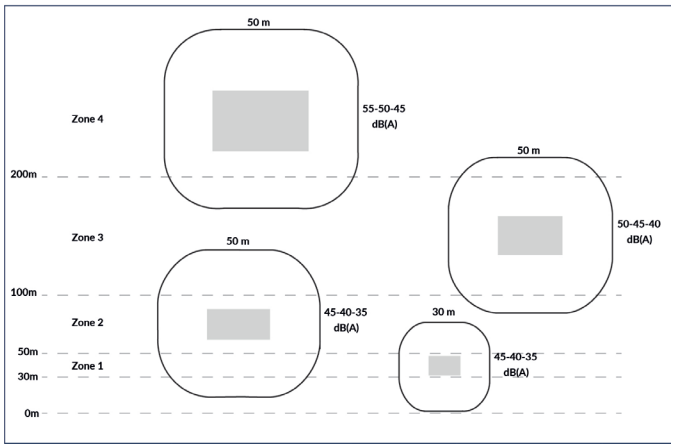
Notably, most of the housing demand is met by the transformation of out-dated business or industrial districts, railway yards or former military, hospital, school areas and alike (Korthals Altes & Tambach, 2008). Especially because demolition of old housing areas usually does not produce more homes, as new homes are often larger than the ones demolished (Wood, 1998 in Korthals Altes & Tambach, 2008). Other studies (Lester et al., 2013; Louw & Bontekoning, 2007) have shown that though residential developments may integrate mixed-uses, new industrial land is not taken into account. Densification and mixed-use policies on industrial districts hardly seem to have an effect on industrial sprawl.

An overview of the Dutch planning system

The Netherlands has a comprehensive planning system that operates at local, provincial and national levels. Similar to most of Europe, the Netherlands is strategic at the national or regional level and uses land use planning at the municipal level (Albrechts, 2004). The main national interests of the central government are documented in a national spatial policy (Rijksoverheid a, n.d.). Ambitions concern national interests such as strengthening the economy, improving infrastructure and networks, improving air, water and soil quality, protecting the country from flooding and protecting cultural and natural heritage. Based on these ambitions the relevant ministers create one or more structural visions (*structuurvisie*). These are strategic planning documents for the whole country that support good spatial planning and describes how to achieve these ambitions related to major spatial development issues that need to be addressed strategically. Not only the planning department publishes such spatial policy documents, but also the departments of transport, agriculture and economic affairs with spatial concepts that suit the concerns of their own (Faludi, 2000). Spatial planning is not only addressed by planners but is also a multidisciplinary endeavour.
The municipal and provincial level make structural visions as well, some in collaboration with each other. In general, the provinces are responsible for enough green space in and around cities. While, municipalities are responsible for development of housing and industrial areas (Rijksoverheid a, n.d.). Next to structural visions, land use plans (*bestemmingsplannen)* are important spatial development instruments also used as direct reference for requesting building permits. It is a detailed and binding plan that covers relatively small areas and shows site-specific zonings for building, land-use and infrastructure. The central government checks whether the structural visions of provinces or municipalities do not conflict with the national ambitions (Rijksoverheid a, n.d.). The land use plan is also subject to provincial approval and is assessed on whether it matches with the provincial structural vision (Faludi, 2000).



F.13 Existing zoning system with environmental categories



F.14 Environmental zoning under the New Environmental Act

Currently, functional separation is realised with a system of inward environmental zoning for industrial districts, when the distance to housing increases, the environmental category that is allowed increases as well (see F.13). An environment category is assigned based on its function or business activity. With this method, businesses are assigned a specific location in a land use plan that allows certain functions. Moreover, it is not possible to integrate the relevant environmental performance standards (Bruinsma & Barrois, 2019). Because of this, recently the need arose to shorten and simplify decision making in spatial development. Particularly in the transformation of business districts to mixed-use environments, that experience various barriers due to the environmental regulations set by the land use plan. Therefore the Environmental Act (*Omgevingswet)*, is planned to replace the current spatial planning law in 2021, *Wet ruimtelijke ordening* (Rijksoverheid a, n.d.; BZK, 2019). The new act will combine different laws concerning construction, the environment, water, spatial planning and nature and encourage participation in the development process. It aims to balance the uses and protect the living environment (Rijksoverheid c, n.d.). Until the implementation of the new act, since 2018 the Transition law *(Transitiewet*, *Tw*) previously the Crisis and recovery law *(Crisis en herstel wet*, *Chw)*, ensures that selected development projects can start faster (VNG, 2018). With it, the development of sustainable projects is stimulated by allowing to deviate from certain building regulations and environmental regulations. Among other cases, certain desirable spatial developments that are hindered by environmental limits are selected. The *Tw* allows for more experimentation and regulatory flexibility in these projects (Rijkswaterstaat IenW, n.d.) This way, a project can easily be selected for a land use plan with a broader, experimental scope and as a result anticipate future development under the new Environmental Act.

In the new Environmental Act the existing multiple land use plans in a municipality will be replaced with one environmental plan *(omgevingsplan)* for the whole municipality (Bruinsma & Barrois, 2019). Its goal it to organise space in a more flexible and general way, balancing the use and protection of the living environment. The most notable difference is that the environmental plan has a larger scope than the land use plan and does not limit itself to spatial planning only. It aims to balance functions and locations, while it can also include rules about activities that impact the physical living environment.

The new Environmental Act presumes decentralised regulation, meaning regulations are made locally, giving local governments the opportunity to adjust policies more fittingly to the context. Furthermore, existing situations will not by default receive right of transfer to the new environmental plan when it is changed. The existing situation can be adjusted according to what is desirable for that location, making it easier to adjust existing rules more easily to new developments and visions.

These changes will have an impact on the development of mixed-use environments and for the integration of industries on urban business and industrial areas. Instead of environmental zones that allow certain environmental categories, the new environmental zoning allows a certain environmental utilisation space (*milieuruimte)* for noise and smell depending on the zone (see F.14). More broadly, in the new Environmental Act a utilisation space (*gebruiksruimte*) is used to describe a legal arena in which certain activities in the physical living environment are allowed. Depending on the distance to residential areas, each business that is located within a particular zone receives a standard environmental utilisation space appropriate to that zone. Being as activities will no longer have an environmental category bound to a land use plan, there will be more flexibility for businesses to locate and customise environmental performance to its urban context.

source F.13-F.14: Bruinsma, R., Barrois, J. (2019). Milieuzonering Nieuwe Stijl. Den Haag, The Netherlands: Vereniging van Nederlandse Gemeenten (VNG).

On another note, residential gentrification can result in the loss of manufacturing jobs. Subsequently, has the additional effect of creating a spatial mismatch between jobs and housing (Kim (2011). Similarly, to attract companies to new business districts particular qualities are assigned that fit the criteria of a chosen target group. Typically, sites are differentiated into offices, high-tech activities, manufacturing or distribution and transport companies. This is included in land use plans and urban design (Louw, 2000). Consequently, it supports the segmentation of the private sector further.

The Dutch planning system has promoted compact city policies since the 1980s, allowing new developments to only take place in highly concentrated form within the existing city boundaries (Zonneveld, 2005). Nonetheless, it has not included compact development of industrial sites. Lately, new business districts and expansions have contributed more to sprawl than residential areas.

It is rare for governments to be as involved with the spatial distribution of industrial sites as is common in the Netherlands. Private parties have a restricted role in the supply of industrial land (Louw & Bontekoning, 2007). Active involvement in the land market influences the decisions companies make to locate. There are advantages to this on the municipal level (Louw, 2000). When the municipality is the land owner, numerous conditions can be included in the sales contract, that cannot be enforced through a land use plan. The timing and phasing of development in the area can be controlled, by deciding when to sell. Furthermore, the development preparation costs can be included in the selling price. However, more and more private developers are interested in purchasing land, securing it for future development (Louw, 2000). This increases the competition of land and raises the land prices. It becomes harder for the municipality to purchase land and reduces the ability for municipalities to recapture development preparation costs. When the municipality is not owner anymore, it needs other ways to exert control.

Effects of local spatial planning practices on mixed-use developments

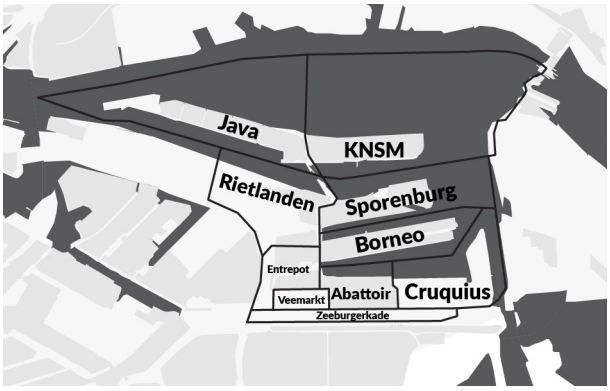
Both the Eastern Docklands and Buiksloterham are transformation locations of industrial areas into mixed-use environments in Amsterdam but in different time periods. The type of planning used during that time has been reviewed, whether it was more strategic or project based focusing on the local level. Moreover, what the ambitions were for mixed-use development. Lastly, whether the mixed-use development was successful and whether it encouraged integration or displacement of businesses and industries (to read more about the cases go to Appendices 1.).

In the Eastern Docklands a shift can be seen in mixed-use policy, from district to block and to the building level. According to Hoppenbrouwer & Louw (2005), the transformation into a mixed-use environment has been successful. The initial estimate in 1987 was to realise 800 jobs. In 2005 more than 1600 jobs were counted in their research. More than half consisted of small-businesses and most of the employment in the service sector, located in the residential areas. While traditional sectors such as manufacturing and trade were found on the business districts, providing for more than 20% of the employment opportunities in the entire area. Notably, their research revealed that while creating mixed-use environments was the objective, many people and businesses view the Eastern Docklands as a residential area. Currently, Cruquius (initiated in 2011) and Zeeburgerkade (no starting date yet) are planned to be transformed into mixed-use environments (Gemeente Amsterdam a, b, n.d.). These transformations possibly mean a loss of jobs in the manufacturing, distribution services and logistics sector. As these have remained mainly on the industrial districts that were not mixed with residences.

Even though parts of the developable area in the plans for Buiksloterham were reserved as business district, following the existing land use plan. Remarkably, while in 2007 different locations were assigned a certain working living balance, including areas where the balance shifted towards working. In the 2019 version, all remaining plots are assigned a programme where living dominates. This means that in the remaining developable plots it will be even harder to realise a mix with businesses that are known to need more space. Generally residential areas allow non-residential uses mixed vertically, with small-scale offices and businesses that can be stacked into multi-level buildings. Especially together with the housing and densification pressure, weaker economic functions come under



F.15 The city of Amsterdam (municipal borders in black)
1. Northern IJ river bank area 2. Eastern Docklands (own illustration)



F.16 Eastern Docklands neighbourhoods



F.17 Northern IJ river bank neighbourhoods

source F.15-F.17: own illustrations

pressure and might assist further displacement of industries. According to the municipality, displacement of extensive businesses is unavoidable. Still, the ambition remains to create productive neighbourhoods that integrate business spaces used for production, repair, storage and transfer of goods (Gemeente Amsterdam, 2019). The municipality of Amsterdam might have set mixed-use and densification ambitions too high for the remaining plots.

These issues are still reflected in the current planning practices. The government has a lot of influence on the spatial distribution of industries. The compact city strategies have focussed more on delivering housing in high densities and have not included the integration of industries in mixed-use development or the compact development of industrial or businesses sites. Leaving industrial sprawl unaddressed. There are several reasons for this.

First, structural visions lay out where business or industrial sites attracting different target groups may locate, supporting further segmentation. This is also happening to mixed-use developments. Such as the introduction of concepts such as the productive, creative or innovative neighbourhoods in the structural visions of the municipality of Amsterdam (Gemeente Amsterdam, 2017). This limits settlement locations for businesses that do not fit the target groups.

Second, many mixed-use transformations locations are allocated to out-dated business districts and brownfields. In both the Eastern Docklands and Buiksloterham this was the case. However, these transformations hardly have an effect on industrial sprawl. Often growing businesses have no choice but to relocate due to land scarcity or restrictions in land use plans on urban sites. Only Cruquius and Zeeburgerkade were kept as business districts in the Eastern Docklands. Here, most of the manufacturing is located. The recent transformation plans for these areas possibly threaten its existence. In Buiksloterham, ideally displacement is prevented by the condition that no party is forced to leave the to be transformed area by the municipality. Moreover, part of the area remains a business site. However, the 300.000 m2 of business situated in the area in 2009 lowered to 200.000 m2 in 2019 after the first homes were introduced. Still, it is only an indication not proof for contributing to industrial sprawl. However, displacement of industries is certainly the case.

Third, it is almost impossible to establish a site outside of a business district. However, the intention is to solve this issue with the implementation of the new Environmental act. The effects of the new Environmental act will not be known until implemented as the *Chw* and *Tw* only apply to selected projects. However, potentially businesses have more options to locate in a performance based zoning system compared to function based. Additionally, it possibly encourages business to perform better environmentally.

On a municipal level still primarily land use planning is used. The Eastern Docklands were developed completely with a land use planning approach. In Buiksloterham however, the municipality shifted to a more strategic plan only assigning rules, no detailed frames and designs. Several issues arise with the development of mixed-use environments when using land use plans or more strategic plans.

First, not surprisingly, also on a local level the focus is still primarily on housing. Though the mixed-use development in the Eastern Docklands is considered successful. Only small-scale business in the service sector were mixed in the residential neighbourhoods. While manufacturing and trade were primarily located on the remaining business districts. When these remaining business districts are transformed, it is uncertain whether a diverse range of sectors is still available or predominantly services. This conflict can also be seen in Buiksloterham. Key difference is that the density ambitions have increased drastically over time. In the first plans different plots were assigned different balances of living and working with fitting densities. In the new plan, all the remaining developable plots are assigned a programme where living dominates. It is already hard enough to achieve attractive environments without the additional density ambitions (Korthals Altes & Tambach, 2008). The housing and densification pressure, strain weaker economic functions and assist displacement of industries.

Second, in the case of the Eastern Docklands, the municipality owned all of the land and selected market parties to develop it. Development preparations costs could be recaptured, timing and phasing of development controlled and additional conditions demanded. However, as more and more private developers purchase land, in Buiksloterham the municipality only owns a third of the land. Consequently, there is no control over the phasing of the development of other parties, nor can parties demand development of the surrounding public space of their plot by the municipality. Moreover, though deviation from the land use plan is allowed, it is still a valid legal reference. When development deviates, stakeholders can object and delay the development process. These issues complicate the development process.

Third, mixed-use development may be limited not only by planning approaches but also by such as environmental regulations protecting people from nuisances. It needs to be kept in mind that comprehensive transformation of an area is very complex.

Conclusion

To answer what role spatial planning needs to play to guide mixed-use development and the integration of industries in urban environments more effectively, a literature and a case-study have provided further insights. Spatial planning needs to adjust their strategic plans by revising the ambitions they want to achieve and reflecting on the purpose spatial planning was intended for. To promote the public interest, to realise social and environmental qualities as well as achieve economic values. There are enough reasons for a more open and flexible spatial planning system that is less strict in regulating definitive land uses. A more resilient system that can adjust to social, economic, environmental and even political changes is needed. More strategic approaches could ultimately be more effective than the traditional approaches. However, for any type of planning approach to work. It needs to be decided what takes precedence, meeting the housing demand, creating attractive vital environments or supporting compact development and thus preventing sprawl of all kinds. Planners need to realise that the effects of the choices made may conflict with the initial ambitions and therefore need to be adjusted. What is still lacking is the conscious integration of industries and managing and understanding of the effects of displacement of industries. The spatial organisation of businesses should be considered a public interest. Based on this, urban regions, cities and municipalities can rethink their strategic approaches in distributing industrial and business districts.
Though strategic plans do provide more opportunities to mix uses naturally. For them to be more effective than land use plans, the plans need to deliver clear and solid ambitions and set priorities. It can be audacious, but most importantly it needs to be communicated clearly to all parties. A planning style is required that involves stakeholders, of both residents and businesses, more actively in the complete process is essential in achieving these ambitions. Mixed-use development and urban integration of industries remains a complex endeavour, especially due to the related nuisances, environmental risks and pollution. Technological developments will play a key role in resolving these issues. However, collaboration and negotiating with businesses on how to achieve better mixed-use environments is just as important.

Implications for further research

Based on this review, this thesis will address the need for a more open and flexible planning system by researching the potential of patterns as a strategic instrument for spatial planning on local scales and city level.

The assumption is that suitably defined and managed performance standards, building codes and development requirements may guide the development of mixed-use environments more effectively than traditional master planning, zoning techniques and strict land use regulations.

The spatial consequences of the shift from land use plan to the environmental plan under the new Environmental Act will affect live and work environments. By testing prevailing patterns on how to create mixed-use environments and achieve urban industrial integration with research by design, it is evaluated whether this strategic instrument is enough to ensure spatial qualities and enable the development of liveable live and work environments that integrate manufacturing*. Moreover, whether the prevailing rules are sufficient to achieve this, need more refinement, or whether strict regulations or land use planning instruments are necessary to protect certain spatial qualities.

D.12

QUALITATIVE FRAMEWORK	THEORIES	QUALITY	SCALE
	Manufacturing / *Industrial intensification* / *Compact city* / *Vitality* / *Liveability*		*Building level* / *Block or street level* / *District level* / *City level*
1.  **FORM URBAN INTEGRATION**	M I C V L	Density	B BS D C
	M I C V L	Diversity	B BS D C
	M I C V L	Adaptability	B BS D C
	M I C V L	Identity	B BS D C
2.  **PLAN PROGRAMME**	M I C V L	Density & Diversity of functions	B BS D C
	M I C V L	Level of mixed-use/ Zoning/ Separation	B BS D C
	M I C V L	Access and Avaiable (public) spaces amenities	B BS D C
	M I C V L	Sharing	B BS D C
3.  **NETWORK CONNECTIVITY**	M I C V L	Permeability	B BS D C
	M I C V L	Multimodality (availability & accesibility)	B BS D C
	M I C V L	Hierarchy	B BS D C
4.  **ENVIRONMENTAL QUALITY**	M I C V L	Building Quality	B BS D C
	M I C V L	Views/ Visibility	B BS D C

5.

5.1 PATTERNS FROM THEORY

Analysis of existing live work patterns

This theoretical analysis focusses on the spatial qualities related to live work environments. The qualities promoted by theory were divided into four categories: form, programme, network and environmental. The different theories are compared to each other in terms of the themes covered. Naturally, there are also patterns related to for example people and organisation that have a big impact on the social acceptance and inclusiveness of designed or existing live work environments. However, as these patterns are used for a design research, only the spatial qualities are chosen for further research. Similarly, spatial qualities of liveability are investigated. As liveability is often considered the main conflict in achieving density and mixed-use. This does not mean that other components of liveability such as social safety are not as important, but are left out for the purpose of this research.

The theories about *Manufacturing*, *Industrial intensification*, *Compact City*, *Vitality* overlap in many aspects with *Liveability* theory. Diversity, availability and accessibility of functions and (public) spaces are important for both live work environments as well as liveable ones. Especially when density increases, the maintenance of walkable environments becomes important. Multimodality ensures less car traffic, accessible transport options for all, supports live and work movements and accessibility of jobs for all.

In manufacturing theory, architectural quality is promoted for industrial buildings. Likewise, liveability recommends housing quality. Moreover, quality of public spaces, while this is not as important for some types of industries. An environmental quality that is not discussed in compact or live work theories is ensuring safe, clean and organised spaces.

Some environmental qualities mentioned are things such as landmarks, architectural quality of both housing and industrial buildings. Some others are direction of views, active plinths, creating separate identities or walkability. However, there could be more focus on mitigating nuisances (such as noise). Predominantly, aspects mentioned are technical or functional, about spatial requirements for industries or the programme needed, however not that much about the quality aimed for. By including liveability theory more focus is put on environmental quality and integrating human-centred design into work environments. Currently, principles are mostly focussed on residential environments, not mixed environments or for business districts.

Sources of relevant theories *

M *Manufacturing : Foundries of the Future (FF), Productive BXL (PBXL), Oram (O), Design of Urban Manufacturing (DUM), Working Cities (WC)*

I *Industrial Intensification: London Industrial Intensification (LII)*

C *Compact City: Grand Urban Rules (GUR), Metromix (Mx), Hoppenbrouwer (H)*

V *Vitality: Jane Jacobs (J), Montgomery(M), Kevin Lynch (K)*

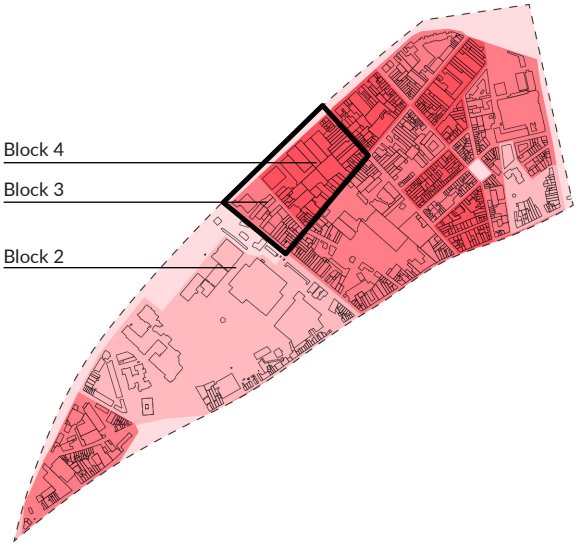
L *Liveability: Dorst, Kotulla et al., Howley et al.,*

Furthermore, often the theory is not specific about the related dimensions or amounts of the qualities mentioned. In principle, these are determined by the context. These qualities are for example, high density (M, Mx), or high levels of ground coverage counter balanced by the correct amount of open space (M). It is interesting to know what qualities these guidelines aim to achieve and what the limits are in relation to other qualities.
Diversity of businesses (SME's), primary and secondary functions, number of key people attractors (M, J, FF, PBXL), say something about programme, but what is the minimum of diversity needed. Moreover, where should these be located in relation to one another. Hoppenbrouwer (2005) does mention the spatial positioning of key people attractors both public and private need to be dispersed. Though, this can be realised in varying ways on different scale levels. In this case the quality aimed for is clear, activities on the streets at various moments of the day.

It is important to remain critical about certain practices and theories. Some directions can be too specific, such as an MXI of 0,4-0,8 depending on the context (Mx). Though this guideline is proposed for urban high density development, it is questionable whether it is it desirable for all blocks to have a mix of functions on block level. Other recommendations remain too vague about how to achieve the proposed qualities. Such as promote street life and people watching (M, J, K), be creative with parking solutions (O) or solve physical barriers (Mx).

From theory a lot of patterns can already be found ready for use. However there are also qualities that are promoted by theory that are not very concrete. What are the dimensions or amounts on what scale level is it important? The purpose of the case study and spatial analysis of Zaanstad is to provide more concrete guidelines in terms of dimensions and configurations in relation to the environmental qualities in various ranges of live work environments.

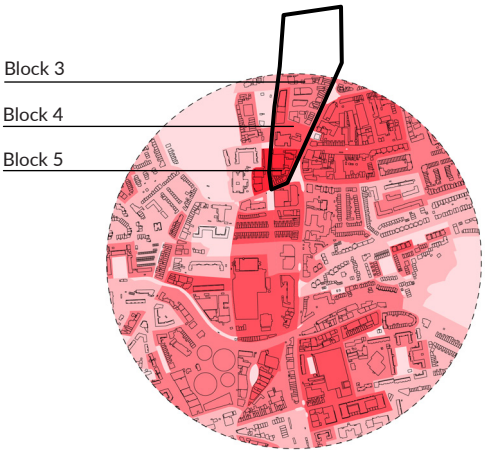
* see the reference list for full source reference



Brussels

Blocks

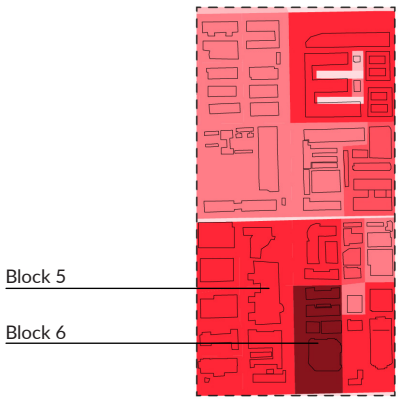
6 | FSI 14.0	GSI 0.54
5 | FSI 5.64	GSI 0.49
4 | FSI 3.89	GSI 0.64
3 | FSI 3.05	GSI 0.51
2 | FSI 1.84	GSI 0.33
1 | FSI 0.01	GSI 0.06



London

Blocks

6 | FSI 8.7	GSI 1.0
5 | FSI 3.3	GSI 0.5
4 | FSI 1.7	GSI 0.5
3 | FSI 1.1	GSI 0.3
2 | FSI 0.7	GSI 0.2
1 | FSI 0.0	GSI 0.0



Shenzhen

Blocks

6 | FSI 10.0	GSI 0,43
5 | FSI 4,91	GSI 0,31
4 | FSI 3,53	GSI 0,56
3 | FSI 2,46	GSI 0,35
2 | FSI 1.57	GSI 0.20
1 | FSI 0.01	GSI 0.00

F.18: block types result of cluster analysis

5.2 CASE STUDY

Representative mixed-use blocks from 3 selected cases

Three neighbourhoods were chosen as exemplary cases. Kuregem in Brussels, Hackney in London and Huaqiangbei in Shenzhen. As each one is considered a successful mixed-use environment.

A cluster density analysis resulted in 6 block types per case. The block types were overlapped with clusters of functions in the neighbourhood. Several blocks were selected from each case that were relatively dense compared to other blocks in the neighbourhood and show a mix on block level. The three cases and the selected blocks are shown above.

The Brussels case blocks have high ground coverage, but are relatively low rise. Building levels are on average 3-5 levels corners of blocks can be 5-7 levels. The block has a representative side with a continuous facade, fine grain and hard edge, and a functional side with a soft edge, larger grain and more openings. The functional side is oriented towards the water. These blocks blend into the rest of the neighbourhood and city with a similar density. There are some small pockets of public space or greenery.

The London case has the lowest density compared to the other cases. Configurations of various buildings form an open block. The facade along the highstreet is continuous and has a hard edge. Permeability is high, as the open blocks often allow streets passing through. There is more variety of densities, ground coverage and building height between blocks than within the block. Built up areas are complemented by large green areas with sports.

The Shenzhen case consists of relatively large singular buildings acting as blocks directly along a wide street or boulevard. Some blocks include towers on top, sometimes with a setback. Streets are wide and have a lot of trees along them. The streets act both as transit and public space. Ground coverage is relatively low. Densities are achieved by height. Most of the plinths are occupied by functions. Some configurations close off an internal space with private terrain, used for for example parking. Some residential slabs are configured into a block with additional plinths.

F.19 Positioning of the selected cases in the city*



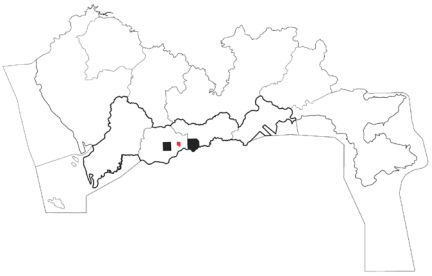
Zaanstad



Brussels



London



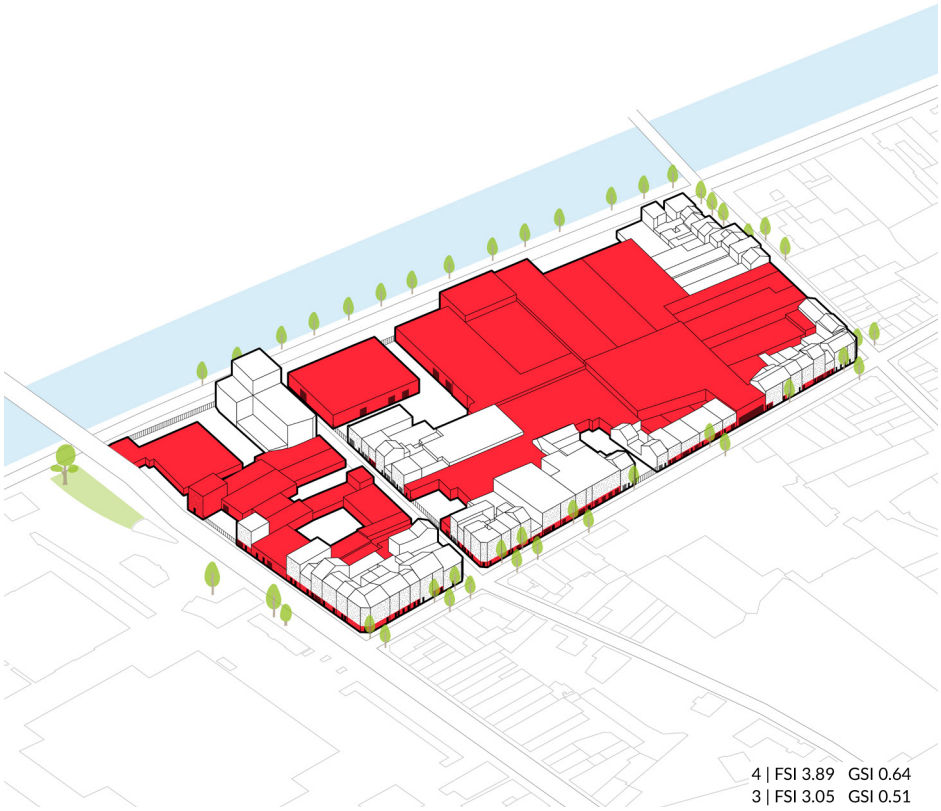
Shenzhen

* red dots location of selected neighbourhoods

* in red other functions
in white residences

Brussels case

B



4 | FSI 3.89 GSI 0.64
3 | FSI 3.05 GSI 0.51

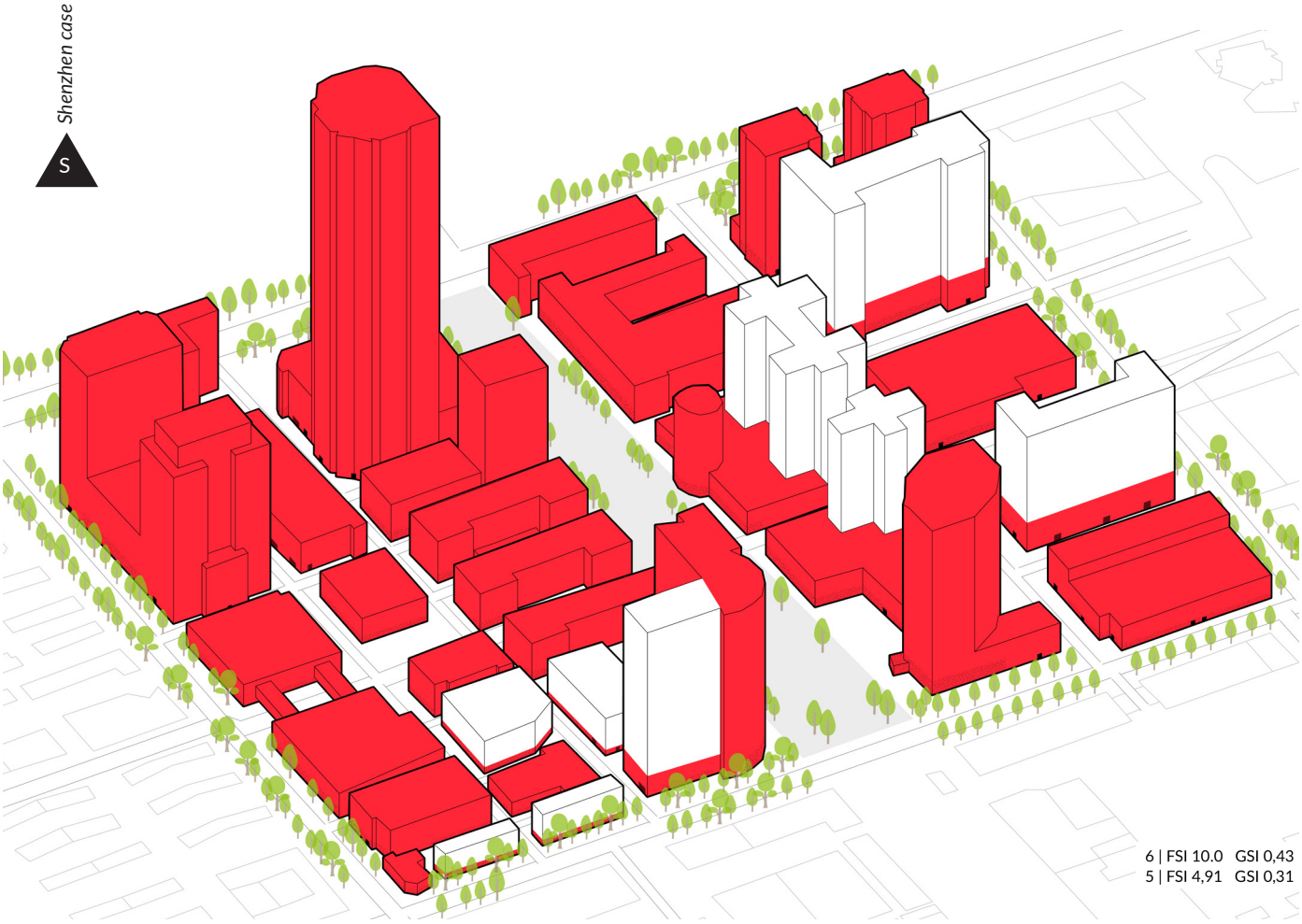
London case

L



5 | FSI 3.3 GSI 0.5
4 | FSI 1.7 GSI 0.5
3 | FSI 1.1 GSI 0.3

scale: 1cm ≈ 40 m

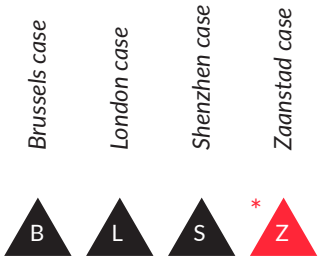


source: own illustrations

D.13

QUALITATIVE FRAMEWORK	QUALITY	CASE BRUSSELS	CASE LONDON	CASE SHENZHEN
1. FORM URBAN INTEGRATION	Density	*		
	Diversity			
	Adaptability			
	Identity			
		B BS D C	B BS D C	B BS D C
2. PLAN PROGRAMME	Density & Diversity of functions			
	Level of mixed-use/ Zoning/ Separation			
	Access and Avaiable (public) spaces amenities			
	Sharing			
		B BS D C	B BS D C	B BS D C
3. NETWORK CONNECTIVITY	Permeability			
	Multimodality (availability & accesibility)			
	Hierarchy			
		B BS D C	B BS D C	B BS D C
4. ENVIRONMENTAL QUALITY	Building Quality			
	Views/ Visibility			
		B BS D C	B BS D C	B BS D C

* in red relative to mixed neighbourhood/district in Zaandam



5.3 PATTERNS FROM CASE STUDY

Synthesis of the spatial analysis of 3 selected cases using the Qualitative Framework

An area of approximately 2km by 2km was analysed around each exemplary neighbourhood of the three cases. For a more detailed spatial analysis see Appendices 2. Here, a short description is given of the similarities and differences between the cases. The diagram on the left shows an overview of the qualities of the cases in relation to the characteristics of Zaanstad.

Form | Urban integration

Density The way the different cases achieve density is somewhat similar. In **S** density is achieved by developing high-rise towers. While in **L** and **Z** only parts of the blocks increase in height. **B** is in that way quite different as density is achieved mostly by high ground coverage.

Diversity In **B** there is more diversity of form within the block than between blocks. While in **L** and **S** there is more diversity between blocks than within the block. The sizes of blocks appear to be around 100-120m or shorter. Similar to **Z**, blocks with industries in **B** are larger than residential ones.

Adaptability Large openings are present **B**, **L**, **S** and **Z**. Though in the last three cases often large openings for access are only at backsides of buildings. In **B** the functional part of the block consists of affordable structures, allowing for structural changes. Large premises are surrounded by open space, allowing for expansion or flexible use. In **L**, affordable structures situate particularly near the railway, or inside block configurations. Due to the uneven forms of the blocks, leftover spaces allow for some excess spaces. In **S**, the volumes are relatively fixed, adaptability is mostly on building level, allowing interior spaces to change functions. **Z** mainly has left over spaces surrounding the larger estates.

Identity In all cases identity of form is mainly created through landmarks. There is not a clearly delineated edge, the 3 different neighbourhoods each blend in their areas. The neighbourhood border seems more administrative. This is in contrast to what theory suggests, a clearly delineated edge is supposed to support separate identities (Montgomery, 1998). Perhaps in **S** the delineation is created by the characteristic pedestrian corridor with the buildings along it. In **B**, unity with the adjacent neighbourhoods is created by finishing blocks with larger businesses with a fine grain around the corners.

While the highstreet in **L** seems to connect the diverse form of blocks and neighbourhoods together. The highstreet does that in a similar way in **Z**.

Plan | Programme

Diversity/Dispersion/ Zoning Each case has a diverse range of functions. Commercial as well as amenities, services and productive. In **B** most of the plinths are occupied by functions. There is a lot of vertical mixing. Larger businesses and plots are integrated by mixing horizontally in the block and oriented to one side. The car industry is quite dominantly present in the neighbourhood. In **L** commercial functions are mixed vertically along the highstreet. While offices and amenities are integrated in the blocks adjacent to the highstreet. More productive functions are mixed horizontally integrated or detached from the block. This is very similar to **Z**. In **S** the building houses multiple businesses and often cover the first 3-5 levels of the building or block. Residences are added in towers on top. Residentially focussed areas have functions in the plinth, or on the corner of the slab adjacent to the main street. The electronics industry is strongly represented in this area.

Access to (public) spaces and amenities This is achieved differently in all cases. In **B**, there are smaller public spaces available in pockets of blocks or leftover edges of blocks. Some green (collective) spaces exist within blocks. In **L** the built environment has several large green patches often combined with sports facilities. There are also semi-private/collective green spaces within blocks, or semi-public ones around configurations of slabs. In **S**, the streets are both used for transit as well as public spaces. Small parks along buildings are often situated along streets. There is also a large park in close proximity. Similar to **Z**, the neighbourhood of **S** is in proximity to larger natural protected landscapes. In **Z** however, it is surrounded by natural landscapes from all sides and has a lot of sports facilities at the edges of the city and landscape.

Sharing In all cases there are some buildings housing multiple businesses. In **S** predominantly. There are no other clear forms of sharing found in the cases.

Network | Connectivity

Permeability In **B** the blocks are relatively short, larger blocks are permeable for the businesses that have an entrance on both sides of the block. The residential blocks are shorter (<90m) than the ones including industries (100-130m). In **L** the configuration of buildings loosely into a block ensures a high permeability, particularly for pedestrians. A lot of streets cross through the block configuration. In **S** the buildings that house multiple functions or businesses are quite permeable to the public. People can go through buildings to reach the other side of a large block, at least during the day. Sometimes a large block is interrupted on the ground floor for a street to go through the building to increase the permeability for both pedestrians and traffic. Similar to **Z**, in all cases some blocks that integrate industries are relatively large and interrupt the relative permeable environment. Though some blocks may be configured in way permeable way, the streets are closed off for private use.

Multi-modality In all cases, there is access to multiple modes of transport. In **B** there is are bus and tram stops at the edge of the neighbourhood and a central train station about a km away. There is a canal along the edge of the neighbourhood but it is not used for harbour activities. In **L** there is a metro stop available and a train station is approximately a km away. Many bus stops are scattered through the neighbourhood. In **S** there are 3 different metro lines connect the neighbourhood to the rest of the city. Various entrances and exists to the metro are available with underground facilities and amenities as well. In **Z** one side of the river is better connected to public transportation than the other. Cycling connections are very good. **B** and **S** are very well connected to the city centre.

Hierarchy.

In **B** the highstreet is continuous and connects the inner city with the outer neighbourhoods and districts. While the highstreet curves, the streets going through the neighbourhoods are straight and connect different neighbourhoods with each other. Creating rectangular or triangular blocks with straight facade. The neighbourhood is situated along a transit road that forms a ring around the city centre. It has a wide profile with green and parking facilities in the middle, several metro stops and connects to the outer ring highway. The highstreet in **L** seems to be the continuous structure connecting districts with each other with blocks positioned along it. While streets within block configurations are destination streets. These are more irregular and branch of from the highstreet from various angles. The dimensions of the highstreet are wider compared to the streets in the neighbourhoods. The highstreet is quite similar in **Z**, difference is that large estates situate directly along the highstreet, in proximity of the highway. **S** is surrounded by several larger infrastructures that connect to the rest of the city. permeability within the neighbourhood. These consist of multiple lanes for car and have a very wide street profile. However the most important street for pedestrians is closed off from car traffic with a street profile of 55m and a length of almost 1km. Only a few streets that connect the neighbourhoods cross the pedestrian corridor.

Environmental Quality

Building quality In **B** the buildings have a certain historic quality, but do not seem particularly well maintained. Some better than others. The facade of residences seem often have a lot of attributes, with for example French balconies. While the facade of functional buildings are somewhat plain. There is not a lot of new building activity at the moment. One dense block project along the waterfront.
In **L** several higher density blocks have been built and are being built around the train station of London Fields. As well as along the highstreet some low rise older buildings are alternated with new dense block structures. The more industrial part has some new temporary container structures. While the mixed blocks along Vynerstreet consists of partly new residential apartment blocks alternated with more temporary structures and renovated or old industrial or functional buildings.
In **S** the building quality along the pedestrian corridor is very high. While the structures behind the pedestrian corridor, especially housing seem older and of lower quality. In **Z** there is a big difference between the low-rise historic houses or village houses and the relatively modern or simple architecture of the large estates that also have height accents.

Views/ Visibility In both **B** and **L** there are no significant high-rises to create views from or towards. On a district level both cases have a boulevard along the canal giving some view over the water. In both **B** and **L** the water is not visible from the neighbourhood, sometimes from branching streets. It is a quite functional road, many businesses are located along it. In **Z** and **S** both high-rises create orientation points. Though in the **S** the high-rise also provide views over the city from the building. In **Z** height accents are mainly industrial.

Testing of patterns on different scale levels:

C

City - District
Structure and organisation of transitions and connectivity of district to the rest of the city

D

District - Block
Configuration of volumes and programme, public spaces and views

BS

Block
Configuration of volumes, activities, spaces and its spatial qualities

B L S

Exemplary blocks of Case-study tested on site Brussels - London - Shenzhen version

B

Street & Building
Human scale

Related qualities on eye level
Confrontation of Case study blocks with existing fabric

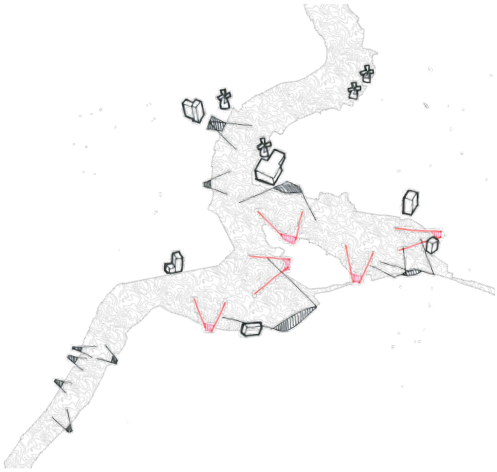
5.4 TRANSFERABILITY OF PATTERNS

Based on the qualitative framework the three cases are analysed and patterns emerge that support certain spatial qualities. These can be pretty specific to the context they are from. In this chapter, by means of research by design, the transferability of the patterns from the cases and theory is determined for the final design. Which patterns and how well these fit into the context of Zaandam.

The patterns are applicable to certain scale levels. Based on the scale level the patterns are tested on the design location. First, the relevant patterns are tested on district level and its positioning in the city. Second, the configuration of blocks and programme and public spaces. Third, a street view presents the potential qualities on eye-level.

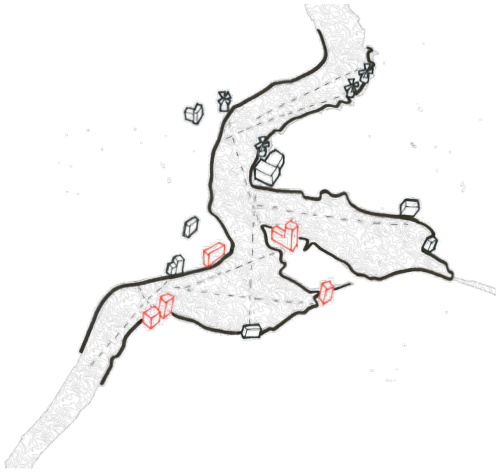
The mixed-use blocks of the exemplary cases are each tested on a chosen inner city location in Zaanstad. This inner city location with fragmented spaces for development was chosen so conclusions can be drawn from how the patterns help integrate these blocks into a different context. If it were to be tested on one large site in Zaanstad, the blocks from the cases may become a separate district from the rest of Zaanstad, while the aim is to find out which patterns fit Zaanstad.

The blocks of the cases are not copied as volumes only, also the spatial organisation of the volumes, its programme, network and related environmental qualities from the case study described in the previous chapter are recreated in the new context in Zaandam.



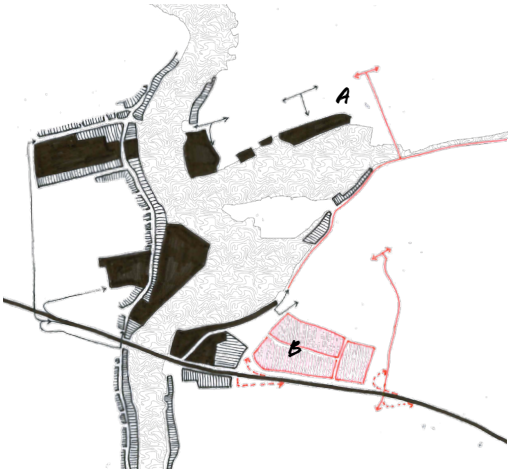
Views & Landmarks
P.9, E.6, E.8

The east side of the Zaan has a lot of opportunities to add views over the water towards landmarks (see X.1, X.2).



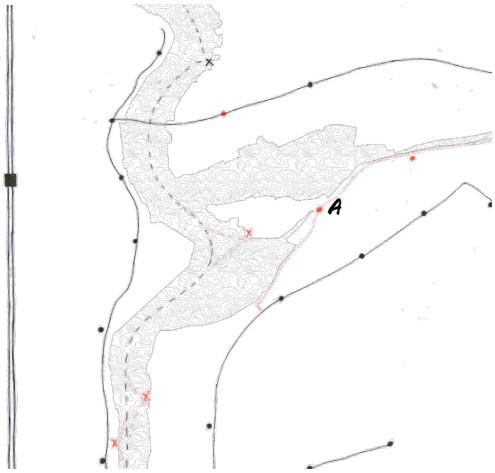
Height accents
F.2, F.3, F.12

Along the Zaan there are some places left that can be densified and given height accents that support the existing height accents (see X.1).



Hierarchy
N.3

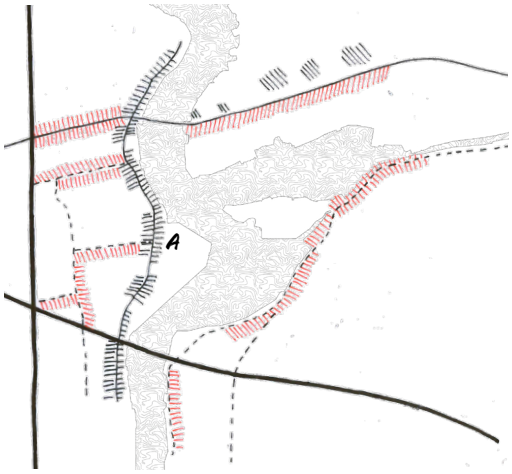
The industrial area (A) is well connected to the regional network, rather disconnected from the local network. There is potential along the A8 highway (B) to place industries as the location is very accessible, even direct connections to the regional network could be introduced (see X.1).



Multi-modality
F.13, N.6

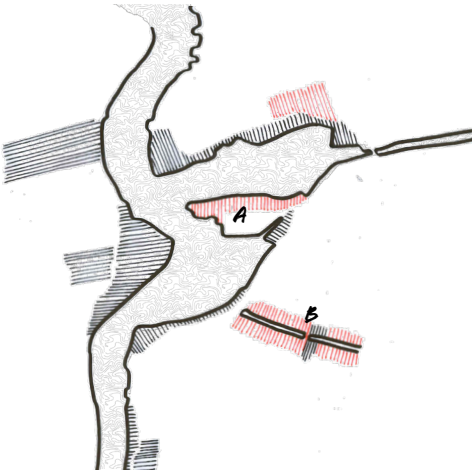
The North-East side of the Zaan has less public transport options. A bus route can be added along (A). When Hemmes is developed, extra stops can be added to the route of the ferry to make short ferry rides possible as well to improve west and east connectivity.

* in red on the maps are potential additions on location: coloured = industry, hatched = mixed, clear = housing



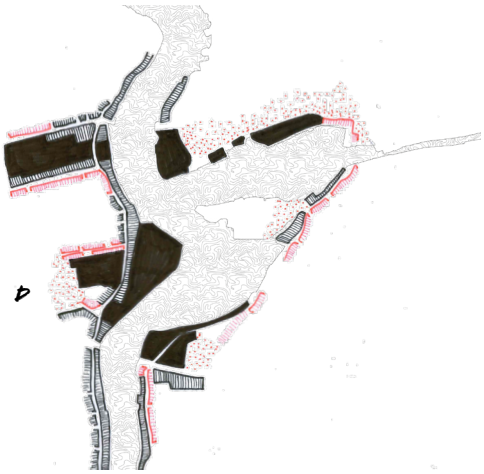
Highstreet as transition
P.11

Along the main highstreet (A) already several industrial estates are located. Using the hightstreet as a means of transition from industrial estates to residential areas, several roads around the industrial estates are potential new highstreets (see X.3).



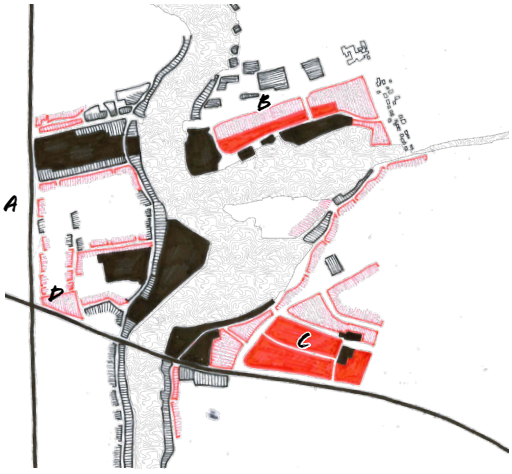
Industry along the water
P.12. P.15

Locating businesses along the water shows potential for Hemmes on the North side (A). Along the small waterway (B) already some industries are located, midst of the sport fields. Potentially here new businesses could be combined with sports facilities (see X.3).



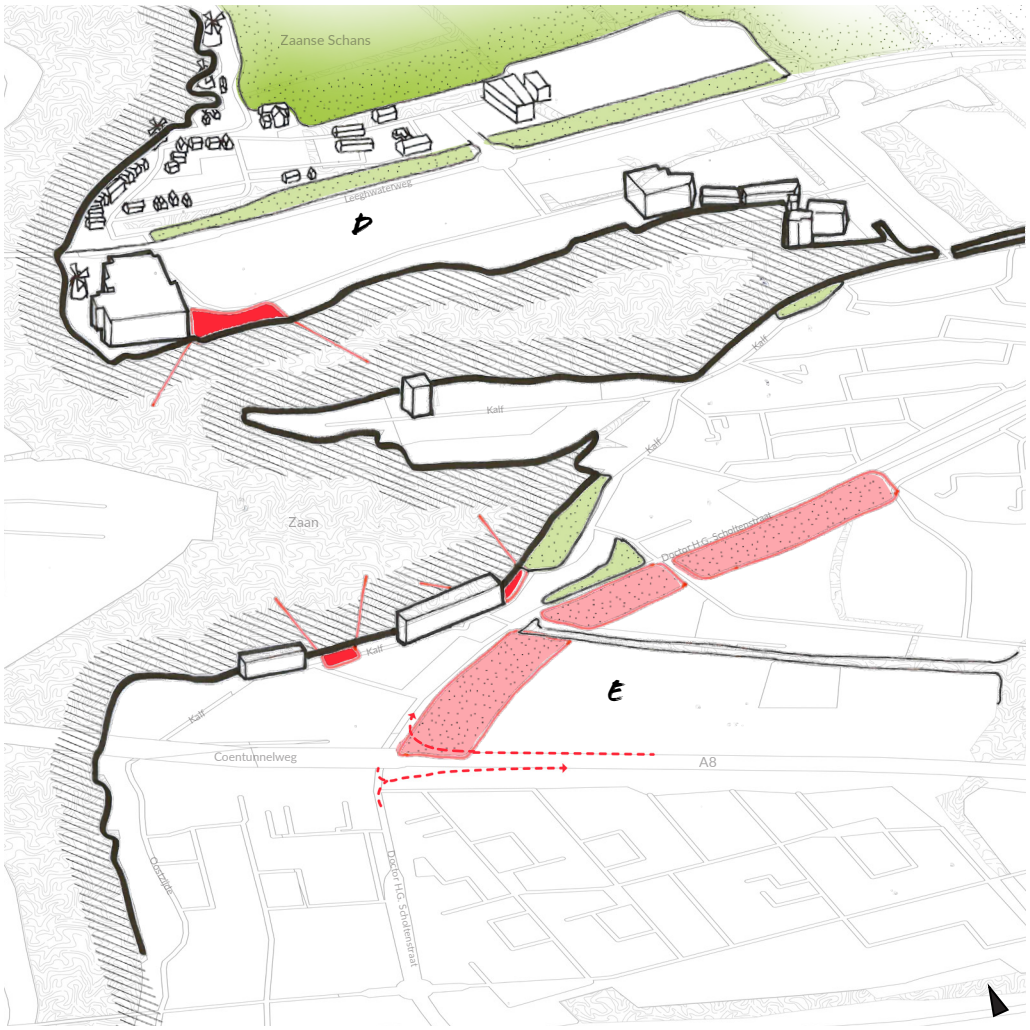
Transition volumes
P.6, P.15

Transitions realised by placing volumes is more appropriate for the West-side of the Zaan river as it is already quite densely built there is no space for transitions by means of public spaces (see X.4). On the East-side of the Zaan there is more space to develop transition spaces instead of volumes (see X.3).



Transition spaces
P.6, P.15

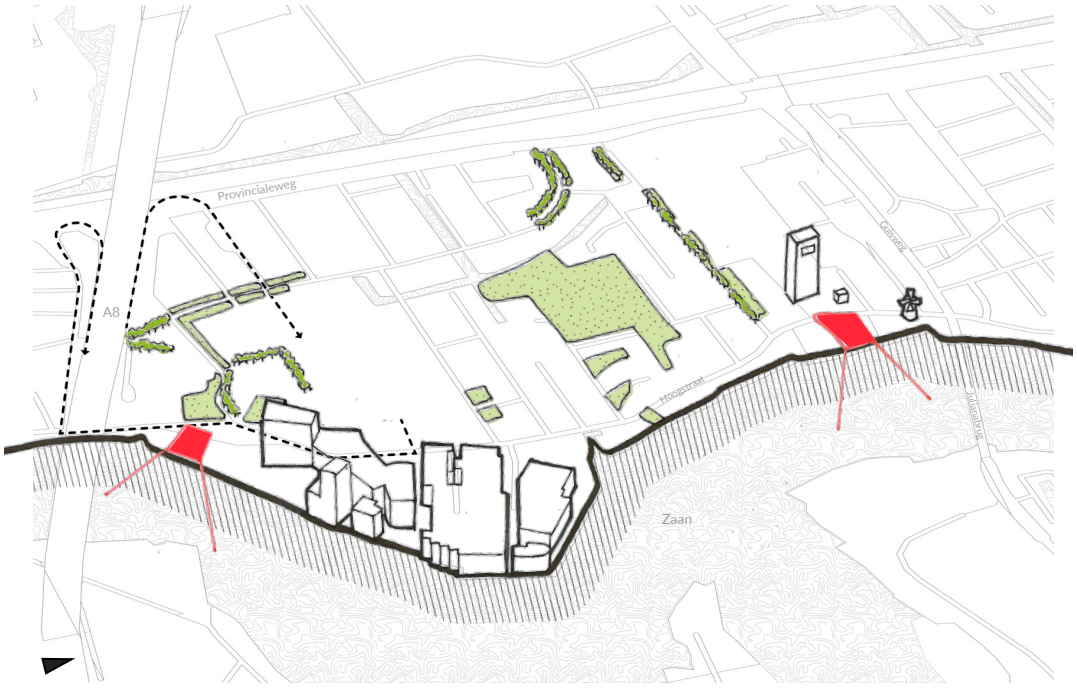
When including infrastructure and railways as something that needs transition, spaces emerge along two roads (A, B). Currently the sports fields (C) are used as transition spaces. Densification with volumes for industries could be a means of combining the noisy highway together with noisy industry. Though in the *transition volumes* exploration it seemed that housing is possible at (D). Because of the heavy infrastructure the suitability of housing there is questionable.



X.1 *Public spaces and network - Zaanse Schans*
P.9*, *P.13*, *N.3*, *E.6*, *E.8

Currently, there are sports fields situated next to the industrial estates at (D, E). It is sufficient as a spatial transition, but for densification purposes the potential for new housing development is limited if the industries stay. The sport fields have the potential to be developed into industrial areas in combination with sport facilities. To keep the green character of the area and dispersion of public spaces, a buffer would be desirable if the sport fields are replaced with buildings.

When developing on open spaces it needs to be kept in mind that enough small and larger public greenery remain available for inhabitants.

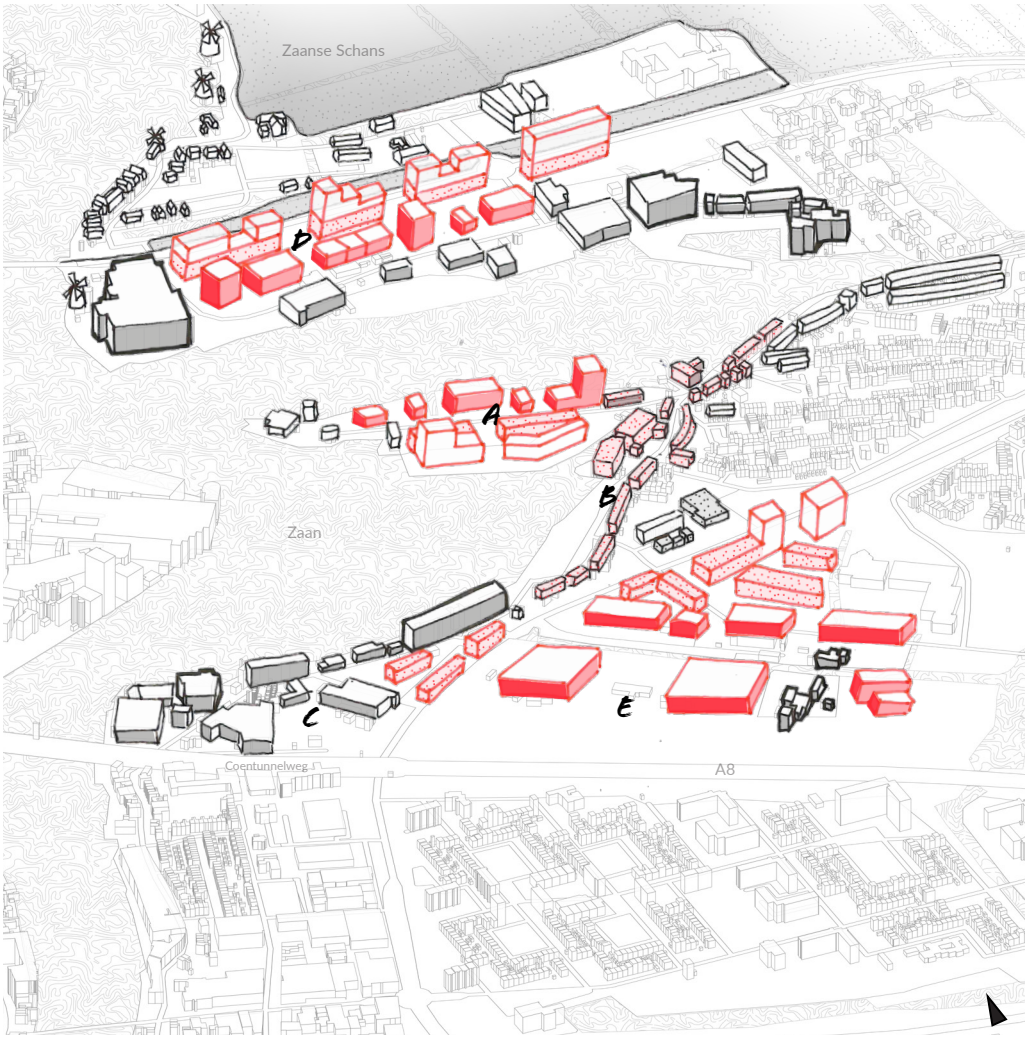


X.2 *Public spaces and network - Oud Koog*
P.9*, *P.13*, *N.3*, *E.6*, *E.8

The large park is not used as a transition space from the industrial areas to residential ones. But plays an important role in providing green in the neighbourhood. Addition of small pocket parks or squares in blocks could increase the amount of qualitative spaces and connect the dispersed greenery. There are some excess spaces around the industrial estates. However for the accessibility from the highway for the industrial estate to remain and keep expansion options, these sites are not suitable for housing.

Some spaces are used as parking or functional terrain for the industrial sites. With small adjustments, making some space accessible for people to sit, can already provide space for people passing by to enjoy the view.

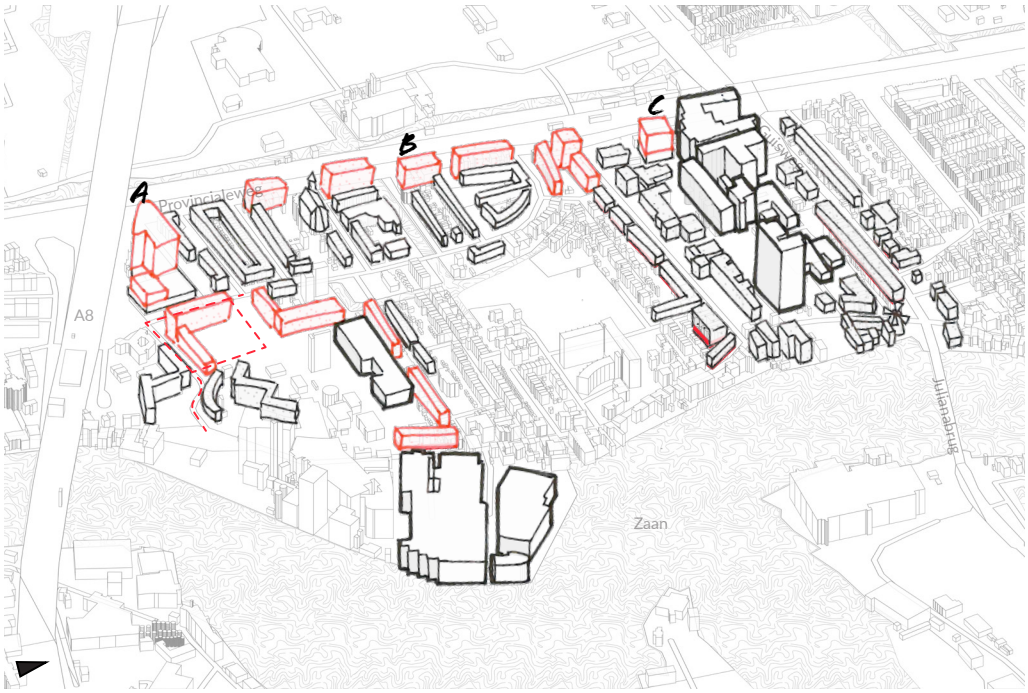
* in red on the maps are potential additions on location: coloured = industry, hatched = mixed, clear = housing



X.3 *Volumes and Programme - Zaanse Schans*
P.6, P.11, P.12, P.14, P.15 - F.9

On the North-side of Hemmes (A) businesses could locate facing the other industries on the other side of the water. The southern side appears a prime location for housing.

The potential highstreet along the east-side of the Zaan river proves difficult. Mainly houses are located along (B). Increased traffic here for those houses can be an issue. Industrial development on Hemmes will therefore be difficult if it means more truck traffic along this road.
Opening up the route traffic along (C) might be an issue for the industries. Currently it is semi-public and dead-end destination route for the industries.

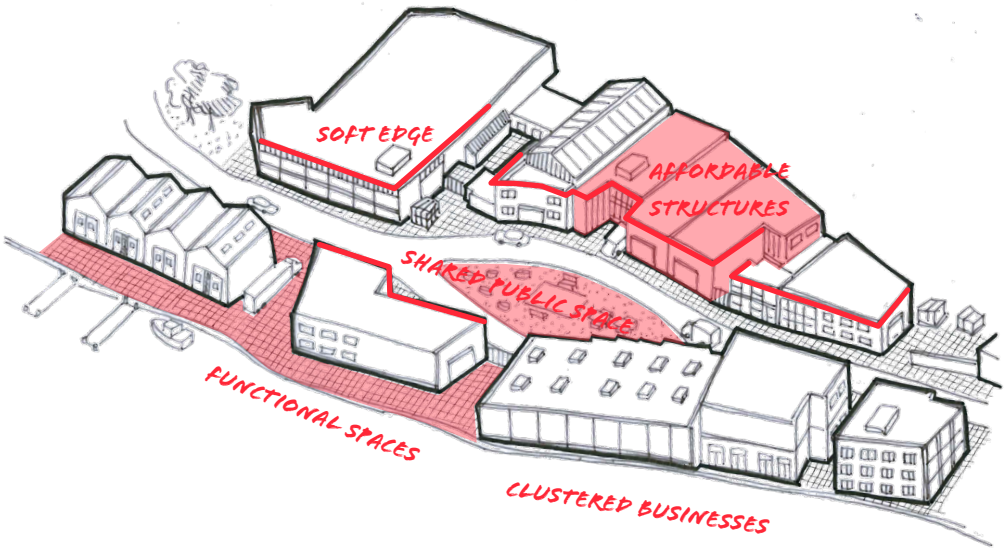


X.4 *Volumes and Programme - Oud Koog*
P.6, P.11, P.12, P.15 - F.9, F.13

Transitions can be created with adding plinths or buildings with other functions on vacant sites or as a replacement of out-dated housing in between residential and industrial areas.

It is possible to create height accents along (B), on top of or replacing large warehouses or storages (A).

Increasing density at (C) is desirable, due to its proximity to a train stop. However measures need to be taken to reduce nuisances.



View A.

F.8, P.4, P.7, E.5

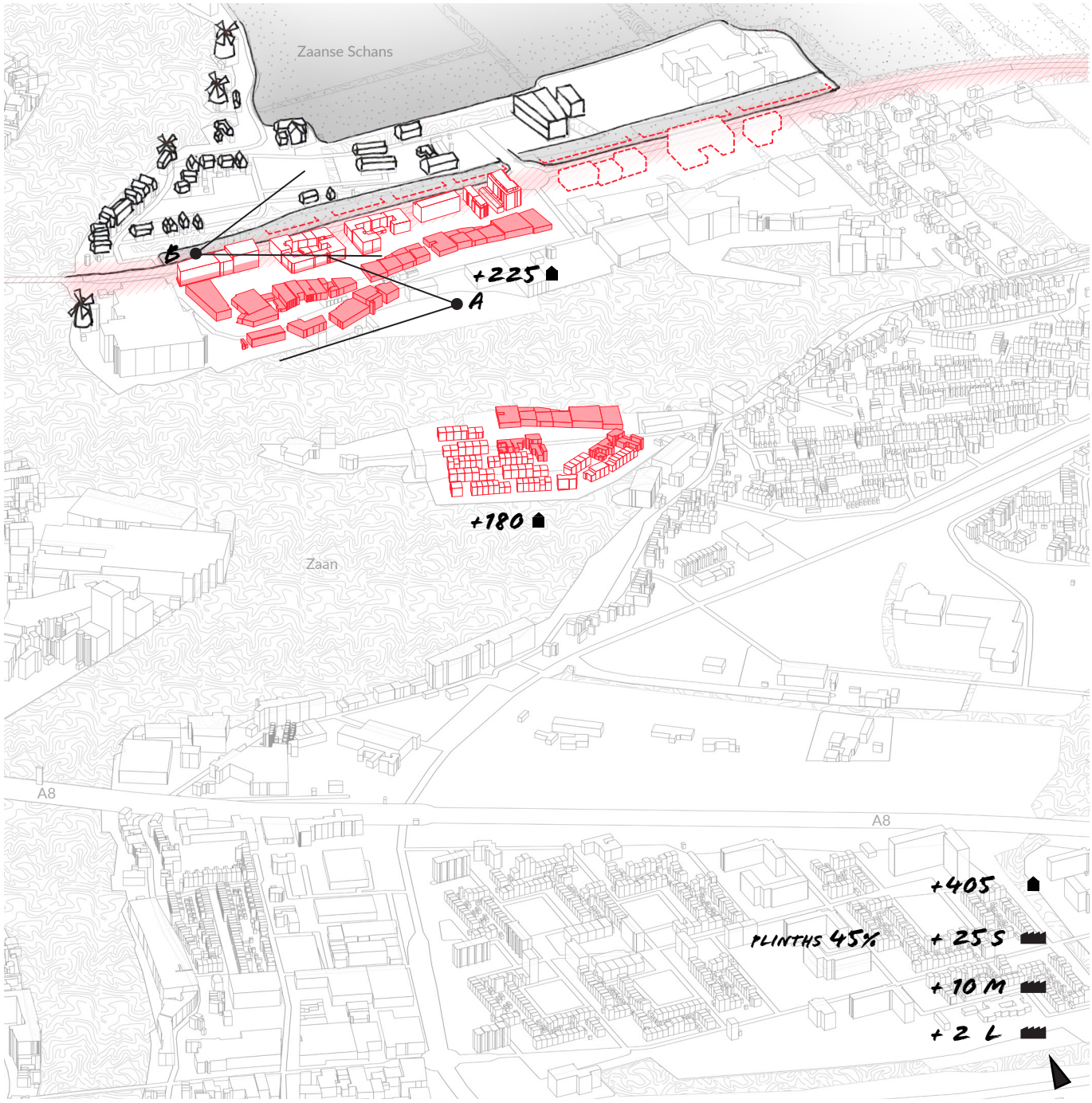
The spaces where industries are clustered together have both more permanent buildings as well as temporary ones. The building frontages are organised at different distances from the street creating a diverse soft edge. The spaces created as a result are mainly functional. The businesses cluster around a small square where people have the opportunity to rest, meet or have lunch.



View B.

P.1, E.3

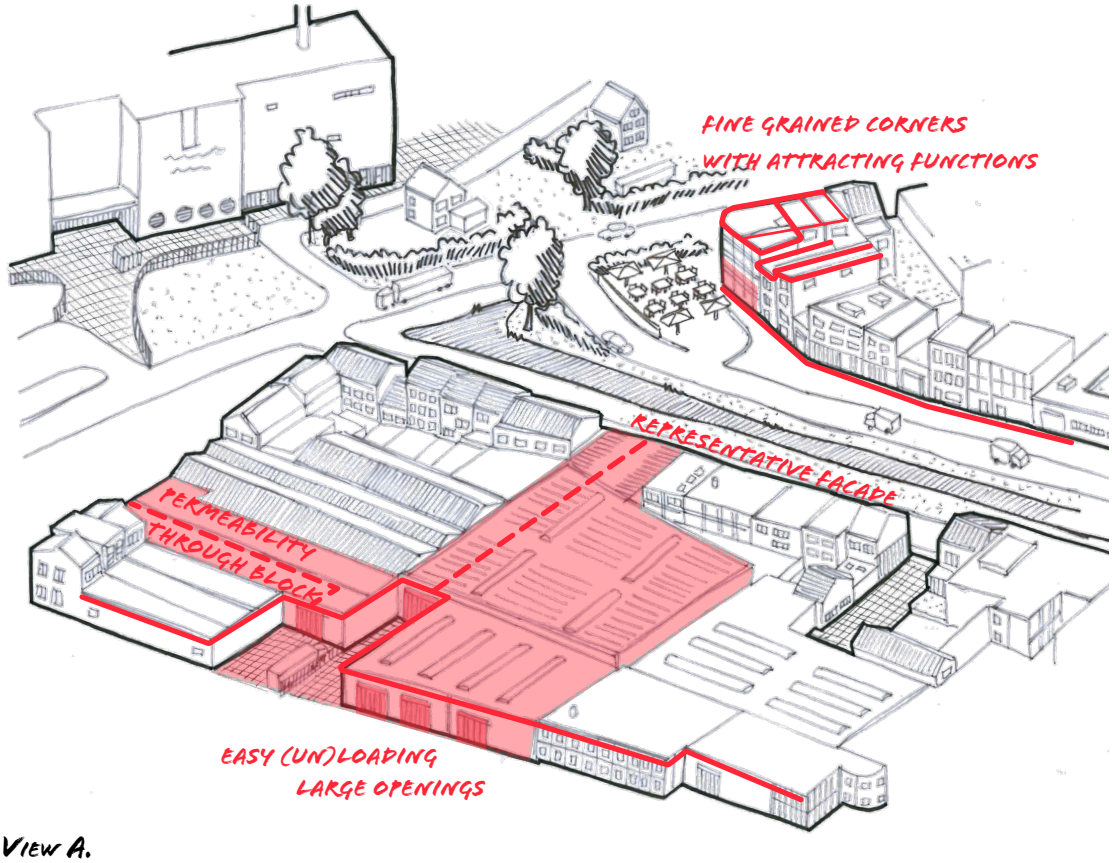
Creating this density along this road seems unlikely. It needs an answer from the other side, yet opposite from it cannot be built as it is protected cultural heritage. The possibility to develop reasonable heights with a nice view over the protected natural landscapes is alluring. Functions could be placed in the plinth such as a cafe or restaurant that attracts tourists of the Zaanse Schans. Traffic from the industries can pass easily with the wide street profile. A safe crossing point for pedestrians and tourists is desirable.



X.5 *London blocks in Oud Koog - Zaanse Schans*
P.6, P.11, P.12, P.15 - F.5, F.9

When applying the London style blocks on site, it shows limited possibilities to achieve housing densities. It does fit the location surprisingly well. The low densities, flat volumes of industries next to each other, mainly horizontal mix of functions and permeability configuration are quite similar to the rest of the area.

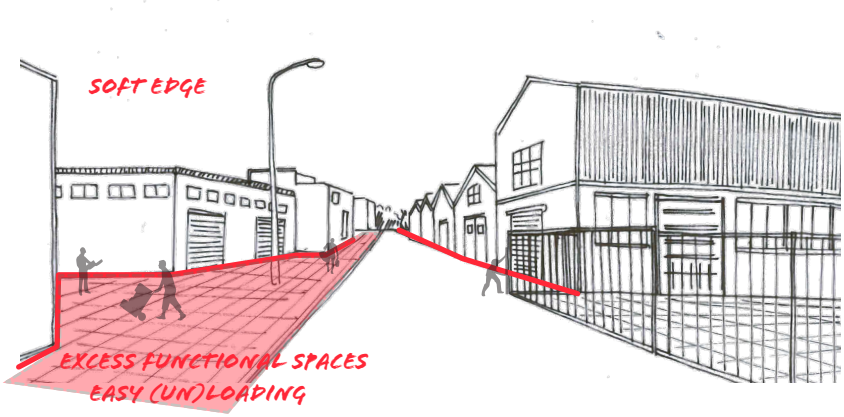
The denser blocks facing the Zaanse Schans are questionable, these densities seem to land detached from its environment. Not all the sports fields are used for development, as in the London case, there are still large sports fields available close to the parks.



View A.

F.1, F.6, N.1, N.2, E.3, E.4

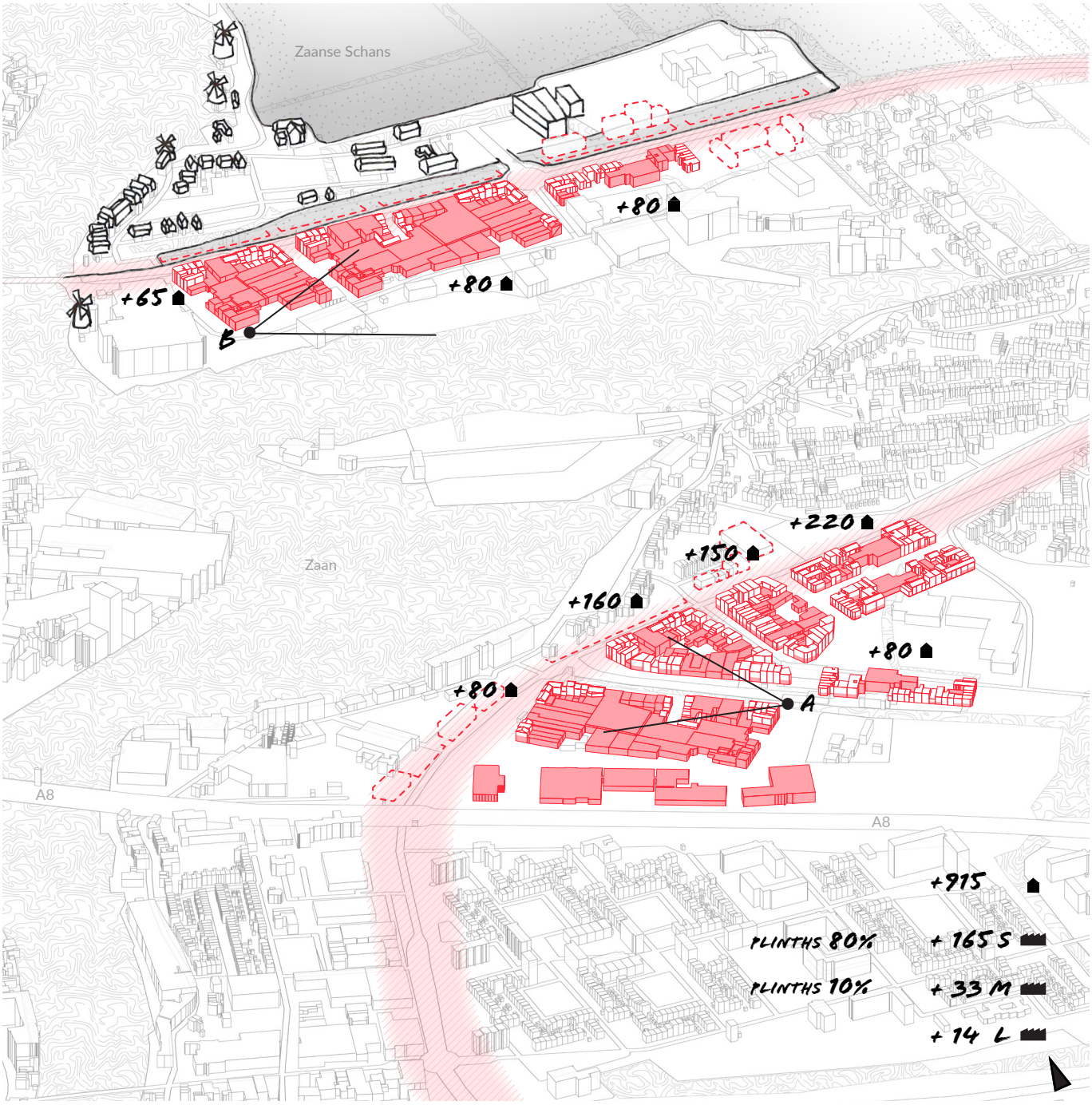
The functional side of the block has larger parcels and the building frontages are organised at different distances from the street creating a diverse and soft edge. At the same time providing spaces to park or load trucks. The side combined with housing has a small parcel grain, in particular on the corners of the block.



View B.

F.7, F.8, N.1, E.5

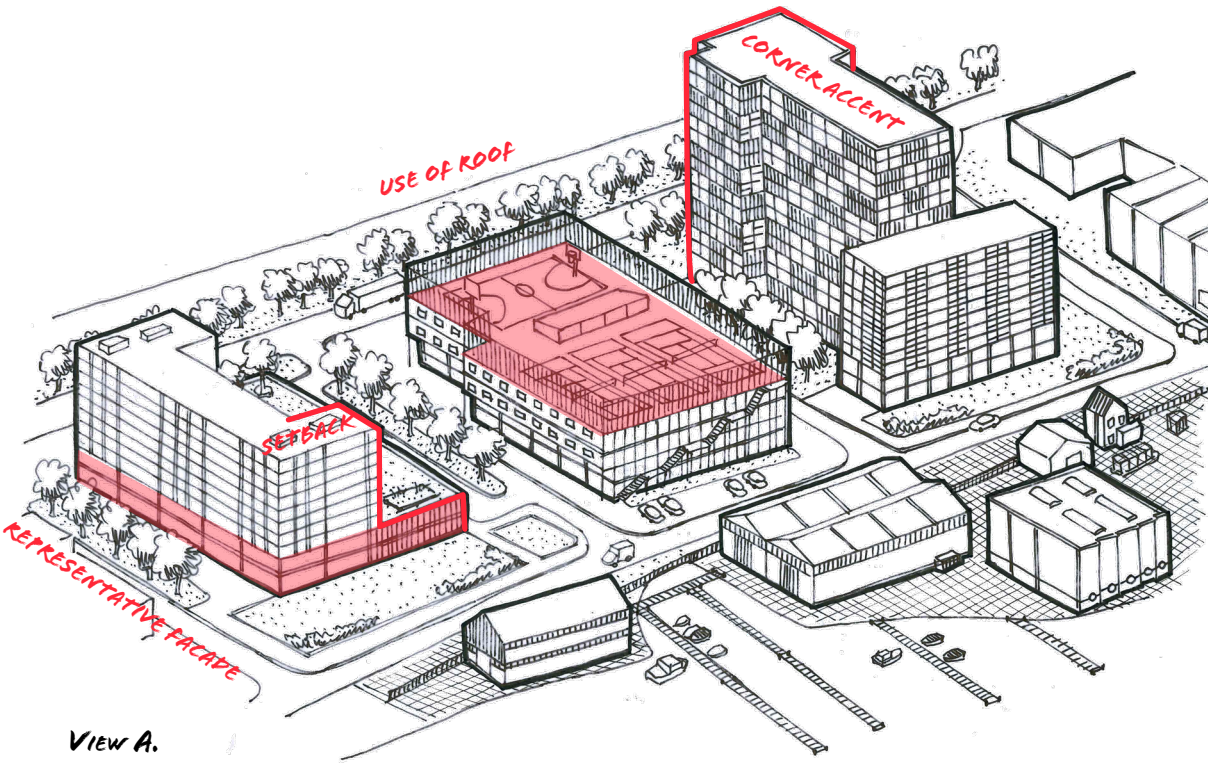
The soft edge and the small distances between each individual building leave space for parking, functional terrain or working space.



X.6 *Brussels blocks in Oud koog - Zaanse Schans*
P.6, P.11, P.12, P.15- F.5, F.9

This configuration, based on the Brussels blocks, adds many small scale workspaces and a reasonable amount of larger integrated industrial spaces. The houses have 4 or 5 levels, these could be made into individual apartments or combined as larger homes.

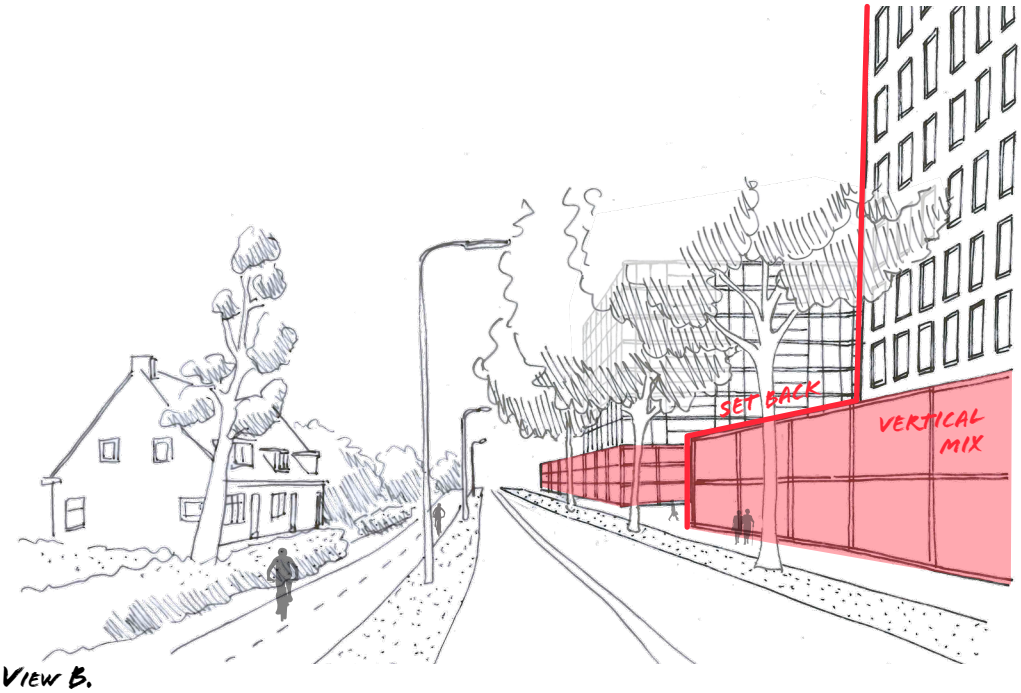
The density is higher than its surroundings. To integrate the blocks into its environment, opposite from introduced blocks some volumes could be added to the existing development to create closed blocks and a continuous facade. Another option is to create more openness in the new blocks, for example by creating pockets. Or reducing the height of the buildings with 1 or 2 levels, to adapt to its surroundings. Naturally, this would have an impact on the amount of programme that can be realised.



View A.

F.10, F.11, P.1, P.5, E.3

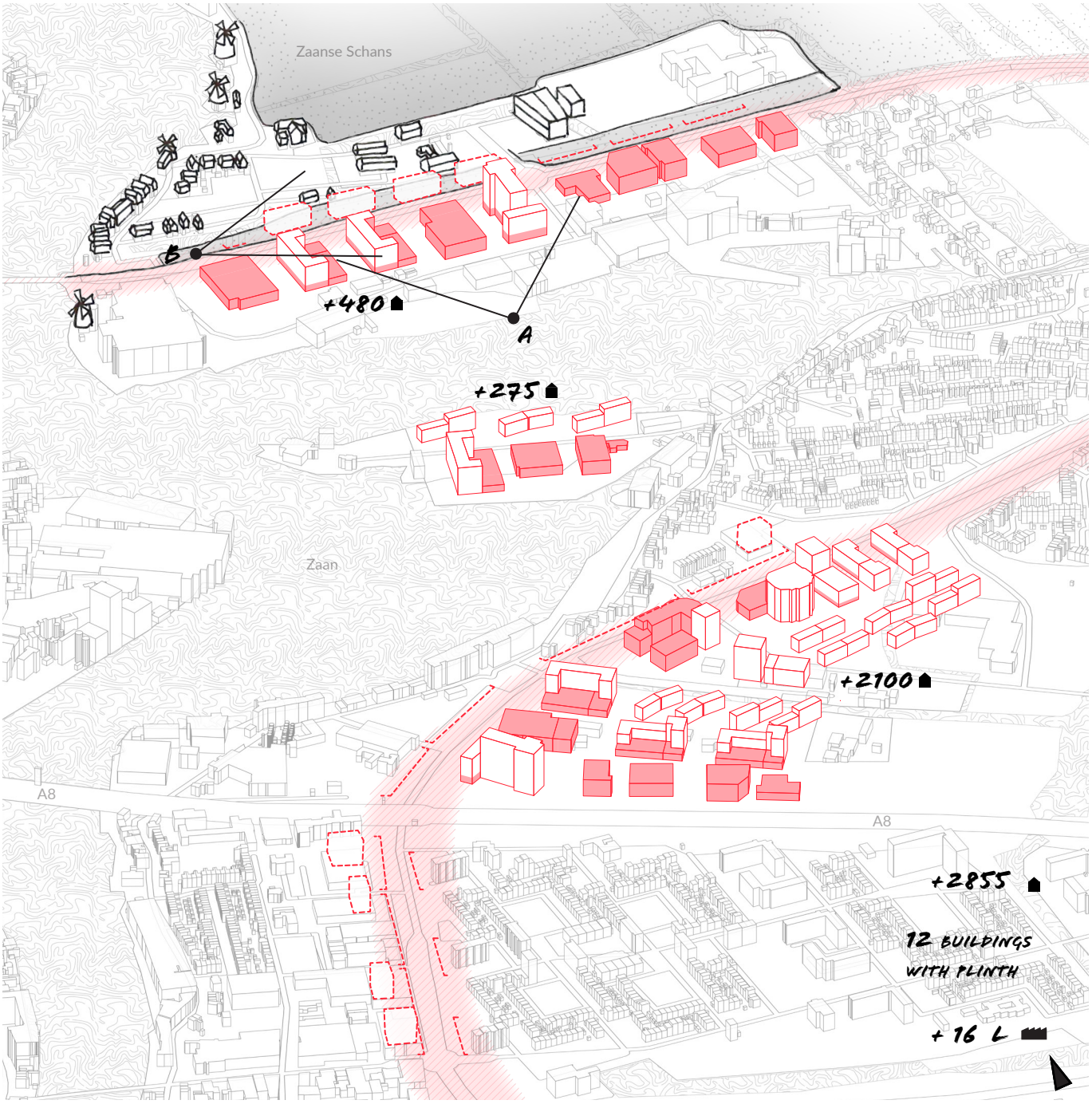
Larger singular blocks are formed, some higher than others. Large roofs are available for other uses such as sports. Streets have a wide profile, a lot of greenery and trees.



View B.

P.1, F.10

The plinth of the large blocks are occupied by commercial functions, offices, amenities or services. These can occupy the first 2 or 3 levels.



X.7 *Shenzhen blocks in Oud koog - Zaanse Schans*
P.6, P.11, P.12, P.15 - F.5, F.9, F.11, F.13

The Shenzhen model provides blocks with towers and slabs on top of them. To fit this context, some downscaling of the towers and sizes of the blocks has been done. Still, it looks like nothing that has been realised in Zaandam before. Only the residential slabs are somewhat similar to the garden city neighbourhoods. While the higher densities along the Zaanse Schans did not make sense in the London version, here the larger volumes seem to complement the larger volumes of the industrial estates.

If there is a need of large industrial estates this variant provides options. However the large amount that is realised this manner is probably more than the demand. Plinths along roads and near businesses provide space for other functions, within the building spaces can be divided among firms. By developing towers and slabs on top a lot of housing can be realised this way.

Conclusions

The Shenzhen case blocks are in general not very transferable to the urban fabric of Zaanstad. Even though the real dimension have already been adjusted, these blocks still heavily contrast with the low-rise residential neighbourhoods. There is some potential for this type near the Zaanse Schans as the large industrial buildings have a similar dimensions.
The fine grain of the Brussels blocks together with the mixing with larger plots seem fitting for the context. However, the high ground coverage is in contrast with the rest of the environment. The London blocks show the potential for application in Koog aan de Zaan, as these blocks have more open configurations similar to the area. However, to achieve higher densities the London blocks have the least potential compared to the other cases.

Not transferable

F.3 Old industrial structures can be used as decorative elements in a landscape. For this site this aspect is not that relevant as many of the industrial estates and its structures are still in use. Vacant structures are often of poor quality. There are some remaining chimneys that could act as a landscaping element. Outdated industrial buildings can certainly be used for other uses, or transformed into housing this is already common practice in Zaanstad.

P.8 Functions under a lifted railway or highway is possible in Zaanstad. However, in some places the height might be suitable for new volumes.

P.10 A pedestrian corridor cannot be made of the existing highstreets on location as it is an important part of the network connecting the different neighbourhoods on city level. Perhaps in a residential neighbourhood or new live-work district this can be investigated further.

N.4 A lifted highstreet is not very suitable as the densities are not high enough. The diverse edge, volumes and distance between volumes along the highstreet do not facilitate an efficient lifted street.

N.5 A road through the building is not necessary. The area is already very permeable. Large blocks are not accessible because of a fence. Therefore, to make blocks more permeable the access of these private roads can be reassessed.

N.7 Functional roads along the waterway seems not applicable to Zaanstad. The early ribbon developments have developed parallel to the Zaan river with buildings between the street and the river. Many industries make use of cargo ships and therefore need direct access to the water.

E.7 Making use of different heights to clear certain views from messy terrains is not that applicable as the landscape is predominantly flat. Perhaps the height difference of dikes can be used to a certain degree.

Implications for further research

Some patterns appear to be not applicable to Zaanstad. While some need further research to determine where these qualities could be located or designed on location*.

The pattern E.1 - invest in architectural quality - and E.2 - diverse and affordable housing and business locations - cannot be properly investigated. Though the different views of the blocks testing do show a certain architectural quality, the balance of the programme and its architectural quality determine the prices and affordability for both residents and businesses. This can be researched further by analysing the housing needs of the context.

The patterns derived from theory and the case study indicate that for a successful live-work environment the presence is needed of:
F.4 Visibility of work activities.
F.7 Excess spaces: flexibility for growth and shrinkage.
P.2 Collective building: multiple functions or similar businesses, with collective facilities.
P.3 Multi-storey factories.
P.14 Diversity and dispersion of businesses: presence of street markets, spaces for storage, community hubs, reuse and repair centres, shared space for making and shared technology, equipment, training, development and education.
N.8 Centralised (inner-city/urban) logistic spots with strategic access along important main routes.

The allocation of these elements can be determined by looking at where certain functions cluster or related functions could support existing functions or the other way around. Based on the *rust reuring ruis* (peaceful, lively, noisy) principle of P.6 Transition of functions, there is preferable transition. People living close to the highway going right through the city complain about the noise. Making these spaces available for industries instead of housing provides a barrier between the noise and housing. Moreover it is beneficial for the businesses who want to locate near the highway.

This way, business districts and mixed districts can be allocated to a certain place. However, it needs to possess the spatial qualities that certain types of industries prefer for it to be attractive to locate to these places. Therefore P.15 - assured space for businesses - needs to be more refined. Subsequently, the other patterns will fall into place.

* In Part III it is determined where potential clusters of work could be realised, based on the organisation of industries and other functions in Zaanstad. To give context to the previous mentioned patterns.

6.1 INDUSTRIAL EPOCHS

The geography of production through time in the Zaanstreek

When looking at the history of work and industry in the Zaanstreek, five significant "industrial epochs" can be distinguished (Rutte, 2017; Davis, 2020) (see F.20 p.102-105 or Appendices 3. for the historical analysis of the geography of production).

Since the 20th century, the Zaanstreek has gradually grown similar to the rest of the Netherlands. In contrast to previous periods. For many centuries the Zaanstreek was neither urban or rural, but something in between, agricultural as well as industrial. This changed after the implementation of spatial regulations and requirements according to national policies in the past century.

Notably, many industrial buildings of the different time periods have remained. Particularly along the river, that presents a diverse historic water front with characteristic landmarks. The recent shift to transport on land and car transport has resulted in separation of certain neighbourhoods and arguably some barriers in the landscape. The reclamation of waterways and the brick housing expansions changed the character of the region and the landscape that was there for centuries. The position of Zaanstad in relation to the sea has also changed due to centuries of land reclamation and draining of land.

This, together with industrial developments have changed where industries now locate. However, elements of every industrial epoch remain visible dispersed along the Zaan. These historic and contemporary industrial buildings are part of the heritage and cultural identity of neighbourhoods and the city as a whole.

- ➜ Keep the architectural visibility of the different industrial epochs along the Zaan river.
- ➜ Heritage needs to be protected and its buildings revitalised to give room for contemporary uses. At the same time it raises the question of what the role of new, future industries can be and whether it can become part of this heritage.
- ➜ The role of water for industries can be revised in providing space for new and future water related industries.

6.2 SPATIAL MANIFESTATION OF INDUSTRIES

In Zaanstad

Zaanstad is quite unique in the fact that there are large industries and industrial districts located right in the city and villages. In contrast to cities where many heavy industries have moved to the edges of the city or completely out of the city. Based on natural classes, the parcel areas and gross areas were divided into 3 classes: small, medium, large. Most of the industrial parcels, in particular the larger estates, are situated on business districts. Outside of business districts, but still in urban environments, the parcels as well as gross areas are in general small or medium sized. Several conclusions have been drawn from spatial organisation of the different sizes of industries (see p. 106-107).

- Industries on larger premises need space surrounding the building for their activities. On business districts larger premises like to cluster. Perhaps a way to make more efficient use of space is to design efficient turning, parking, loading and unloading places, around the industries that need it and cluster them together. Preferably with a direct connection to the highway and accessible in at least two ways. If these premises are located along a dead end road, a lot of space is needed to facilitate a turning point for trucks. While in informal environments the larger estates appear more singular and dispersed.

- Smaller and medium sized industrial premises locate clustered along streets in business districts, and dispersed along the highstreet. Typically, they need little to no excess space surrounding the premises.

Based on a calculation of the gross floor area of all buildings in Zaanstad, approximately a mix of 50% residential and 50% other functions (of which 30 % industry) was found (see F.21 p. 106). So more than half of the area covered by other functions is for industrial use. Similar percentages were found for the Koog aan de Zaan area, which is not that surprising. Even though it is an urban environment, there are several large industrial estates situated there. Several conclusions have been drawn from spatial organisation of the different functions, the mixing of functions on building level, vertically and horizontally (see M.5 p.109).

- Vertical mix is mainly found along the highstreets in small to medium sized premises. While a horizontal mix in found elsewhere, along branches of the highstreet or in mixed work districts or business districts.

- Buildings that house multiple functions or businesses are located dispersed along the highstreet in small to medium sized premises. Or clustered together in a business district.

(To view all the analytical maps about the spatial organisation of functions see Appendices 5.)

The analytical maps identified places where industries are mixed vertically or horizontally, with other functions or with housing. A local analysis of a several selected buildings or blocks revealed characteristics of how the functions are organised in relation to each other on small scale (see p. 108).

- Alleys can lead to a functional entrance, while the alley provides space for temporary parking or storage space.

- Large openings in the facade that guide to the interior of the block, where there is space for parking or open work spaces.

Both say something about the functional permeability through the block.

- Residences on top of functions have balconies with views oriented to a certain direction.

- Representative sides of blocks are along streets used by residents, such as neighbourhoods streets or the highstreet. While other functions situate along the backsides of the highstreet.

- Some spaces along parking lanes can facilitate other uses, such as presentation spaces for stores, small patches of greenery or terraces for café's etc.

Continue on p.114

F.20 *Industrial Epochs*

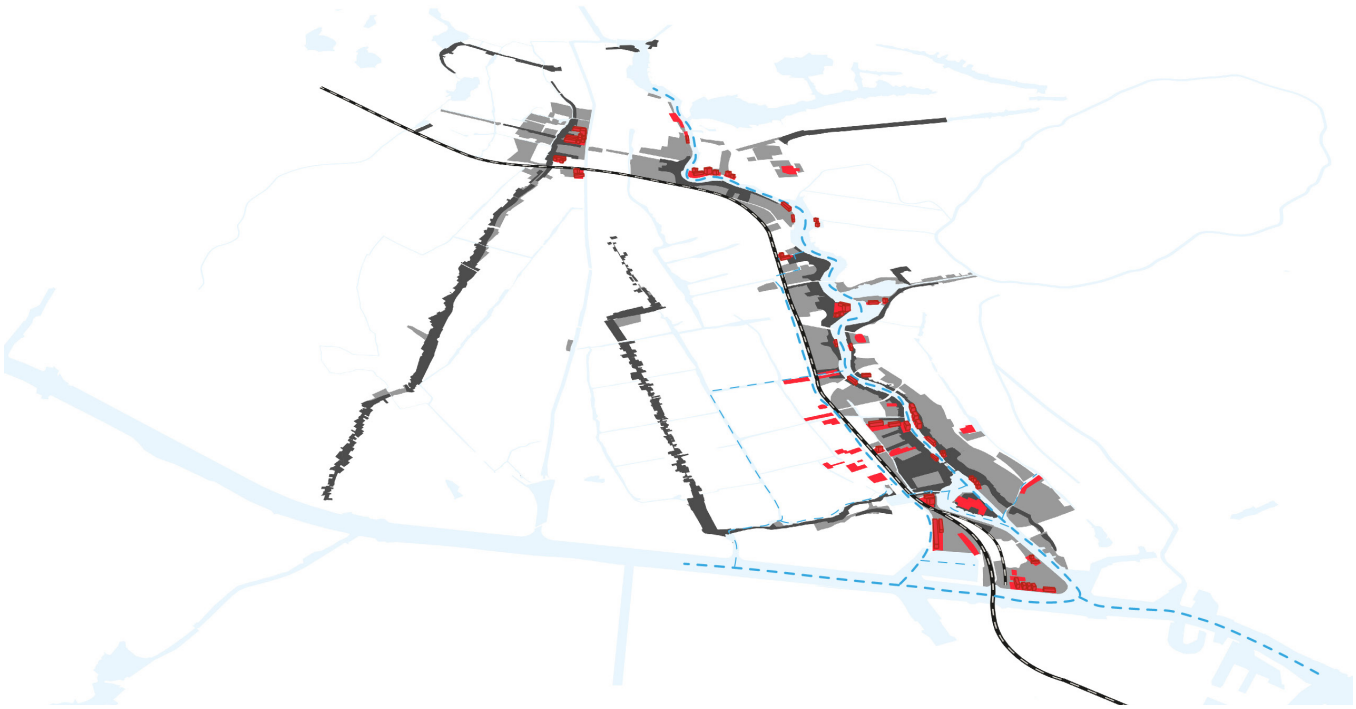


1. *Pre-industrial: 15th century – end of 16th century*

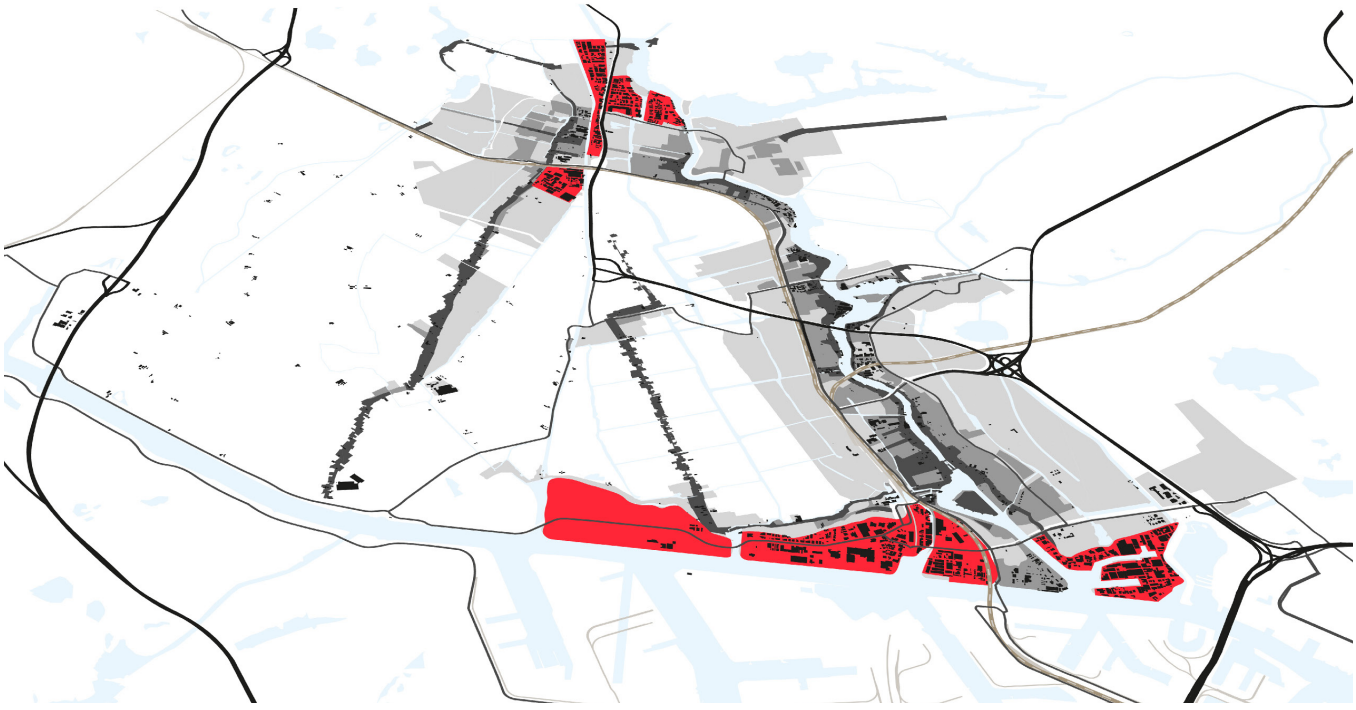


2. **3.** *Industrial landscape: End of 16th century – mid-18th century*
Mid-18th century - mid 19th century: stagnation

source: F.18: Own illustrations



4. *Industrialisation: Mid-19th century – mid 20th century*



5. *Globalisation: Mid-20th century – today*

The historical development of the Zaanstreek to Zaanstad

When looking at the history of work and industry in the Zaanstreek, of which the municipality Zaanstad is now part of, five significant "industrial epochs" can be distinguished (Rutte, 2017; Davis, 2020). This historical analysis focusses on the geography of production. Where were the physical facilities of the production process and the way these were clustered. How was the overall reach of the network of supply chains geographically organised.

1. *Pre-industrial: 15th century – end of 16th century*

Villages and ribbon development in peat landscapes and along the Zaan river. The ribbon development villages were larger than the villages along the Zaan river. Mainly agricultural activities, but due to wet landscapes also non-agricultural activities emerged such as fishing, bird catching, shipping, predominantly along the river. Notably, there was no significant market or harbour centre or main village square.

2. *Industrial landscape: End of 16th century – mid-18th century*

The existing ribbon developments were extended and expanded along the Zaan river. Throughout the Zaanstreek, behind the ribbon development many industrial mills, many small factories and shipyards were developed in the peat landscape that had a delicate network of canals and locks waterways. Many shipyards were also situated outside of the dam, at the river mouth. The shift to non-agricultural activities continued. Especially, after the invention of the sawing mill. It was a flourishing industrial landscape with many kinds of industrial mills. As a result, the Zaanstreek is known as the oldest industrial region in Europe.
As shipyards, factories and mills produced a lot of nuisances. These needed a lot of space and stand freely, preferably in an open landscape to catch a lot of wind and great accessibility to the water for transportation. The conditions along the Zaan river were ideal due to its long shape and the lack of regulations in the Zaanstreek. Not only the river, but also the vast water network in the peat landscape provided many advantageous locations for mills.
As the city of Amsterdam grew to become the global trade centre, the industry in the Zaanstreek produced for the enormous demand of Amsterdam. While, the city of Amsterdam aimed to get rid of many informal developments (of both housing and industry) and introduced functional separation in its expansion plans, moreover prohibited the development of industrial mills in the city. This opened up opportunities for the Zaanstreek. Where, in contrast to Amsterdam, a clear border between agricultural or industrial land did not exist. The whole area had industries and housing mixed together. At that moment, unlike Amsterdam, the Zaanstreek did not have a strong administration with a vision. This however distinguished the Zaanstreek from many cities and villages in the Netherlands. Though it must have been a filthy area, its economic freedom, low land prices and no taxes created a diverse economy and must have played a role in its industrial success.

3. *Mid-18th century – mid 19th century*

The economic success of the Zaanstreek resulted in that the area stagnated half a century later than the rest of the Netherlands. As the economy stagnated, there were no notable spatial developments.

4. *Industrialisation: Mid-19th century – mid 20th century*

Though industrialisation arrived about 100 years earlier in England, it only started around the 1880s in the Netherlands. As the economy recovered, the industry along the river was upscaled. Many mills along the river were replaced with factories with steam powered machines (later diesel or gas and after that electric engines). While the industrial mills in the landscape were cleared.
Before, the area was characterised by its ribbon development along the river and the industrial mills spread in the peat landscape. In the 1900s, large scale and high industrial buildings concentrated directly along the river. The focus also shifted to the food industry and wholesale or chain stores. Some factory owners built big villas opposite to their industrial estate with a view over the water. This period may be seen as the second industrial flourishing period.
While in other industrial cities the localisation of industries was closely related to railway infrastructure, creating certain clusters around it. In the Zaanstreek area industries remained focussed on its water infrastructure as it was already there. Similarly, the industries remained spread over an extensive area along the river. Therefore, the development did not have a lot of effect on the localisation of industries, though it did have an effect on new housing developments. The construction of the Noordzeekanaal however, had a significant effect on the spatial organisation of industries and boosted the infrastructural function of the river. New harbours were built around the river mouth, also called the Voorzaan. After the replacement of the old lock in 1903, larger ships could enter inland. This contributed to Zaandam becoming the urban centre of the Zaanstreek with many facilities, shops and offices. Before, the region did not have a particular centre.
Many municipalities in this time were required to make expansion plans and regulate spatial development after the introduction of the Housing Law in 1901. This resulted in the development of many garden city neighbourhoods with brick housing that significantly improved the living quality in the Zaanstreek. Before, houses were predominantly built of wood.

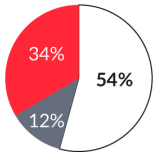
5. *Globalisation: Mid-20th century – today*

At the end of the 20th century, municipalities west of the Zaan were combined to become one, Zaanstad. Municipalities were obliged to develop spatial policies according to national guidelines. This has resulted in that the region has gradually grown similar to the rest of the Netherlands.
After the WWII, for the first time, water was no longer the primary infrastructure. Development of roads increased the significance of car transport. Unfortunately, the development of main roads resulted in the reclamation of many small waterways characteristic of the villages. The positioning of factories along the river suddenly became a disadvantage, as often accessibility by car and trucks was inadequate. Many industries moved to business districts. Factories along the Zaan were demolished, some were repurposed to housing, offices or cultural functions. The municipalities needed to attract new businesses and develop new industrial areas. Hence the development of accessible business districts was stimulated. At the same time, this development is restricted since the peat landscapes have been declared cultural heritage.
Like many Dutch cities in the 1960s, as part of the welfare state, Zaanstad experienced substantial transformation and expansion. Housing demand was met by developing many post-war neighbourhoods that were preferably accessible by car. Due to the village and city expansions a lot of agricultural land was lost.

F.21 Dimensions of industry in Zaanstad

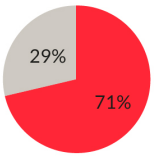
Gross floor area of all buildings in Zaanstad

residential
all other functions
industry



Amount of Industrial parcels in and outside of business districts

business district
urban

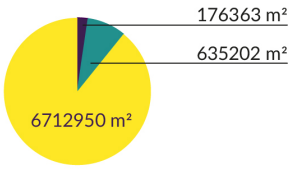


Gross floor area

XXS	<500 m2
XS	500-1000 m2
S	1000-2000 m2
m	2000-5000 m2
M	5000-10000 m2
L	10000-50000 m2
XL	>50000 m2

Sum of SML total areas

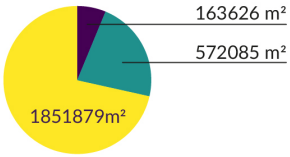
* Parcels



Functions
industry
shops
offices
gathering
health
sports
other

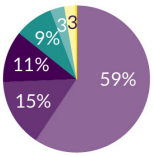
Sum of SML total areas

* Footprints



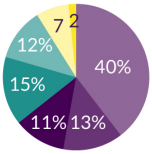
Number of SML other functions

* Gross floor area
* Total amount of buildings with other functions in Zaanstad: 1863



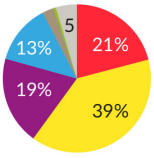
Number of SML

* Gross floor area
* Total amount of industrial sites in Zaanstad: 1493



Housing mixed with other functions

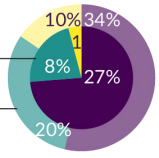
* Total amount of buildings mixed vertically with housing in Zaanstad: 1202



Number of SML

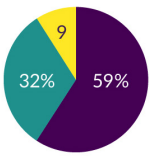
outside of business districts
on business districts

* Gross floor area



Number of SML with more than 1 function

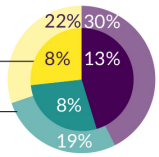
* Gross floor area
* Excluding housing
* Total amount of buildings mixed vertically with more than 1 function in Zaanstad: 811



Number of SML

outside of business districts
on business districts

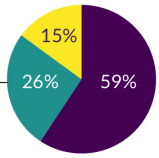
* Parcel area



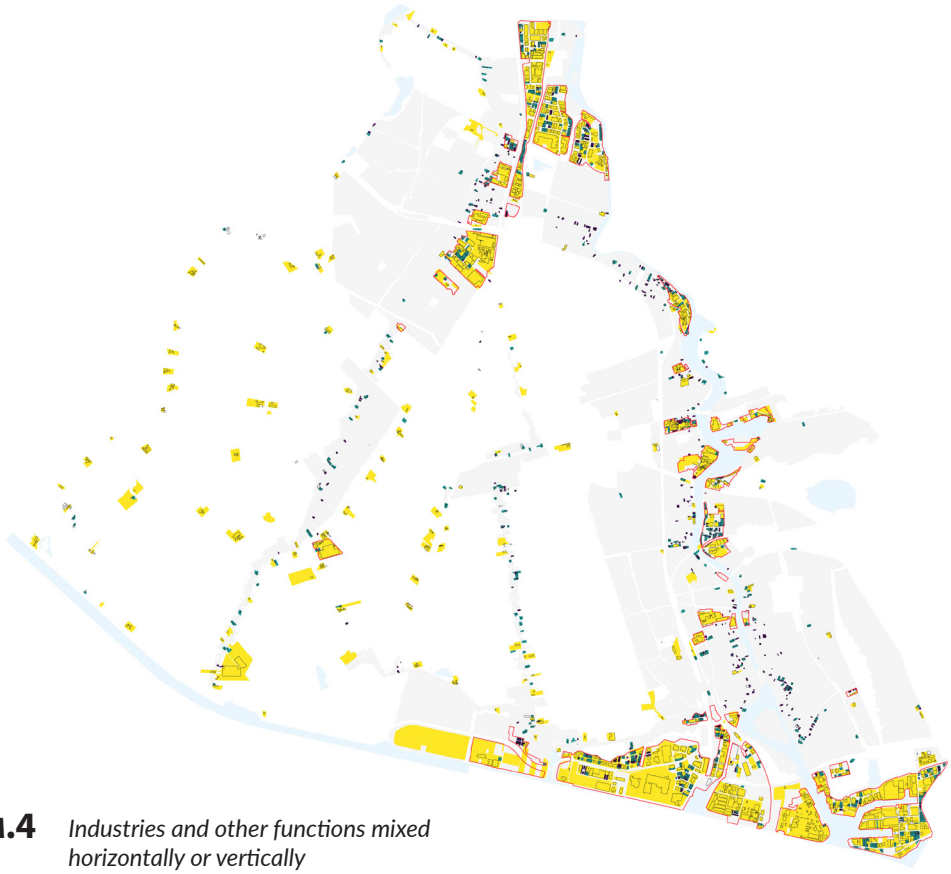
Number of SML

outside of business districts still in urban environment

* Parcel area



Source: Interpretation of BAG3D and BAGverblijfsobjecten geodata



M.4 *Industries and other functions mixed horizontally or vertically*

A business district is a formal location, while outside of a business district is called an informal location. Most of the industrial parcels (71%) are situated in business districts. The urban industrial districts are situated along the highstreet Westzijde and the ribbon development Oostzijde running parallel to the Zaan river.

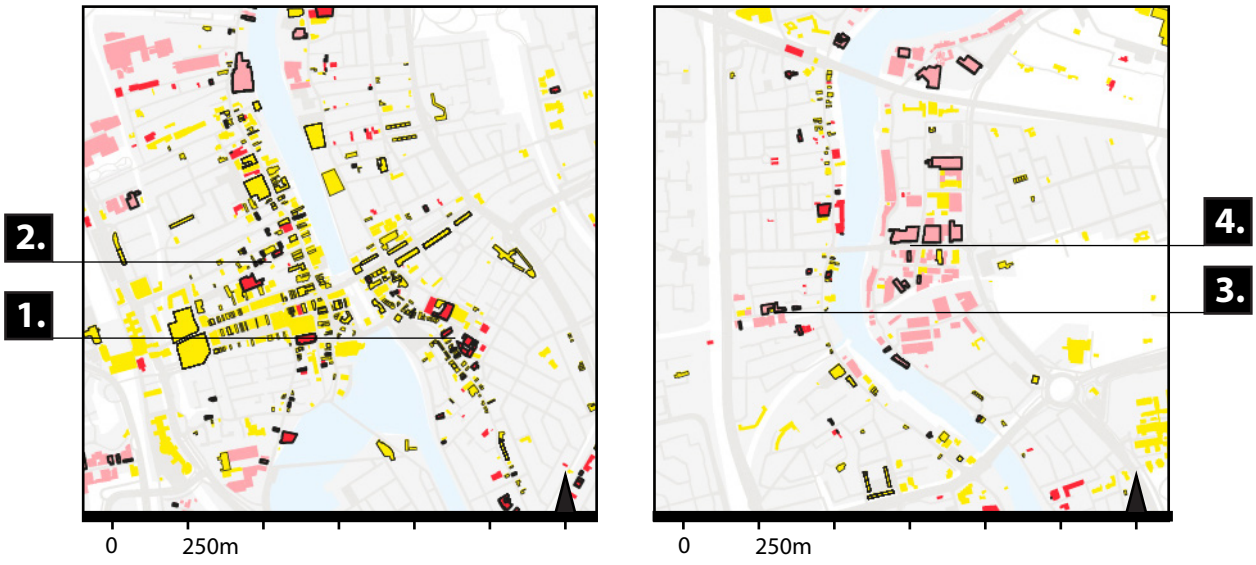
Large parcels make out roughly 80-90% of the total area covered by industrial parcels. In other words, L sized parcels make up of most of the floor space used. The total area covered by large industrial footprints is a lot less than the total amount of large industrial parcels, meaning there is a lot of space surrounding these footprints. When we compare the total area of large parcels and large footprints we can conclude that approximately less than a third of all the large parcels together is built. However, it differs per location how built-up it is.

Unsurprisingly, business districts have more L parcels with L sized buildings. 10% compared to 1% outside of a business district. Outside of business districts S and M sized buildings are situated mostly on L parcels. Half of the rural parcels outside of business districts are L size, but when you look at the footprints you can see that these parcels are mainly covered by S or M sized footprint gross areas.
There are relatively a lot more parcels and footprints outside of business districts that are S and M sized. 85% of urban parcels outside of business districts are S or M. In contrast to the large parcels, S and M sized footprints, particularly outside of business districts, cover the parcel almost completely.
S and M footprints seem to cluster together along a street both on and outside of business districts. While the larger footprints cluster together on business districts, but appear more singular or dispersed in informal environments.

S
M
L

contour buildings
contour business district

Source map: QGIS adaptation of BAG3D and BAGverblijfsobjecten geodata



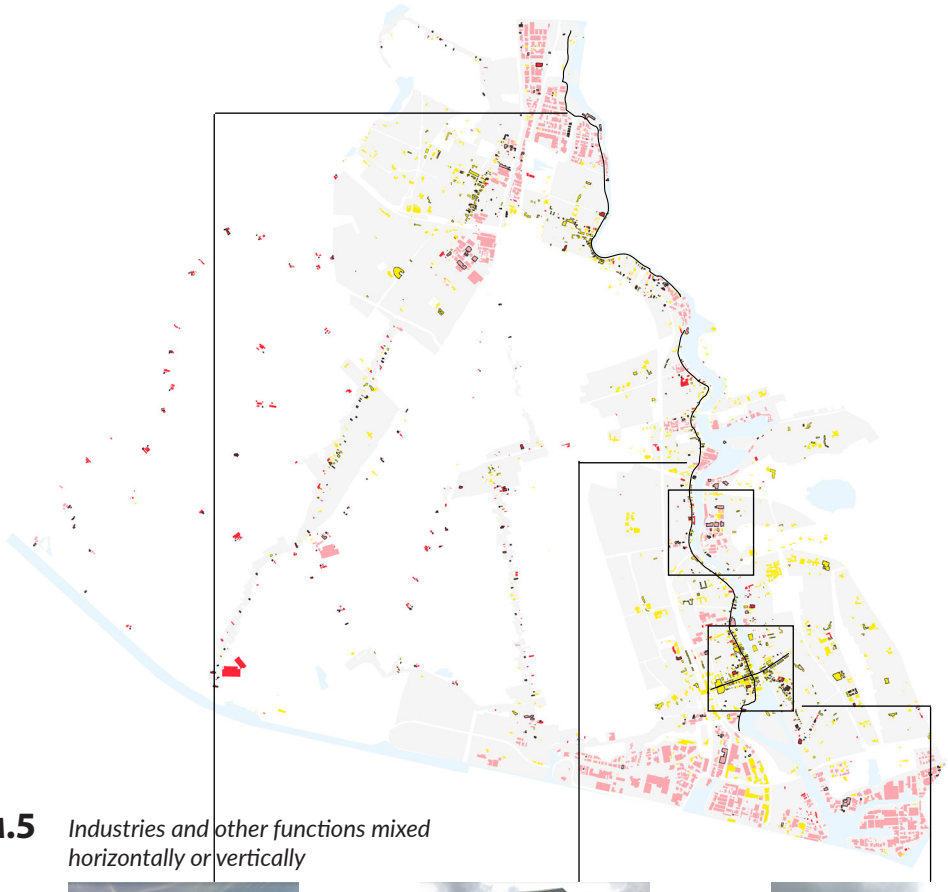








These images show how certain industries are mixed horizontally or vertically directly with houses. Here access through the block appears to be an important aspect. This can be access though the building with an entrance leading to an open terrain available on the inside of the block (3,). Or a small alley leading to the entrance of a storage building deeper in the block (2.). Another aspect is the parking space available, and the ability to give different uses to that space. Such as a presenting space of goods for a store (2.,4.).



M.5 *Industries and other functions mixed horizontally or vertically*







Functions other than industry need smaller gross floor areas compared to industries. Often the medium sized gross floor areas are schools, while the large gross floor areas are often hospitals or other healthcare facilities. Functions other than industry are situated along roads and form a type of grid starting from the highstreet.
Shops are mixed with housing vertically the most. Notably, it is not at all uncommon for people to live above industrial activities in Zaanstad. Housing is mixed with other functions mostly along the highstreet. It appears that away from the highstreet functions are mixed more horizontally.

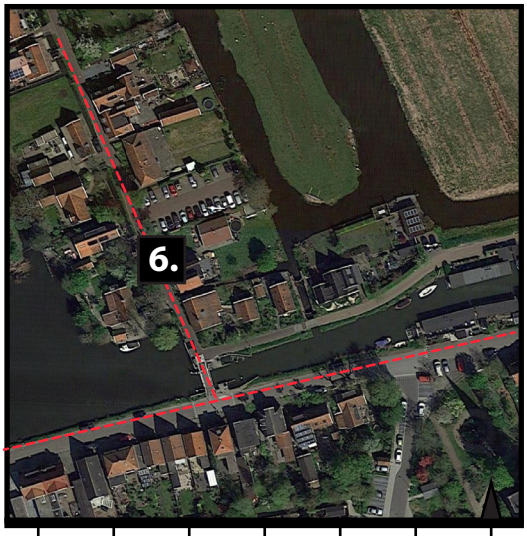
Remarkably, buildings with multiple functions require 59% of the time less than 2000 m2 gross floor area in Zaanstad. S and M sized buildings with 2-3 functions are situated along the high street while buildings with multiple functions are more dispersed along the highstreet.
Buildings with multiple functions outside of business districts appear to cluster mainly along the highstreet close to the city or village centres. Predominantly in S and M sized buildings, with some L buildings dispersed along the high street. On business districts, buildings with multiple functions are larger and cluster together not necessarily along a street.

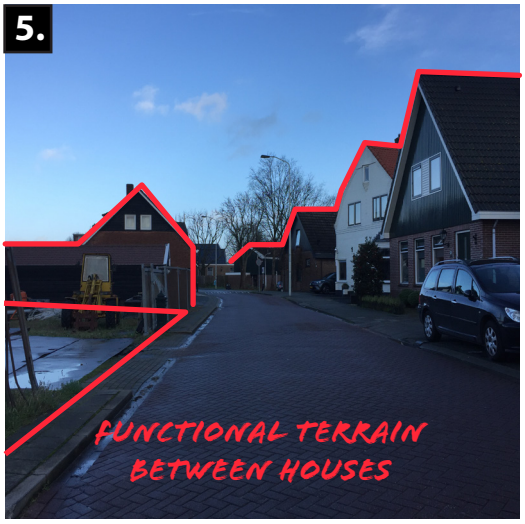
Type of mix
- industries informal environment
- industries formal environment
- other functions
- industries mixed with housing vertically
- other functions mixed with housing vertically

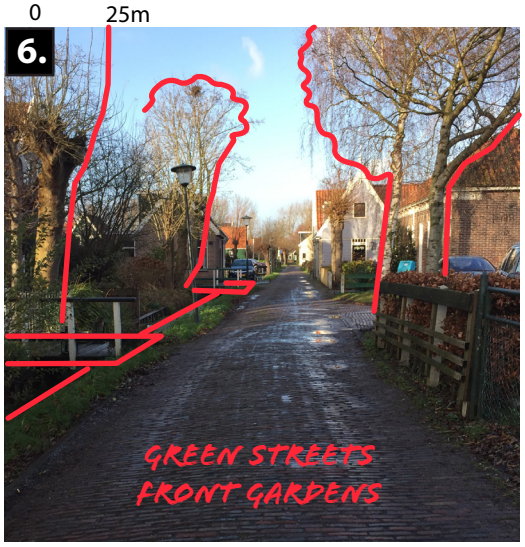
Source map: QGIS adaptation of BAG3D and BAGverblijfsobjecten geodata; photos: Google street view, Google Earth

SP.4 RIBBON DEVELOPMENT





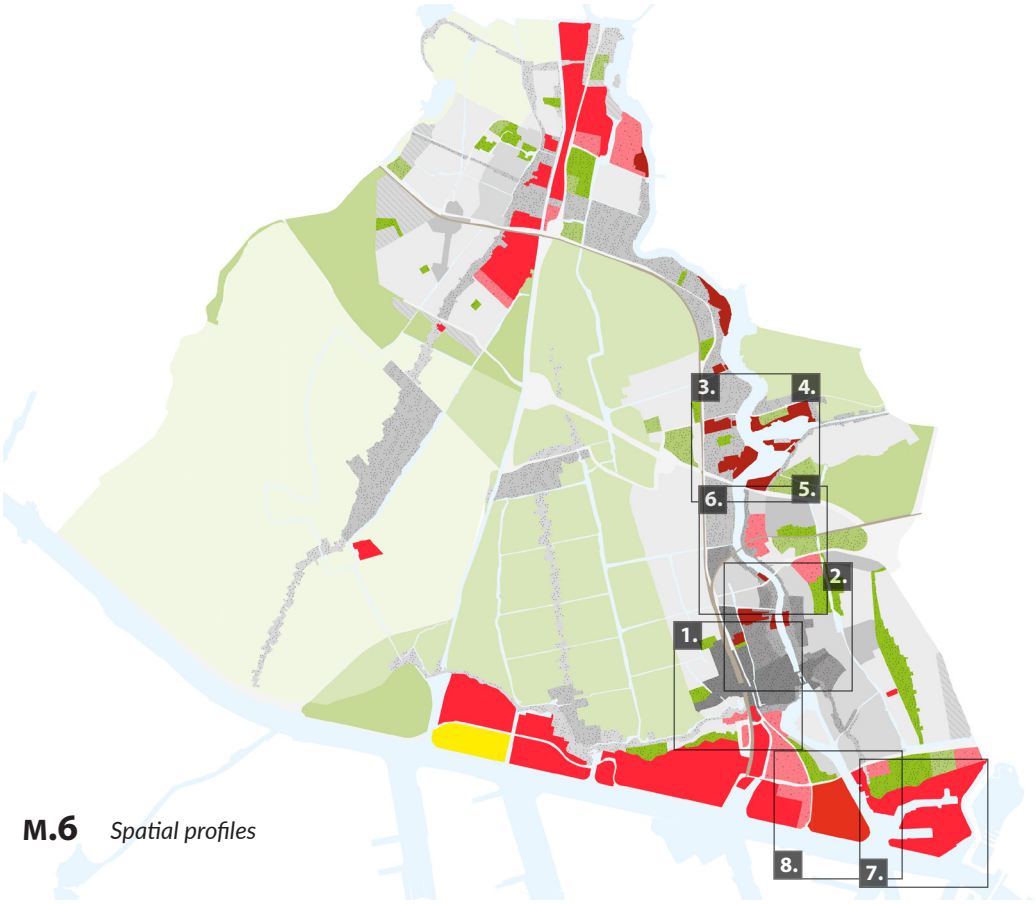








On the east side of the Zaan some parts of the ribbon developments have also have expanded with some residential areas along it. The public space and surroundings are very green and blue, as they are situated along natural reserves and the river. At the same time, the ribbon developments are mainly residential while also directly situated next to inner-city industrial areas. Trucks of the logistical flows of the industries drive, turn and park in the narrow streets. Other parts are mixed horizontally with other functions, that include some terrain around their building between the houses.



M.6 *Spatial profiles*

By defining different areas with similar qualities, 8 different spatial profiles were selected for further analysis.

The area around the *City Centre* of Zaandam is relatively dense or compact. Around the station there are some high-rises. Here and along the main shopping street most of the functions cluster. In general there is a lot of low rise but with high ground coverage.

On both sides of the Zaan strips of ribbon development exist. The *Urban Ribbon Development* is situated closer to the city centre, has higher densities and more vertical mix compared to the *Ribbon Development*. There, there are more open spaces and horizontal organisation of functions. The *Villages* are related to the *Inner-city Industrial areas* and *Ribbon Developments*. Many of the houses in these areas were developed for the workers in the industries. The inner-city industrial estates form a characteristic skyline and image of the city and literally stand out from the low-rise residential neighbourhoods. Large truck pass through the historic ribbon developments every day.

The *Mixed Working Districts* is a partially zoned area for light industrial activities. Houses situate directly next to functional industrial buildings, sometimes even mixed vertically with them.

The *Industrial and Harbour* areas are classic business districts separated from residential areas. Large building footprints characterise the area. The spaces are functional, with a lot of space for parking, loading and unloading. The *Hembrug* district is more particular. It has a lot of historical industrial buildings with green patches surrounding the buildings. It is separated from residential areas with a large forest. There are predominantly small and medium sized buildings, only some larger ones.

Green Urban Development, *Garden City and New Garden City* are expansion areas consisting mainly of residences. Sometimes there is a small amenities centre in the neighbourhood.

Mixed
- ribbon development
- village
- urban ribbon development
- compact
- city centre Inverdan

Residential areas
- green urban development
- garden city
- new garden city

Working areas
- harbour/ industrial
- industrial business districts
- mixed business district
- inner-city industrial
- hembrug

Outer lying areas
- agricultural
- nature reserve
- recreation area

Inner-city recreation areas
- parks
- sports

source: adaptated version from Gemeente Zaanstad. (2012). Ruimtelijke Structuurvisie 2020. Zaandam, The Netherlands: Gemeente Zaanstad.

Opportunities



Art, information etc. in public space about industry and industrial history



Pocket views towards the water and industrial land marks



Strong visual relation with the water



Views through buildings keeping the connection with the Zaan as main artery



Small lunch corners in business districts where people come together



Decoration and personalisation of space



Public play elements



A place to rest and meet for own use as well as others



Modern and traditional
High and low
Industrial and cultural



Smaller trucks for destination logistics



Representative skyline



Making use of non-spaces

Source: own photos

Challenges



Seemingly endless blank walls form barriers



Large spaces needed



Spaces for parking and loading of trucks needed



Hardened surfaces



Unpleasant barriers with the use of fences



Visibility of messy terrain



Confrontations with other functions and housing, parking



Large trucks through narrow streets



Dike as barrier between housing and industry



Large infrastructural elements without destination



Messy public spaces



Pollution

6.3 SPATIAL PROFILES

Site Visit

The different spatial profiles and housing types of Zaanstad are based on the Structural vision of Zaanstad in 2012 and a cluster analysis of density differentiating various block types (see M.6 p.111). By defining different areas with similar qualities, certain places are selected for the site visit. 8 different spatial profiles were selected for further analysis. For the purpose of this research the predominantly residential expansion areas of Zaanstad were left out of the analysis. Only profiles that are already mixed to a certain degree and business environments were elaborated.

A site visit revealed opportunities and challenges relevant in Zaanstad for live work environments (summary on p112-113) and the spatial qualities of each particular profile (example on p.110 or see Appendices 4. for full analysis).

In general it can be concluded that:

- Most of Zaanstad consists of low rise neighbourhoods. Some blocks with higher densities can be found in the centre of Zaandam and along the waterfront of the Zaan.
- Views to and from the water are very important. The waterfront has diverse volumes along it with some industrial buildings as height accents. Small pockets along the water are used as parking spaces or small parks and provide views over the water.
- Public engagement is realised by providing information signs or artwork along streets at the edges of the industrial site. There is often a representative office present. Moreover, billboards along sport fields show which companies sponsor the sports activities.

Some other conclusions:

- Blocks with industrial functions often integrate leftover spaces or pockets around the building.
- Blocks with industrial functions often cover the interior workspaces with a simple structure.
- Industrial districts often only have functional open spaces, used for traffic and work activities. Hembrug has a lot of green surrounding the functional buildings. Some benches and tables are placed and are used by the workers.
- On several urban as well as separated districts a small snack bar could be found. A lunch corner for the workers.
- Large roofs of wholesale stores, or large supermarkets are often used as parking spaces.
- Spaces underneath the lifted highway that goes right through the city are used for parking spaces for trucks or a large skate park. These non-spaces are given use as additional private or public space.
- Housing situated in business districts or near industrial estates often have the backside of the residence oriented towards the industries.

Though it is not preferable to situate residences directly next to large industrial estates. This pattern can still be used for mixing with small scale production.

Some solutions for the established challenges:

- Especially with large premises it is sometimes inevitable to have a blind facade without any entrances. As these spaces are not used for work activities, these spaces can be used introduce more greenery on industrial parcels and improve the attractiveness of these spaces.
- Large trucks use the main roads. But especially near the urban industrial districts the highstreets are also used to access the sites. This can create sometimes unsafe situations, as the highstreet is also used by many pedestrians. A gallery in front of the plinth of buildings can separate the loading and unloading area from the pedestrian lane.

Live work typologies were established based on the types of blocks present in the different spatial profiles. These previous conclusions are related to the different typologies. A summary of the spatial organisation and configuration of functions, form and spaces is presented on p. 115-119. These typologies are later used to design new environments that fit Zaanstad.

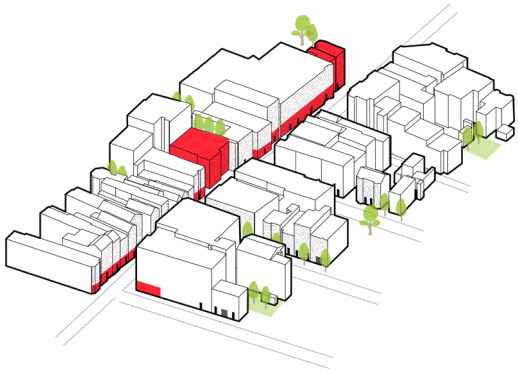
LIVE WORK TYPOLOGIES

Zaanse urban blocks in mixed environments

Context: central, urban.
Mix: horizontal and vertical.
Activities: residential, commercial, offices, amenities, services (behind the highstreet/ backstreet or branch of highstreet small to medium sized manufacturing, repair etc.).
Public space: limited, compact. Narrow streets, with small pockets and some trees. Little to no temporary parking spaces. Some bicycle parking spaces.
Network: very walkable, accessible by car.
Focus: city.

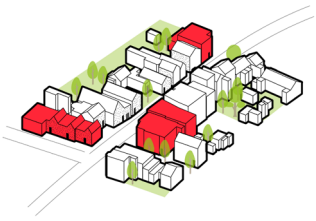
Other qualities: backstreet for logistics, parking places sometimes on rooftops of large buildings, continuous facade.

Urban highstreet



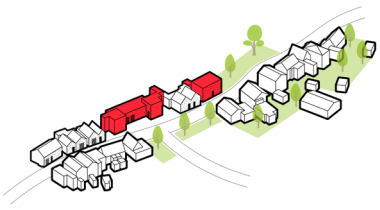
Context: local, urban.
Mix: horizontal and vertical.
Activities: residential, commercial, offices, amenities and services, small to medium sized manufacturing, repair etc.
Public space: some trees in street, front gardens, more functional space in front and next to buildings, some parking spaces along one side of the street.
Network: cycling, accessible by car.
Focus: neighbourhood.
Other qualities: not a continuous facade, the highstreet can be interrupted by a larger urban industrial district.

Highstreet



Context: local, semi-urban.
Mix: mainly horizontal and little vertical.
Activities: residential, amenities, services, small to medium sized manufacturing.
Public space: some trees in street, front gardens, more functional space in front and next to buildings, some parking spaces along one side of the street, some parts larger patches of green along the street.
Network: cycling, accessible by car, some trucks.
Focus: neighbourhood.
Other qualities: the street can be interrupted by a larger urban industrial district. Near larger natural landscapes or parks.

Mixed-ribbon development

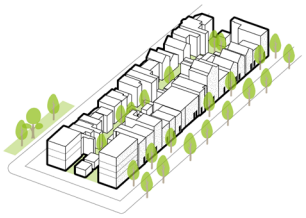


* in red the spaces where activities take place

Context: central, urban.
Mix: little, if any horizontal or vertical on corners.
Activities: residential, amenities, small café or snackbar
Public space: limited, compact. Narrow streets with small pockets and continuous row of trees. Parking spaces in the street.
Network: very walkable, accessible by car as destination street.
Focus: neighbourhood.

Other qualities: the block consists of both single families homes as well as apartments.

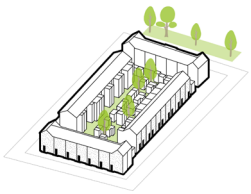
Compact block



Context: local, urban.
Mix: none, if any horizontal or vertical on corners.
Activities: residential, amenities
Public space: narrow streets alternated with streets with trees and green patches, some with playgrounds and benches.
Network: reasonably walkable, destination streets, accessible by car, cycling.
Focus: neighbourhood.

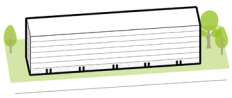
Other qualities: private gardens.

Village block, workers homes



Context: central, local, along main roads, highways.
Mix: little, if any vertical on corners.
Activities: residential, offices, amenities, small café or snackbar
Public space: singular building in a green open space. Collective green, playgrounds, larger plots of parking spaces.
Network: accessible by car as destination street.
Focus: neighbourhood.
Other qualities: the block can consist of single families homes on the ground floor (and first floor) with apartments on top. This type can be combined with a slab or open or closed block to form a certain configuration.

Slab



Context: central, local, along main roads, highways.
Mix: little, vertical.
Activities: residential, offices, amenities, services.
Public space: singular building in a green open space. Collective green, playgrounds, larger plots of parking spaces.
Network: reasonably walkable, destination streets, accessible by car, cycling.
Focus: neighbourhood.

Other qualities: this type can be combined with a slab or open or closed block to form a certain configuration.

Tower

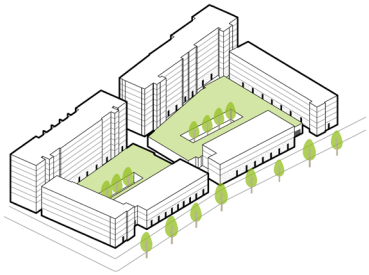


High density urban blocks in Zaanstad

Context: local/central along waterfront, highway or main road network
Mix: little to no mix, vertical on corners or along the main road
Activities: residential, communal, amenities, services, offices, small supermarket.
Public space: shared rooftop, with gardens, playgrounds, collective greenery etc. Entrances to homes along the street as well as parking garage entrances.
Network: cycling, accessible by car.
Focus: neighbourhood

Other qualities: integrated parking, views over the water.

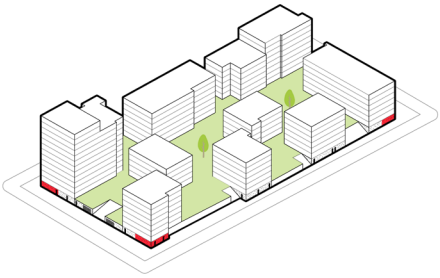
Closed or open block



Context: local/central, along main road network
Mix: horizontal and vertical
Activities: residential, communal, amenities, services, offices, small supermarket.
Public space: shared rooftop, with gardens, playgrounds, collective greenery etc. Entrances to homes along the street as well as parking garage entrances.
Network: cycling, accessible by car.
Focus: neighbourhood.

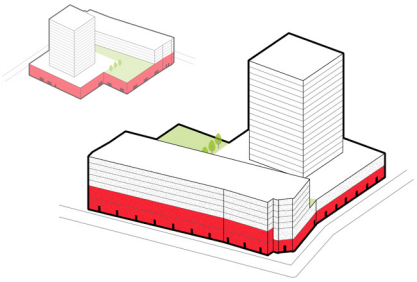
Other qualities: integrated parking.

Campus model



Context: central, urban.
Mix: vertical
Activities: residential, commercial, offices, services, amenities.
Public space: limited, small pockets, some trees in street
Network: cycling, accessible by car, public transportation.
Focus: city, regional.
Other qualities: integrated parking. In this block a lifted street is integrated so functions are accessible for pedestrians on multiple levels.

Super-block

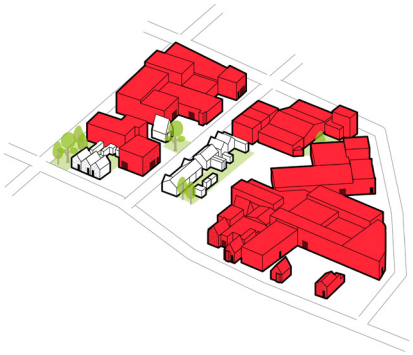


Mixed - Industrial block typologies in an urban environment

Context: local, semi-urban.
Mix: horizontal.
Activities: little residential, indoor sports, services, repair, wholesale, logistics, production/ manufacturing, related offices.
Public space: functional space in front and next to buildings, parking spaces along one or both sides of the street. Green patches with trees next to housing, some between housing and functions.
Network: accessible by car, reasonably connected to highway.
Focus: local and regional.

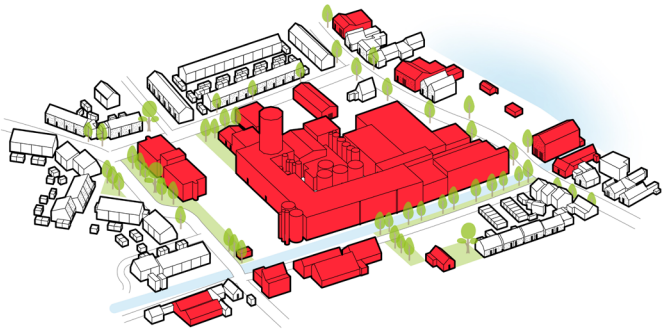
Other qualities: the block consists of both single families homes as well as apartments. The configuration has a more representative or functional side, with a more continuous or open facade. Workspaces near residences are covered. Housing faces housing, functions face functions.

Mixed working blocks

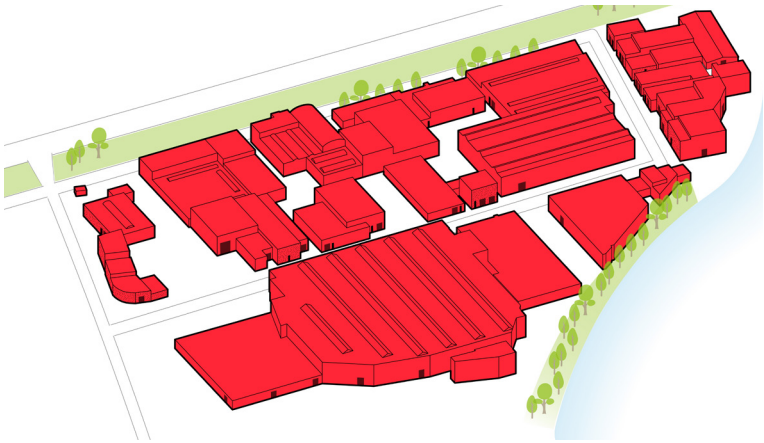


Context: local, semi-urban.
Mix: horizontal mix of larger premises, some vertical mix in smaller premises.
Activities: residential, wholesale, logistics, production/ manufacturing, related offices.
Public space: functional space in front and next to buildings, parking spaces on private terrain. Green patches with trees next to housing, some between housing and functions.
Network: relatively accessible by car, cycling, near highway, near/along waterfront.
Focus: regional/international
Other qualities: Some of the industries not only have a production site, with office. Sometimes the office is also accessible for information. Some add a store that sell their own products. In the case of the food industry, sometimes it is combined with a restaurant or café. Corners of blocks often have a relatively fine grain. Backsides of houses oriented to the industries.

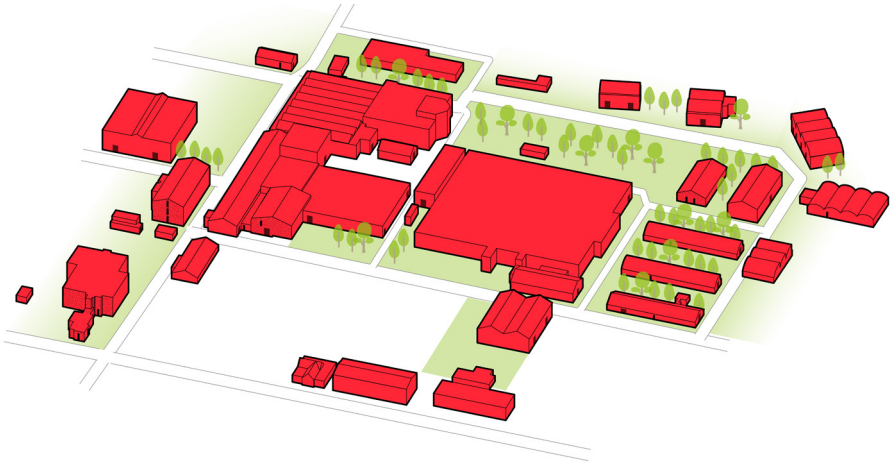
Urban industrial district



Formal district



Clustered industrial park



Separated industrial district typologies

Formal district

Context: separated.
Mix: none (horizontal on district level).
Activities: all kinds of industrial activities, many larger premises.
Public space: functional, limited amount of trees, functional space in front and next to buildings, parking spaces on private terrain.
Network: accessible by car, close to highway, some cycle connections to the city.
Focus: city, regional, international.

Other qualities: some plots of the company are accessible from both sides of the block, some water related businesses

Clustered industrial park

Context: separated.
Mix: none (horizontal on district level).
Activities: all kinds of industrial activities small, medium and some larger ones, also for public and private events.
Public space: functional space in front and next to buildings, parking spaces on private terrain. Also a lot of unused open spaces along streets that are green, have trees and some patches with furniture for people to sit together.
Network: accessible by car, close to highway, some cycle connections to the city.
Focus: city, regional.

Other qualities:



"I cycle and walk a lot, I just want to open the door and do sports."

(anonymous, inhabitant Oud Koog)



"Dirty hands does not mean dirty work, making is a beautiful industry."

(anonymous, business Zaandam)

7.

7. PERCEPTIONS

General impression from survey and interviews

Interviews and a survey have revealed perceptions of inhabitants towards live-work environments as well as perceptions of industries of inhabitants in proximity. The survey for the inhabitants focussed on the activities inhabitants want to do in their living environment. While for businesses it was also important to determine what spatial qualities are necessary to facilitate their work activities in the future (see Appendices 9-11 for survey results and interview questions).

Set up:

Inhabitants survey: Inhabitants were asked about how satisfied they are with their neighbourhood, home dimensions (garden storage). What aspects they are satisfied about. What activities they would like to do close to their own home. Moreover, their perception of live work environments and the businesses in their neighbourhood.

Approximately 50 inhabitants of the Koog aan de Zaan area participated in the survey and interviews were conducted with multiple businesses from Zaanstad and Amsterdam. These resulting patterns are specific to the local context and particular situations. Only a sample of inhabitants and businesses were able to be interviewed, so these patterns do not represent a largely shared preference. But are interesting solutions to some concerns relevant in live work environments.

Businesses interviews: 7 manufacturing businesses in Zaanstad (3 L, 2M, 2 S) and about 15 in Amsterdam were asked about their activities, why they have chosen their current location, what aspects they are satisfied about of their location, network/logistics, premises. If located in a mixed environment, what they perceive as benefits or disadvantages of such a location. Furthermore, how they expect their activities will change in the future and whether the location allows for these changes. Finally, whether they have any desires for their current location.

Many interviews were made possible by a significant contribution of the project '*Ontwerp van gemengd gebruik in de stad*' (2020).

Inhabitants

While access and available public spaces area mainly discussed on district level in theory. Interestingly, from the survey it became clear that people desire both private and public greenery. Particularly on the building scale level, own open spaces such as a storage and garden are considered important. Many participants appreciate the green character of the neighbourhoods and the proximity to the natural reserves in the surroundings. Notably, being able to do outdoor recreational activities or outdoor sports also outside of clubs was mentioned by many inhabitants. Moreover, water related activities such as recreational boat fares, swimming etc.

Many appreciate the proximity of a supermarket, some shops and restaurants and cafés. Often, local businesses were mentioned. Either referring to the contribution of the activities to the liveliness of the area, or being able to buy local products.

In general, sharing of certain spaces (workspace, storage or garden) was not very popular. Collective sustainability interventions, such as waste collection, sustainable energy sources or heat exchange were often chosen as things that people would share. Some suggestions were made to share tools or gardening instruments.

Unfortunately there were not enough participants from to determine whether the size of the residence, garden or storage is related to the satisfaction of the neighbourhood. Most results came from the Oud Koog neighbourhood, consisting of mainly row-houses with private gardens. From these results, it could be assumed that when the size of the home or garden increases, the satisfaction of the neighbourhood increases as well. However, a more extensive survey is needed, with inhabitants near industries from diverse housing typologies, to come to evident conclusions.

While some express that the smell of the different cacao industries give a sense of home, others also express concerns about sending their children cycling to school while large trucks drive past. Frequently mentioned nuisances by participants were mainly about noise and smell. Smell reduction is a technical issue. As there are not really any spatial solutions to reduce smell from those industries other than remove the source. Therefore, spatial design solutions for noise reduction were investigated. Lugten (2014) is used as the main source for patterns mitigating noise. These were added to the pattern language of this research.

Businesses

Certainty:
A concern from multiple companies in transformation locations in Zaanstad was the uncertainty of whether they could stay or not. Assured space for businesses was one of the main concerns. This pattern from theory (P.15) was confirmed by the interviews with multiple businesses.

Diverse local businesses:
Another interesting conclusion was that diversity of businesses (P.14) is not only important because it creates diverse activities and as a result a vital environment. But also to provide options for businesses to form local relations and get their commodities locally. Many have indicated that if it is possible to get their office supply or goods locally, they prefer it. On the other hand, goods for specialistic manufacturers, or manufacturers of customised craft products often do come from far, but in small amounts.

Relocation:
Relocation would be desirable for some companies. Especially, growing small to medium sized companies. Many have grown from one smaller premises and over the years bought adjacent parcels and built additional structures. However, this growth does not necessarily benefit the efficiency of the spatial organisation of the work flows or production processes.

> *"If you can build a new premises now, you can organise it more efficiently and based on future needs. So there are benefits to relocation." (Construction company, 2000 m2, 35 workers)*

Some firms have machinery that are relatively easy to transport. However, for some manufacturers the machinery is built on site and cannot be transported to another location. The primary investment needed to build a new factory can be too large to even consider relocation.

> *"if someone asks me, here is 20 million and a piece of land, build your factory more efficiently on a site 3 km away,' that would be interesting us. Especially because you can become more efficient afterwards. The initial investment is just too high, and you would have to run your operations parallel to the new project. You have to hire people for that, so it costs a lot of money... We are located on expensive land, you could build nice homes here... We do not necessarily have to situate here, but we are not going to relocate from our own initiative either."*
> *(Food industry, 35 000m2, 50 workers)*

The experience:
More and more manufacturers really try to sell their products as part of the local experience. Combing the experience of the production with the consumption of the products. The central urban location connects the products to the consumers.
The expensive location is representative face 'a flagship store', with a small production part. The two interviewed experienced indicated that if the firm would grow, expansion on site would not be possible. A larger factory would be built somewhere else, preferably relatively nearby on a business district.

Organisation of the plot:
Manufacturers in urban environments near residential areas think about where the components with risk are organised on the plot. The direction of the explosion risk is composed or the harmless components, such as storage, office or logistics are wrapped around the hazardous parts to reduce risk contours.

Excess spaces:
In one case the excess spaces surrounding the large manufacturer are made available to the adjacent residents. These spaces are unused but are left open for future expansion needs. Every 3 years contract is renewed with residents. Until the firm needs it for expansion, the spaces can be used for parking or addition to the back gardens of the adjacent residences. The firm indicated they have very good relationships with the neighbours.

The building:
The building quality of old historic structures often is not according to current practices. It is not considered suitable as an office. However it does provide affordable spaces.

> *"It is a beautiful classic building, but to work in it is a different story. In the winter it is extremely cold and in the summer extremely hot, the building is out-dated... because it is industrial heritage there are limitations to renovations... It is a coat with the pockets in the wrong places, you get used to it but it is not optimal."*

Many of the smaller manufacturing firms indicated that when they moved to their work space, they started from nothing. Sometimes not even sewage facilities. They started from scratch, own investments were made to the interior layout so the premises could be organised exactly the way the entrepreneur wanted.

Connectivity:
Companies with logistic activities often have peaks at certain times of the day. Especially at the beginning of the day and end of the day. Moreover, for smooth logistics, it is important to have a two way access to the site.

> *"We only have one access route, the other one you can only access with a private car. You are always dependent on this route, if something happens there, we have a problem."*

Public engagement:
In Zaanstad, many businesses contribute locally in some way, for example with sponsorships of events or sport clubs. Family businesses sometimes go several generations back, as well as the workers. Many inhabitants have relatives that work or have worked for the well-known industries. This creates an intimate relationship.

Businesses indicate that experiences with inhabitants are in general positive. Especially with the inhabitants originally from the Zaanstreek there is a lot of understanding. It was even pointed out that when new residents (often from Amsterdam) start to complain about the smells or noises of the industries, local residents immediately react that the industries are part of the region and contribute to local employment opportunities.

Perceptions of inhabitants on live work environments



"They are part of this neighbourhood, I knew that when I came here."



"I have lived here my whole life so I am used to it. "

"They have been here for so long, it is part of the Zaanstreek."



"If they have been here already it is fine, but no expansions."



"Great! They provide a lot of employment opportunities!"

"Good and nice! I like to buy from the companies from the neighbourhood."

(inhabitants, Oud Koog)



"In the end, I am an entrepreneur. I think by putting residences next to businesses, it makes working impossible"
(Construction company, 2000m2, 35 workers)

F. Form and urban integration
P. Plan and Programme
N. Network and Connectivity
E. Environmental Quality
z. addition from Zaanstad

Only in Zaanstad

Theme

Z ***X . 0 Title***

Description summarising the principle

ILLUSTRATION

Explanation that supports the pattern

Proposed practical application



Scale level

Theory

Case

Interviews

Appears in case:

B *Brussels*

L *London*

S *Shenzhen*

Z *Zaanstad*

Sources of relevant theories:

M *Manufacturing : Foundries of the Future (FF), Productive BXL (PBXL), Oram (O), Design of Urban Manufacturing (DUM), Working Cities (WC)*

I *Industrial Intensification: London Industrial Intensification (LII)*

C *Compact City: Grand Urban Rules (GUR), Metromix (Mx), Hoppenbrouwer (H)*

V *Vitality: Jane Jacobs (J), Montgomery (M), Kevin Lynch (K)*

L *Liveability: Dorst, Kotulla et al., Howley et al.*

N *Noise mitigation: Lugten, (2014)*

Applicable scale level:

B *Building*

BS *Block - Street*

D *District*

8.

8. PATTERN LANGUAGE

Development of patterns related to live and work environments

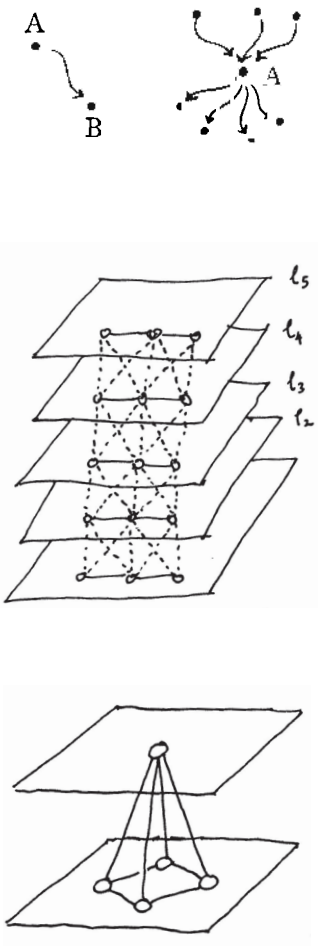
"... what demonstrates the patterns' inevitability is their connection to fundamental patterns of human behaviour and movement. Many human functions and interactions are facilitated by the proposed urban geometry, and we could graphically link behavioural patterns to these architectural patterns directly." (Salingaros, 2000).

What is interesting about patterns, is the link between the activity and the geographical or spatial. This particular quality is important for the development of live work environments. In the end, it is the essence of urban design to facilitate activities.

Another interesting feature is the interrelation between patterns. Each patterns describes physical relationships which deal with a small system of interacting and conflicting forces. This way, a complex problem can be approached one step at a time. A good pattern is connected to another and connected on different scale levels (see F.22). For example the landmark, it may be an incidental building somewhere, but in Zaanstad a lot of landmarks are located along the Zaan river. These patterns are related but can also be used separately, depending on the context.

First, spatial qualities of live work environments are explored with a literature review of relevant theories and reports and documents review of common practices and principles. A case study of exemplary mixed use districts reveal additional and supplementary qualities to the ones gained from theory. This forms the first iteration of the patterns. In the second iteration of the patterns the transferability of the patterns to Zaanstad is determined. Already some of the interrelations between the patterns are uncovered.

Patterns specific to Zaanstad have been developed based on a historical analysis of the geography of production through time and a spatial analysis of the different types of mixed neighbourhoods in Zaandam and where and how certain types of work manifest. These together with the patterns from theory and the cases are used for the third iteration process, design testing on location in the framework of the scenarios*.



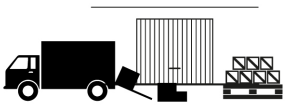
F.22 Interrelations between patterns (Salingaros, 2000)

Each pattern consists of a statement, summarising the idea or hypothesis. Secondly, an explanation that supports the pattern. This can be theoretical, scientific, from statistical data or empirical observation. Third, an instruction in practical terms of how to incorporate the pattern in an actual design. As the aim of this research is make abstract patterns more concrete, often the description summarising the principle is similar to the proposed practical application.

Salingaros, N. (2000). The structure of pattern languages. Architectural Research Quarterly, 4 (2), 149-162.
* Part IV Research by design

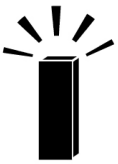


FORM | URBAN INTEGRATION



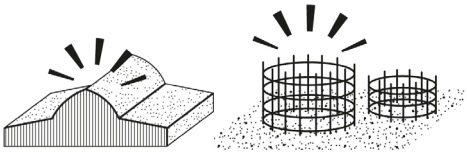
B M B L S Z

F.1 Large openings
Large openings provide easy access to goods, materials and equipment. Developing buildings with high ceilings facilitate large openings and are more flexible to function change. (FF).



B C V S Z

F.2 Landmarks
Landmarks are height accents, recognition points for its inhabitants and give a sense of place in relation to their surroundings. Landmarks in the city is characteristic of Kevin Lynch theory. (K, GUR).



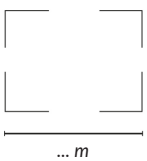
B V B L Z

F.3 Historic Landmarks
Historic buildings or landscape elements contribute to the memory and character of the neighbourhood. Many older industrial buildings have been built to last more than a hundred years and can be aesthetically pleasing. Similar to landmarks, with view-lines through streets or openings in blocks. Also supporting a range of architectural styles in the neighbourhood (J, K). Renovate or give new purposes to these structures.



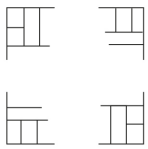
B M

F.4 Visibility of work activities
Make production process visible (FF, O, WC). More transparency in the processes of businesses can create more understanding from its neighbouring inhabitants. This can be done by selling the products on location or creating a transparent facade making parts of the production process visible.



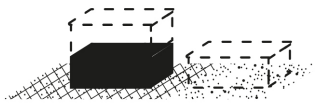
BS V B L S Z

F.5 Short blocks
Create short blocks. As a closely related aspect, a large number of intersections. This way, increasing the permeability and walkability of the neighbourhood (M, J, GUR). Additionally, contributing to the human-scale. Based on the blocks present in the exemplary cases, block sides should not exceed ≈ 120m.



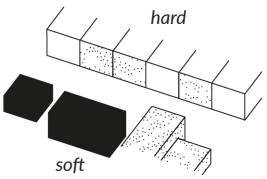
BS V B L Z

F.6 Fine grained block corners
Promote fine grained footprints for corners of blocks. This way the experience of the block is one of a fine grained neighbourhood even when it includes larger footprints. Theory already supports a fine grain (M, J, K). However, in this way medium sized and large industrial plots can still be incorporated within the block. This principle can be useful at intersections or along streets used byresidential traffic.



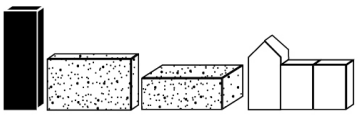
B BS M B Z

F.7 Excess space
Provide excess space and flexibility space for growth and shrinkage (O, FF). For businesses to stay viable they need space surrounding the premises to expand as well as spaces for work activities.
It can be leftover spaces or not building on the whole plot. This can be realised by creating unfinished or flexible buildings or blocks that allow for expansion, adjustable to future need.



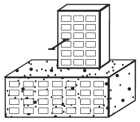
BS M B L Z

F.8 Hard & soft edges
Allocate appropriate edges to blocks along certain streets. Residential blocks, or along highstreets, often have hard edges or continuous facade. Buildings that are in alignment with each other. While mixed neighbourhoods, working districts or industrial areas have a soft edge, leaving spaces open next to its volumes. These spaces are essential as flexible spaces for work activities, loading, parking etc. (DUM).



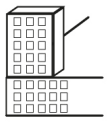
BS M C V L B L S Z

F.9 Diverse plots and volumes
Provide a diverse supply of building plots, volumes and footprints in a certain district. Diversity includes a range of architectural styles and building types. Moreover, varying costs, ages, styles, uses and conditions (FF, M, J, GUR). This creates flexibility within a certain area for a diverse range of uses. As the organisation of different volumes is related to the organisation of functions.



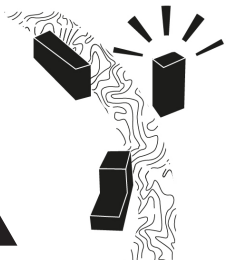
BS L S

F.10 Setback
Advocate the human-scale by introducing a setback when a building exceeds a certain height. This way pedestrians experience a lower building height and a degree of openness is maintained. At the same time, enabling higher densities.



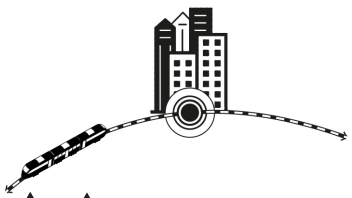
BS C S

F.11 Corner height accent
Develop height accents on corners of blocks along broad avenues (GUR). This way a higher density can be achieved while providing an orientation point. It can be a tower or an increase in height with several levels balanced relative to opposite blocks of the street.



D B L Z

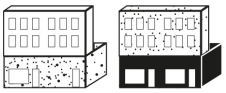
F.12 Landmarks along the water
Multiple landmarks along the waterfront. The waterway as a large open space provides an overview of the area, while the height accents or landmarks give a sense of place. It is supported by observations in several cases. This is in contrast to the pattern from Grand Urban Rules, where the maximum permissible height is advised to progressively reduce as the water edge is approached.



D C L S

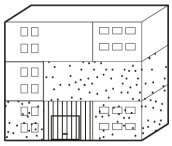
F.13 Densities at public transportation nodes
Create higher densities in proximity to public transport nodes to promote use of public transport. This way it is possible to cut back in car use and amount of parking space per person (Mx). Densification strategies can focus on developing around existing and new transportation nodes.

PLAN | PROGRAMME



B M I V B L S Z

P.1 Vertical mix
Stimulate vertical mixing of functions. To stimulate active plinths and streets (FF, O, M). Vertical mixing occurs mostly with shops, services and amenities, offices and small workshops or manufacturing. It may also be in the form of a work home.



B L S Z

P.2 Collective building
Clustering of similar or related businesses in the same building. Multiple similar businesses can make use of collective facilities. Using spaces more efficiently and making it possible to share investment costs for specialistic machinery. Related businesses in proximity increases interaction and collaboration. Larger buildings provide space for multiple smaller and medium sized businesses and workspaces.



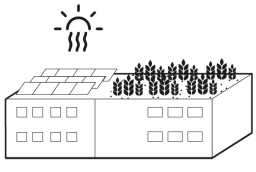
B M S Z

P.3 Multi-storey factories
Enable vertical organisation of production processes. Architectural technologies now make it possible to adopt more efficient use of ground floor space and organisation of work activities. With the use of goods lifts, load-bearing floors and efficient floor planning (FF, LII, WC).



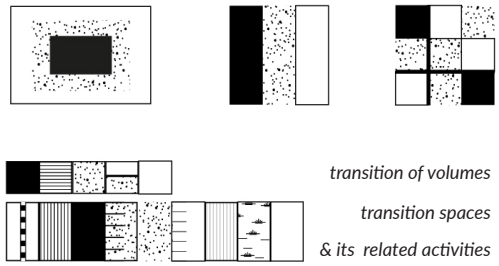
B BS M B L Z

P.4 Affordable structures
Ensure a supply of affordable options for businesses. Affordable structures and temporary structures keep the location attainable for small businesses, start-ups and freelancers. Moreover it facilitates flexibility for different uses over time. Low cost transitional spaces can be used to revitalise the neighbourhood with activities while waiting for investment. a (FF, PBXL).



B BS M

P.5 Make use of rooftops
Make unused rooftops productive. Flat roofs often remain unused. However these spaces, especially on large roofs of industrial volumes can be used productively. To generate sustainable energy or to produce food such as an urban farm. Other uses can be as a water storage after heavy rainfall, roof garden or terraces (FF).

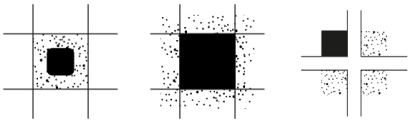


D M C

P.6 Transition of functions

Enable transition of functions based on inward, outward or micro zoning. These can consist of transition volumes or spaces. Where the industries with the most nuisances are furthest from vulnerable functions. Or the noisy highway or railway are furthest away from the quiet spaces. These different transition spaces and volumes create spaces of *rust reuring ruis* (peaceful, lively, noisy). Businesses with similar environmental nuisances can be clustered together. This is also applicable to types of spaces. Noisy spaces such as infrastructure, can be clustered with other noisy functions.

Microzoning, that defines particular conditions to a certain site, can be used to allow exceptions in general zoning plans. The borders of zoned areas can be given particular conditions that allow for transitions between different zones (FF, GUR, Mx).



BS

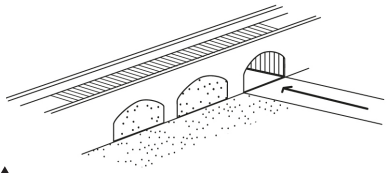
Transitions can be realised within the block, outward from the block or manifest around corners where different blocks meet.



BS L S

P.7 Clustered businesses

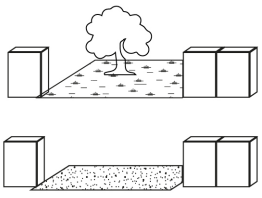
Industries and businesses cluster around a square and make use of a shared public space. This way workers can enjoy public space, promoting street life. While the different business terrains remain private. Organise fronts of businesses towards a similar space. Collaborations between businesses can give infill to these spaces.



BS L

P.8 Under rail

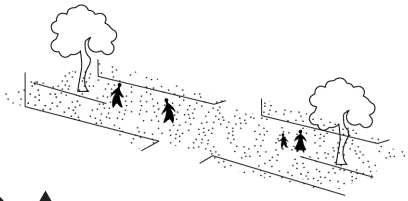
Turn unused spaces under infrastructure into useful spaces. When a railway is lifted, the space left underneath can be used for more messy or noisy functions to settle. While the lifted infrastructure allows for crossings underneath without interrupting traffic.



BS B Z

P.9 Pocket spaces

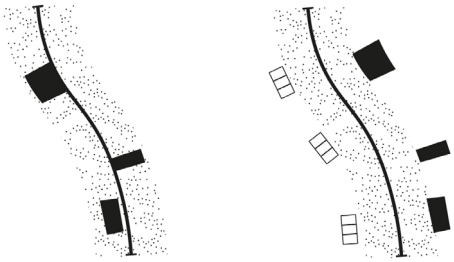
Pocket parks, public space or terrain provide spaces to rest, meet or play for the people living there or people passing by. These spaces are also available for more temporary activities. It increases the amount of green in the neighbourhood and diversifies the amount of available public spaces. These pockets can be integrated within the block, on leftover spaces or between blocks.



D C S

P.10 Pedestrian corridor

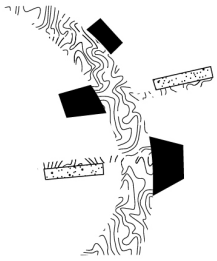
A pedestrian corridor creates a walkable environment for people. A pedestrian highstreet can connect different blocks with different functions together promoting street life and people watching (GUR). Heavily used streets can be turned into carless streets, safeguarding safe pedestrian movements.



BS D M I C V B L Z

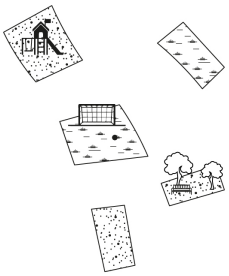
P.11 Highstreets
Facilitate vital highstreets with active plinths, businesses on ground level and compact public spaces with interactions between inside and outside activities. The highstreet acts as the face for urban facilities and local productive activities. Industrial functions situate along a highstreet together with other functions (FF, LII, PBXL, LII, J, GUR).

The highstreet can be also used as means to transition from an area with industries that create some nuisances to a residential area. While both profit from the proximity of shops, other facilities and services. Locating manufacturing behind the high street.



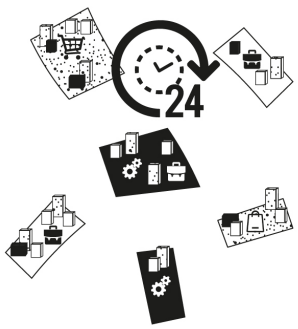
D B Z

P.12 Industry along the waterfront
Larger Industrial estates locate along the water. While medium and smaller industries locate along smaller waterways or branch streets. Historically, many industrial sites located along the water and were dependent on water for transportation of goods.



BS D V

P.13 Diversity and dispersion of public spaces
Smaller and medium sized public spaces and parks are dispersed through the district. Providing spaces for people to meet, rest or play of varying prices and quality. A balance of planned exchange versus movements for spontaneous exchange is needed. Quality of the public realm is important for the success of mixed live work environments (Mx, J, M). Complement existing greenery in neighbourhoods.



D V B L S Z

P.14 Diversity and dispersion of businesses
Stimulate diversity and dispersion businesses, primary and secondary functions. Particularly, SME's (PBXL, M, J) and of which a proportion locally owned (FF). This will support diverse opening hours and varying activities during the day (J, M). A number of key people attractors is needed to create vital neighbourhoods (J, M, K). The spatial positioning of key people attractors, public and private need to be dispersed (H).

The presence of the following activities are promoted for live work environments. Such as street markets, spaces for storage, reuse and repair centres, shared spaces for making and technology, equipment, training development and education and inclusive community hubs for sharing knowledge (FF, PBXL, M).

* These can also be seen as separate patterns, more concrete ones related to this broad pattern

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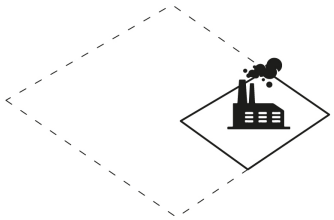
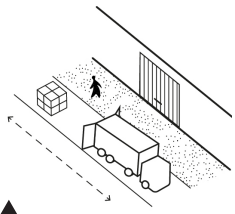


D M

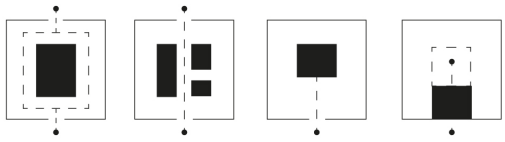
P.15 Guaranteed space for businesses
Provide certainty for firms so they can continue to carry out their work activities and invest in their location. Businesses need to make long-term decisions and make investments in technology, its premises, its workers, local networks etc. These decisions tie them to their location (FF, WC). Plan assured spaces for businesses on strategic locations.

NETWORK | CONNECTIVITY



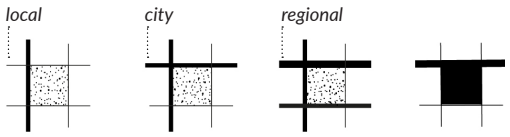
B M B Z

N.1 Easy loading& unloading
Allow temporary parking spaces for loading and unloading at appropriate places. Separate parking lanes allow continuity of traffic in the streets. Enough space in front of the premises for the relevant activities. For frequent, larger amounts, even loading docks and ramps facilitate easy loading and unloading (FF).



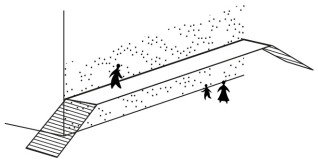
B BS M I B Z

N.2 Functional permeability through the block
Create permeability or separate access for businesses through the block. This way trucks can easily drive through without difficult turns. Separate entrances for different uses ensures that the different uses to not interfere with each other. The exterior of the block provides proper street frontage while manufacturing, logistics, loading and storage spaces are on the inside. These spaces can be optimised by sharing (LII, FF, O).



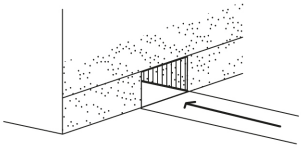
BS D M I B L S Z

N.3 Appropriate accessibility
Facilitate appropriate accessibility in relation to the activities. To create good connectivity and prevent congestion. Depending on the activities, small to medium sized companies can situate along a highstreet or city road. Often larger industrial estates need direct access to the regional network. Access for heavy goods vehicles needs to be managed with links to the main transport infrastructure (FF, LII, O, PBXL).



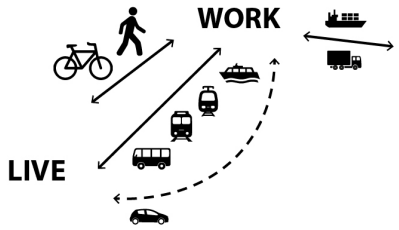
BS S

N.4 Lifted street
Develop a lifted (high)street in dense commercial areas. This way, 2 layers of the building are accessible to pedestrians. In dense environments functions that need pedestrian access can locate on multiple levels. It can also improve the walkability when a street is lifted over a heavily used street by traffic.



BS S

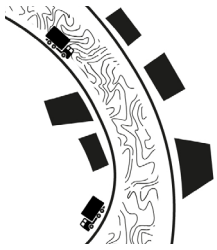
N.5 Permeability through the building
When blocks are large, a road through the building ensures permeability without interrupting the continuity of the block. This can be for traffic as well as pedestrians.



D M V L B S

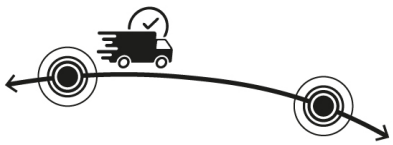
N.6 Multi-modal transport
Provide multi-modal transportation options. Multi-modal transportation is a characteristic of mixed-use neighbourhoods. As dense environments cannot rely solely on car travel of residents and workers. Moreover parking and its infrastructure require a lot of space that is not used efficiently. The car is only used at specific moments of the day and empty most of time. Moreover, improving public transportation options on strategic locations increases mobility for multiple groups of inhabitants. Also those who cannot drive or afford a car. It therefore supports sustainability.

Mobility strategies should focus on 5-10 minutes walking or cycling distances that enables living and working movements (Mx, M, K, LII, FF, PBXL).



D B

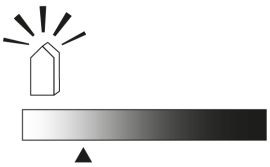
N.7 Logistic flows along the water
Develop functional roads along a waterway, where industrial estates situate. Historically, many industrial sites located along the water and were dependent on water for transportation of goods. Separation of flows can be realised in this way.



D M

N.8 Logistic hotspots
Centralised inner-city logistics centres along accessible routes, to the city as well as region provides an efficient way to deliver and pick up goods and packages to and from the inner-city (FF, PBXL). Larger trucks can unload at the centre, while smaller trucks or busses deliver to the (less accessible) inner-city locations. Develop logistic centres at strategic places.

ENVIRONMENTAL QUALITY



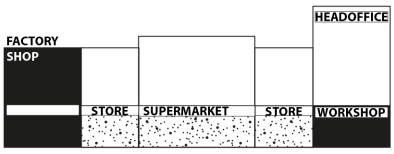
B B Z

E.1 Affordable housing
Provide affordable housing options. To ensure diverse options of housing for different groups of people. It contributes to stimulating housing of varying costs, ages, styles, uses and conditions. A common characteristic of mixed live and work environments when looking at the whole neighbourhood, is that the neighbourhood is relatively affordable.



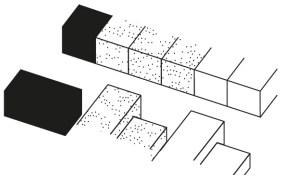
B M

E.2 Architectural quality
Invest in architectural quality. For housing as well as industrial structures (FF, PBXL, O). At least on the representative sides.



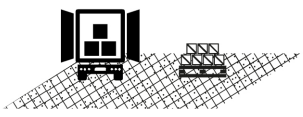
BS M B L S Z

E.3 Representative facade
Create representative facade for functions along roads also used by residents. It creates a public presence of the company. In the highstreet it means that the functions can be partly accessible to the public as well. For industries along streets that are also used by residents, it means that the facade has a certain architectural quality, has an entrances, or where the office related to the industry is situated (FF).



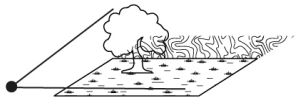
BS B L Z

E.4 Functions face functions
Functions facing functions, while housing faces housing. This way the parts of the street are used in similar ways by the businesses or residents. Preventing irritations from neighbours (DUM). When developing certain areas, always look at the other side of the street.



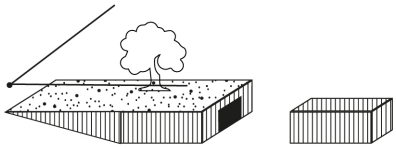
BS B L Z

E.5 Functional spaces
Hard surfaces and functional spaces give room for industries to do their work, temporary needs such as parking or truck loading etc. It has a low maintenance cost, but it does not mean that these are unorganised or messy. This principle is not supported by theory but necessary for businesses. It needs to be balanced with unhardened, permeable materials to prevent undesired environmental effects. Functional spaces are particularly needed by large sized businesses.



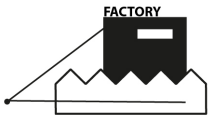
BS M I Z

E.6 Design views
Guide views to desirable directions. When spaces and its views are designed it can provide desirable views and direct away from undesirable ones (LII, O). Such as views towards greenery and way from messy terrains.



BS B

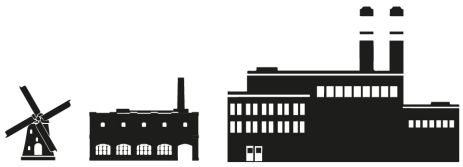
E.7 Views at different heights
Make use of different heights to direct away from undesirable views. Combing large roofs of industrial buildings with a public space or another use for the neighbourhood. While the height difference conceals views to the functional terrain.



BS D S Z

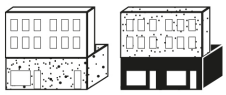
E.8 Industrial landmark
Make industry recognisable in the neighbourhood. High buildings of industries are a landmark but also contributes to the industrial character and identity of the neighbourhood. Promote vertical organisation of industries and design the views towards it.

ZAANSE ADDITION TO EXISTING PATTERNS



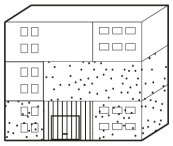
B D

F.3z Historical Industrial Landmarks
In Zaanstad the historical landmarks show the various industrial periods the region has known.



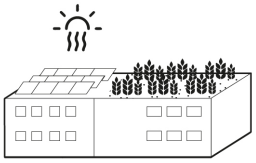
B BS

P.1z Vertical mix
Functions are mixed vertically predominantly along the highstreets.



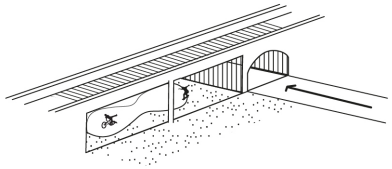
B BS

P.2z Collective buildings
Buildings with multiple uses or collective buildings with shared facilities are located in a central location along the highstreet. Preferably, with good public transportation options.



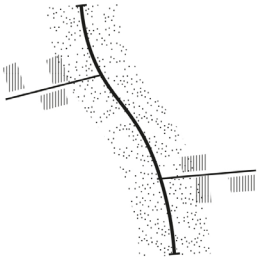
B

P.5z Make use of rooftops
Many large roofs of wholesale stores, or large supermarkets are used as parking spaces.



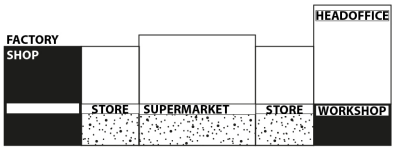
B BS

P.8z Under rail
More in general this pattern promotes making use of unused or non-spaces. In Zaandam, underneath the highway that goes right through the city, a large supermarket is placed, parking spaces for trucks or a large skate park are several ways to make use of these spaces.



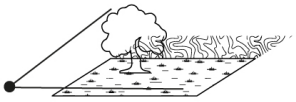
BS

P.11z Highstreets
Locally focussed amenities, services are mixed horizontally along branches of the highstreet.



BS

E.3z Representative facade
The representative side of a mixed use block is located on the side of the block that is near housing or used frequently by residents. While behind the representative side practical access for the businesses is organised. This can be a backstreet.



BS D

E.6z Design views
Pockets along the water provide views over the water, overview of the place and a sense of openness. Pockets in blocks can provide small public spaces for the people living there and direct neighbours. This way an endless facade is interrupted.



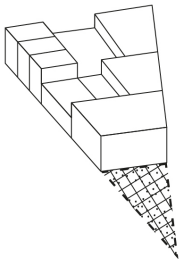
ZAANSE PATTERNS

FORM | URBAN INTEGRATION



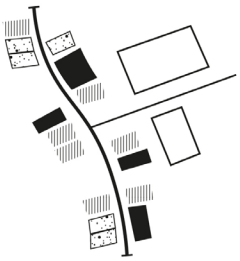
B BS

ZF.1 Large premises with open terrain
Large businesses need a premises with enough open terrain encompassing the building. This may be for work activities, parking, loading and unloading. But also for expansion possibilities or adaptation to new or adjusted activities. With limited space, buildings can be higher. Small and medium sized businesses do not need a lot of open terrain. Ensure large parcels for large businesses.



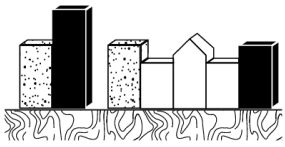
BS

ZF.2 Leftover spaces
Leave leftover spaces open. The built environment in the Netherlands is not a perfectly square grid. Meaning block shapes can become more triangular, this can create inefficient volumes. By leaving these spaces open as excess space, these spaces can be used for loading and unloading, turning, temporary parking or a shared public space etc. Create efficient blocks and leave inefficient spaces open.



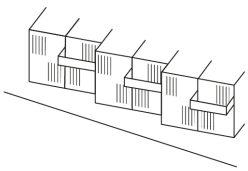
BS

ZF.3 Small and medium sized premises along the street
Organise small and medium sized premises along the street. Small and medium sized manufacturing firms cluster along the highstreet or the main road in informal working environments. In a business districts small and medium sized premises cluster along the main road.



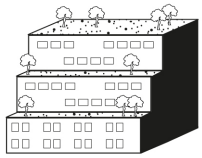
BS

ZF.4 Diverse waterfront
A diverse waterfront provides an interesting view and the landmarks give sense of place and orientation. A height accent on one side of the waterfront is complemented by an opening or low rise on the other side. This way diverse forms and activities have access to the waterfront.



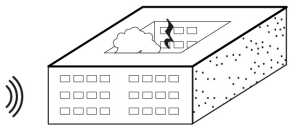
B N L

ZF.5 Facade attributes
Create facade attributes on noisy sides of the building. An irregular facade with attributes such as balconies sticking out scatter noises. Similarly, shutters in front of windows or doors scatter noise. Or a double facade can mitigate the noise nuisances .



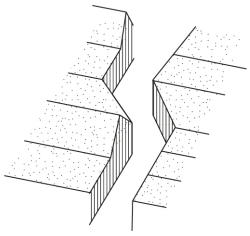
B L

ZF.6 Terraced apartments
Create qualitative private gardens for apartments. This building typology enables higher densities and provides private or collective green spaces for residents on multiple levels.



B N L

ZF.7 Accoustic polder
Create noise free zones on the inside of blocks. Closed blocks creates an interior open space that is protected from noise from the outside.



BS N L

ZF.8 Narrow irregular streets
Introduce narrow irregular streets near noise producers. Noises travel smaller distances as they reflect from the irregular facades.

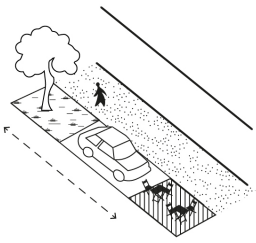
ZAANSE PATTERNS

PLAN | PROGRAMME



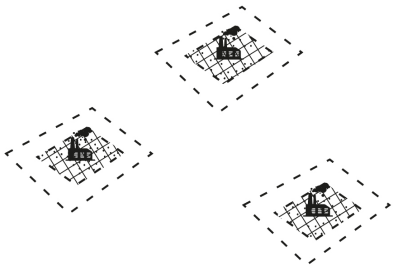
B

ZP.1 Lunch-corner for businesses
A lunch corner in a business district can serve as an amenity and place to meet for businesses that do not prefer informal or mixed environments. In several business district in Zaanstad a small snack bar or sandwich shop was found. Develop a lunch-corner in an accessible and central location.



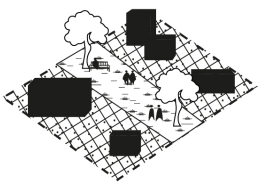
BS

ZP.2 Multiple use parking lanes
Stimulate diverse use of the parking lane. Often there is an excessive amount of parking spaces in the streets. These spaces can be made more diverse by providing spaces for green, bicycle parking, terraces for café's or restaurants, presenting spaces for products etc. Places important for loading and unloading are kept as temporary parking spaces.



B BS

ZP.3 Dispersed micro-zoned Industrial estates
Disperse large industrial estates in a district. The Zaanstreek is characteristic for the industrial estates situated dispersed along the Zaan river. These are mostly related to the food industry, in particular manufacturing of cacao.



BS D

ZP.4 Shared public spaces for businesses
Create shared public spaces in industrial districts. Often there are only functional open spaces. By opening up some space, a place is created for the workers to sit on a bench during a small break, have lunch or meet other workers in the district etc. To create spatial quality in an otherwise primarily functional space. These can be situated centrally in the district or along the edge bordering a residential neighbourhood.



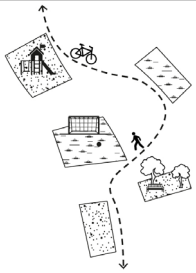
B D

ZP.5 Public engagement
Encourage public engagement of firms to their local environment. To develop a relationship with its surroundings and create understanding. An information centre in a neighbourhood can provide information or serve as a point where people can go to ask questions. It can also appear in the form of art, information signs, office reception or sponsorship of local activities and events.



B L

ZP.6 Hubs for sharing commodities
Develop hubs for sharing commodities. Such as a *toolotheek* or *speelotheek*, these similar to public libraries. Instead of books people can rent tools, such as gardening tools or toys.



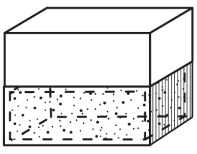
BS D L

ZP.7 Links to recreational routes
Create links to recreational routes from public spaces in neighbourhood. Connecting the public spaces and greenery to each other and to local recreational routes. Also providing suitable pedestrian lanes for walking, cycling, running etc. This way, outdoor recreational activities are facilitated for many.



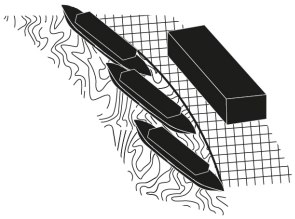
B W

ZP.8 Flagship store
Create a place that is a representative image, where people can experience the production process. This way contributing to transparency of production processes and enabling local involvement of the industry. The flagship store can be in a central location. It can be combined with small scale production, a commercial store selling locally as well. While large-scale production takes place somewhere else.



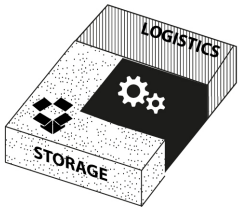
B W

ZP.9 From scratch spaces
Provide affordable spaces, where industries are able to invest in the organisation and design of the interior themselves. The lack of services and amenities ensures an affordable price. While the stripped space allows for businesses to organise the space exactly to their needs.



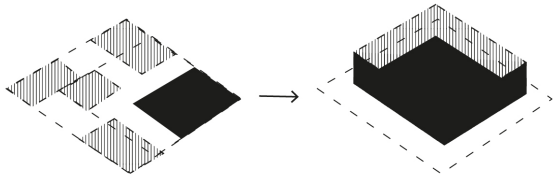
B W

ZP.10 Storage spaces on the water
Options for additional storage space on the water. When the industry is situated along the water, but does not necessarily transport goods over water. Storage boats can be placed on the water as additional storage spaces.



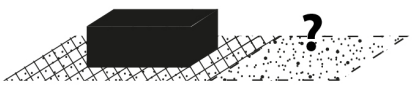
B BS W

ZP.11 Wrap around production activities
Encourage wrapping of non-risk or non-nuisance spaces around nuisance sources. Storage spaces, office or logistic spaces can situate around the production activity. Mitigating nuisances by wrapping around the activities creating risk or nuisances.



B BS W

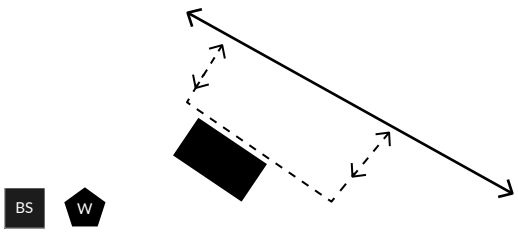
ZP.12 Growth options
Provide options for growing businesses on site as well as relocation to larger plots. At some point business grows beyond the capacity of the site. Or as a result of multiple expansions on a plot or different plots the activities are not organised efficiently anymore. It may be necessary to invest in a new location that fit the needs of the growing company and a new premises where the spaces are organised more efficiently.



B BS W

ZP.13Temporary shared excess space
Excess spaces around large estates often remain unused for many years, to guarantee expansion options for the industry in the future. With the right contract or agreements and mediation the excess space can be used temporarily for events, even used for parking for the neighbourhood or green space for the inhabitants as a sort of extension of their garden.

NETWORK | CONNECTIVITY



ZN.1 2-way accessibility
Create a two way access route to the main road network for the logistically reliant businesses. A single route connecting business locations to the main road network creates uncertainty and discomfort. If something happens on the single route, work activities may be interrupted. At least 2 access points are needed in and out of the district or neighbourhood that connects the businesses to the main road network.

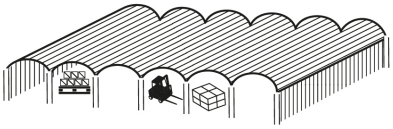
ZAANSE PATTERNS

ENVIRONMENTAL QUALITY



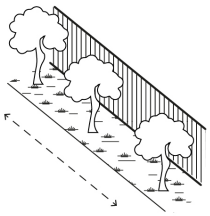
B

ZE.1 Backsides to industries
Orient residences the residential part neighbourhood. Backsides towards small or medium sized production premises. To direct away from undesirable views and towards desirable ones. While the garden forms a visual barrier between the backside of the residence and the production premises.



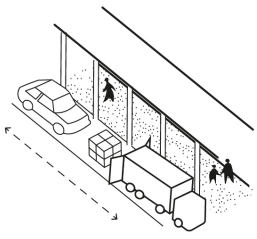
B

ZE.2 Covering workspaces
Cover work activities with potential nuisances with suitable and efficient structures. Blocks that have residences and industries integrated together may have covered the work spaces with a cost-effective structure, that mitigates some of the nuisances from the workspaces located in the interior of the blocks near residential gardens.



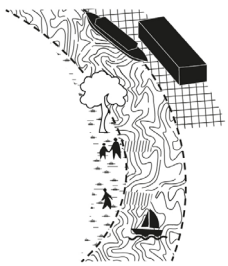
BS

ZE.3 Green blind routes
Place greenery along blind facades of industrial buildings. Especially with large premises it is sometimes inevitable to have blind facades that do not have many openings or entrances along it. The spaces along the street can be more green and permeable for rain, as there are no work activities along it that need hardened surfaces. Preferably, only one side of the street has a blind facade, not both sides of the street.



BS

ZE.4 Gallery
Develop safe pedestrian lanes along streets also used by trucks. Important loading and unloading locations in streets can create unsafe spaces for pedestrians. A gallery in front of the plinth of buildings can separate the loading and unloading area from the pedestrian lane. In stead of or together with a gallery a significant height difference can also separate the pedestrian lane clearly.



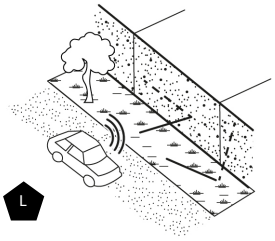
D

ZE.5 Relationship with the water
Allow access to the waterfront for multiple users. The visual relation with the water as well as the physical relationship are important for the spatial experience. The work activities as well as recreational and living activities are strongly related to the Zaan river. Both public and private access to the water is desirable.



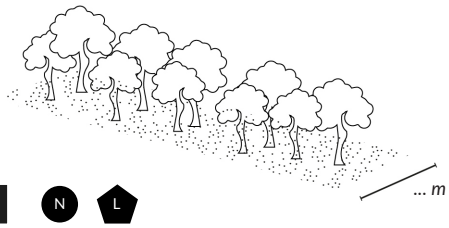
B N L

ZE.6 Exposed vs quiet side
Limit nuisances to one side of the building. Residences in mixed areas need at least one quiet side of the building. The exposed side can provide a noise shadow.



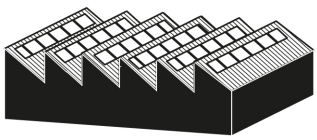
B BS N L

ZE.7 Soft materialisation
Stimulate use of soft materials, particularly in spaces with noise nuisances. Hard materials reflect noises further. Depending on the type of material, soft materials can absorb noises. Such as green facades or gravel in stead of asphalt.



BS D N L

ZE.8 Barriers
Create barriers around noise sources. Wide tree belts, of approximately 20 metres, with trees that have high leaf density can mitigate noise nuisances.



B W

ZE.9 Light in workspaces
Create sky-lights in buildings with work activities. Natural light from above in large workspaces provide comfortable work environments. In the past, the triangular shapes of the roofs allowed for maximum incidence of light during the day, to cut costs in energy use.



source: own photo



Zaandam, the Netherlands

III

PART III SCENARIO DEVELOPMENT

9.1 Future of Industries	*Review of trends and technological developments that affect the spatial manifestation of industries in the Netherlands.*
9.2 Economic Profile	*An analysis of the current economic profile of the region, together with the trends and future demands of industries.*
10. Intentions	*Municipal ambitions and visions.*
11. Preliminary Analysis	*Desirable Interventions on a larger scale.*

12. Scenarios

9.1 THE FUTURE OF INDUSTRY

Development and Trends

Technological change is altering the physical footprint, spaces, distribution processes and networks, access to transportation and preferred geographical locations of industries, making industries potentially more mixable with other functions.

In the Netherlands, these technological developments are referred to as the Next Economy. According to Kort, Ploem and Poulussen (n.d.) 5 trends that are part of the Next Economy will have the most dominant effect on the spatial manifestation of industries and localisation and development of business and industrial districts. These are smart industry, open innovation, robotization, smart logistics and the circular economy (see T.3).

These trends are discussed on the following page. The effect that these trends will have on the different types of industrial sectors and the their localisation preferences and processes is represented in several diagrams on the next pages.

T.3 *Next Economy Developments*

1. **SMART INDUSTRY:** Combining automatization and data exchange in the industrial production process. Using smart sensors and Big Data (the Internet of Things), automatization and robotization to make the production process smarter and more efficient, increase flexibility, improve quality and enhance participation within the value chain and interaction with customers. These may create new products, related services or processes. Less prototyping may be needed for example, as they can be tested digitally already. The smart industry trend can be also applicable to only a select part of the production process, while most of the process still remains traditional. Businesses that combine old and new production processes emerge.

Who?
Knowledge and innovative high-tech firms

What?
- Contributes to reshoring of industries to the Netherlands.
- More space is needed for established manufacturing companies, to produce larger production volumes.
- Choose locations that support the early phases of the production process and prefer to be near related businesses and similar industries, with a diversity of businesses in proximity.
- This clustering stimulates sharing of buildings, premises and facilities and results in increasing demand of related functions. Such as logistics, business services, research and knowledge institutions etc.
- Increases demand for alternative locations, such as field labs, test and experimentation sites, pilot plants.

2. **OPEN INNOVATION:** In contrast to closed innovation, innovation taking place within a certain business, open innovation means businesses cluster together, collaborate to stay innovative and competitive. Collaboration between businesses and educational institutions supply the workers with the needed skills. Collaboration may exist in terms of exchanging workers, providing internships, external research, organising events or testing of business case by start-ups. However, this trend is not applicable to all businesses, many are too specialistic and want to protect their intellectual property. Dealing with the energy transition is something that businesses do want to collaborate with.

Who?
In particular the smart industry, knowledge intensive sectors such as the high-tech manufacturing industries

What?
- The need for collaboration between (high-tech) companies results in clustering and sharing of buildings, premises and facilities also with related firms, such as research institutions, education and business services.
- Smaller businesses, start-ups etc. cluster around one or multiple large (manufacturing) businesses or large research and development facility.
- Clustering of research and development with manufacturing firms/high environmental categories.
- Prefers proximity to the city as its potential workers consist of the education and knowledge workers. Some companies are bound to their current location because of the investment in the workers of their company.

3. **ROBOTIZATION:** Increasingly robots are used in the production process and logistics to replace routine work. The added value increases.

Who?
Electronics industry, Automotive industry, increasingly the Food industry

What?
- More space needed for industry and logistics.
- Some industries become bound to their location as they invest in expensive production lines.

4. **SMART LOGISTICS:** the logistics sector grows due to development of smart industry and e-commerce. Big data is combined with logistics to make the process more efficient. Similarly, automatization and robotization of the process make logistics more efficient. It will contribute to the development of new logistic services, knowledge intensive logistics , last mile logistics and return logistics.

Who?
Logistic sector

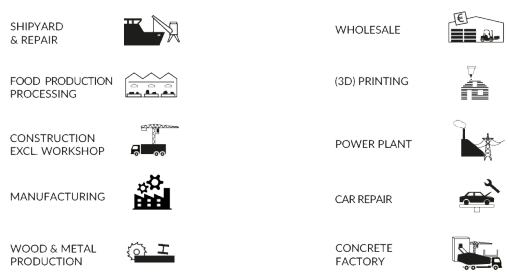
What?
- On the one hand very large, (XXL - distribution centres of several hectares) are in demand in certain hotspots. On the other hand, small distribution centres are also upcoming that can be more spread out.
- Development of digital warehouses, mobile factories, 3D printing result in more regional and local supply chains of goods to manufacturing sites or of products to people's homes.
- Logistics hotspots.
- Opportunities at the edges of city centres, not only edges of cities.

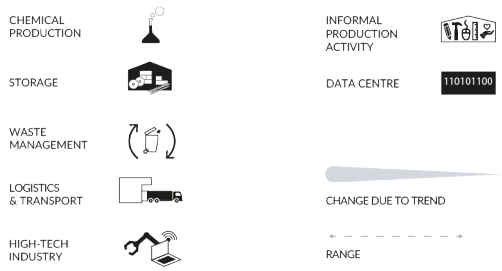
5. **CIRCULAR ECONOMY:** high quality recovering of resources, waste and rare metals from the city and the use of residual warmth and CO2 as an energy source.

Who?
Industries and knowledge intensive firms: waste management, recycling, large scale production/ manufacturing, logistics

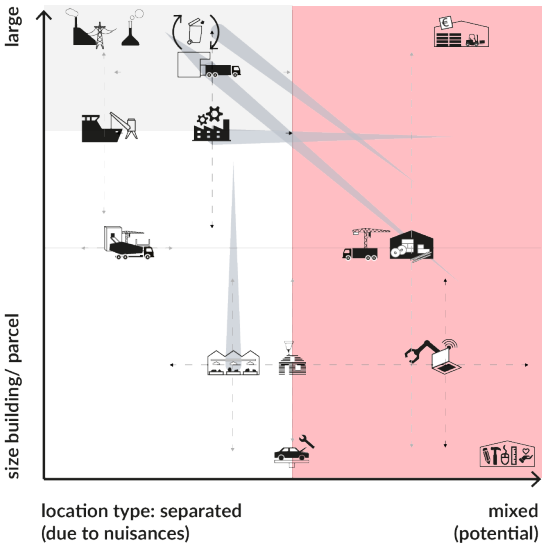
What?
large parcels, large scale industry locations increase from 15% (2010) to 20% (2017) and 25% (2030)
proximity to (open) water
high environmental category
optimal opportunities to share and exchange facilities and utilities (electricity, warmth etc.)
multi-modality
waste and recycling companies in proximity to the city for efficient transportation of resources, but also sustainable manufacturing businesses that want local supply chains to reduce CO2 emissions.
preserving and protecting existing qualities and values, as new infrastructures and networks require big investments, the use of existing qualities, systems and spaces need to be optimised to enable effective transformations with the least impact on the environment

source T.3: Kort, E.J., Ploem, H., Poulussen, J. (n.d.). Next economy: welke megatrends cruciaal voor bedrijventerreinen? Retrieved from: https://stec.nl/wp-content/uploads/2018/03/Stec-Groep-whitepaper-Next-Economy.pdf





D.9



Location type: separated versus mixed
Building size: small versus large

Waste management and Logistics both will require more localised pick up systems small scale processing stations in the city to be closer to customers. Such as an intermediate station that can deliver back to larger waste centres or logistic centres at the edges of the city close to highways, for good regional accessibility.

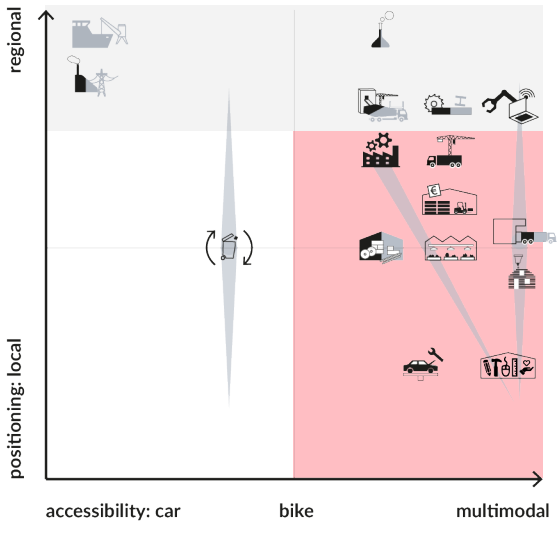
Manufacturing facilities are often larger volumes. Due to automation and digitisation some nuisances may be reduced and it may become more mixable in urban environments. Wholesale does not produce a lot of nuisances but require space and good loading and parking facilities for its logistics and its visiting traffic. It is mixable in an urban environment if the space and infrastructure is available.

Construction and Storage facilities have some logistic requirements, but due to its size and function are relatively mixable in urban environments. Though construction workshops may produce some noise and dust nuisances.

Car repair and other city serving activities are often small scale and can produce some nuisances. Because of their city serving function, proximity to its inhabitants is important.

Informal production activities, such as workshops and crafts are mixable as these are often small scale activities. Some may produce noise, smell or dust nuisances and therefore need to be integrated carefully with enough transition space to housing.

D.10



Accessibility: car versus multi-modal
Positioning: local versus regional

For most larger firms it is important to have good access to regional infrastructural networks for transport of goods. Most sectors also require multi-modal transport options for good accessibility for its workers.

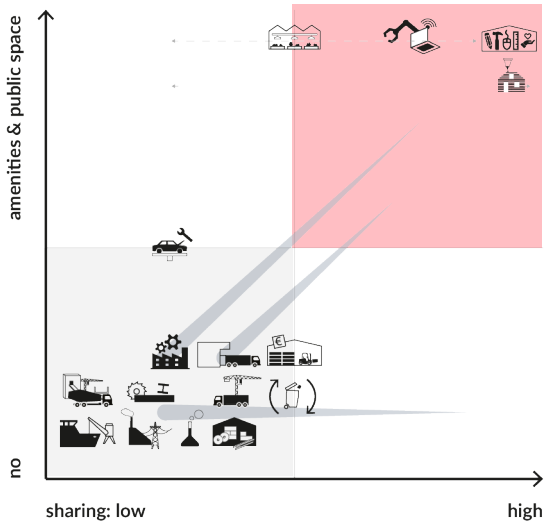
Industries that increasingly are more automated, use robots, do not have a lot of workers or can be controlled remotely, do not benefit from proximity to urban environments. Such as shipyards and power-plants.

More and more industries that are of regional importance start looking at how they can contribute locally and increasingly prefer urban environments to benefit from its liveliness, amenities and public spaces.

The transport, wholesale sector in particular demand large distribution centres in certain hotspots. On the other hand, small distribution centres are also upcoming that can be more spread out. Together with 3D printing of products companies can provide even faster delivery and even customise products.

These industries also provide a lot of low skilled low income jobs, the workers particularly benefit from local public transport accessibility. Also for sustainability reasons the high-tech high-skilled workers often travel by train.

D.11



Sharing: low versus high
Preference for amenities and public space nearby

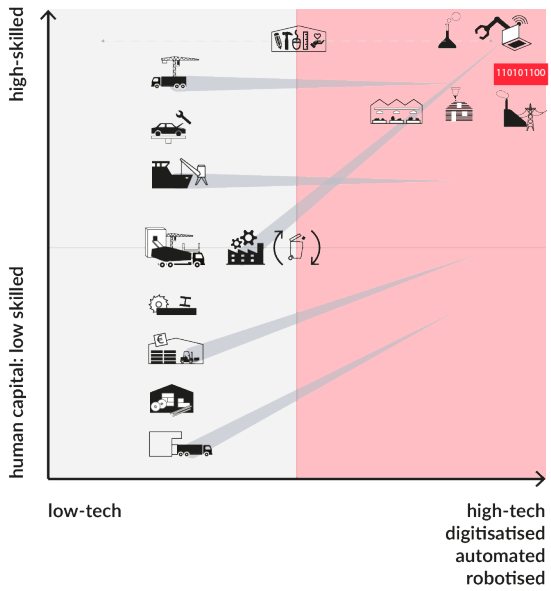
A lot of larger firms are hesitant to share space, facilities, machinery or knowledge. Some processes are sensitive and firms want to protect their intellectual property.

Large scale straight forward processes such as wood and metal production do not see the benefits of sharing workshops and machinery as the machinery is often intensively used. However, most are willing to share investments and use of sustainable energy sources.

High-tech firms and manufacturing companies see the benefits of open innovation. By sharing knowledge firms can innovate improve their products even faster. The type of workers that these sectors attract often favour a lively work environment with amenities and public spaces nearby.

In contrast to large firms, small manufacturing firms or informal production activities do benefit from sharing spaces, machinery and knowledge. As it is cheaper to rent space together and share investment in machinery.

D.12



Low tech versus high tech (digitised, automated, robotised)
Human capital: low skilled or high skilled

Particularly in manufacturing, logistics and wholesale jobs will be lost as standardised processes are automated or robotised. Production processes become shorter as technology such as 3D printing innovates the traditional production line. Informal production activities can flourish as new technologies make it faster to design and develop prototypes of products.

Similarly, for certain construction activities, certain difficult or heavy activities can done by robots, while workers supervise the machinery and results.
However, a large part the construction sector will not undergo extreme transformation. Certain processes may become more efficient due to digitisation. Building prefabricated components can be standardised work that may become robotised. But workers will still be needed to build and place components according to the particular designs on site.

Some of the more traditional sectors, such as car repair or other repair services will not undergo a lot of transformation. Similarly for wood, metal or concrete manufacturing.

Source D.9-D.12: Adaptation from Ad 3. table 'niet mengen om het mengen' from source: ORAM, MUST stedenbouw. (2019). Werken aan een nieuw Amsterdam. Amsterdam, the Netherlands: ORAM.

Related social developments

Technological progress has the opportunity to create more quality of life. However, due to globalisation and digitisation, processes also become more incomprehensible. As a result, products and services that speak to the human scale, safety, care and concern increasingly become of more importance (Borra et al., 2018). This includes the need for more transparency in the ever more complex production processes and supply chains. This way, the impact of products and services can be understood and judged and people can have more impact on the way products are realised.

Progressively, more people desire to find ways to make production processes and supply chains more local, fair and sustainable. Consumers become the producers themselves of the products they consume. This trend is already happening with the rise of 3D printing, local energy production, local food production and care. Likewise, new types of productive activities, that currently are not recognised as work, may gain more importance in the future. This could include volunteer work, informal care or the sharing economy. These informal activities, when recognised and given value could add economic or societal value.

What spatial changes can we expect?

What you can see from the different diagrams is that not all industries are suitable to place in an urban environment. Ones that do not appreciate a mixed environment, do not need public spaces or amenities or not willing to share facilities, knowledge or space. Sectors such as shipyards, concrete factories, power plants and chemical production still have large nuisance contours, and do not benefit from an urban environment as they preferably do not share knowledge, public space or facilities and are oriented regionally. These sectors need to be looked at separately on how these can be developed in the landscape in a more sustainable way, it will be left out of the scope of this thesis.

➔ Industries that may benefit from an urban environment and are potentially mixable with other function and housing are sectors: wholesale, storage, transport & logistics, manufacturing, high-tech, informal production activities, car repair, and food production and construction to a certain degree.

The most important changes in the spatial manifestation of industries are that more and more industries see the benefits of being in proximity to the city. For one, to be closer to its workers. Especially, as more businesses are digitising they need a higher educated work force that has just graduated. In general, these groups enjoy being in an urban environment. Another reason is the vitality of an urban environment and proximity to other amenities, catering services, repair services etc. As open innovation increases collaboration between firms, institutions, education and start-ups, proximity to others becomes more important to stimulate creativity, innovation and production. Moreover, for sustainability reasons, many companies prefer accessibility to multiple transportation options. As public transportation needs certain densities to make a station viable, it also increases the amount of amenities and services present, pulling industries closer to the city.

➔ As a result the following localisation factors are becoming more and more important factors for industries:
- location
- clustering with related businesses and amenities and services
- informal meeting spaces and other public spaces
- proximity to its work force
- multimodality
- (regional and local) logistical access

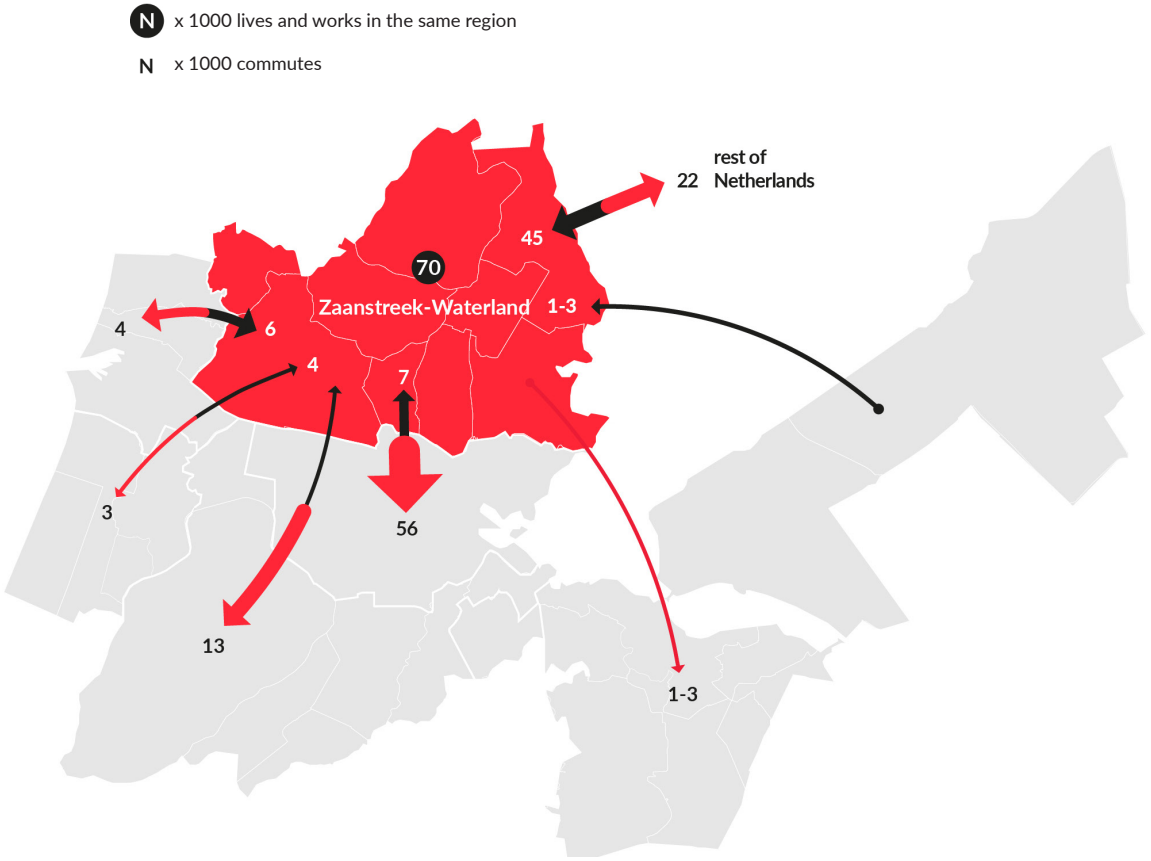
Automation, robotization and digitisation are changing the working skills needed in the sector. Less low-skilled jobs are available as industries develop towards more high-skilled and high-tech activities.

As more and more sectors are digitising, automating and robotising, the storage of Big Data gains significance. The presence of data centres in proximity is therefore becoming an important localisation factor for these companies.

Part of the success factor of industries in urban environments is related to the willingness to share knowledge, space or facilities, or give back to the local community and show transparency in their processes and the decisions made that impact their environment.

➔ Consequently, transparency in processes and accessibility of industries to the public to a certain degree are important to take in to account.

F.23 Live-work movements to and from the Zaanstreek Waterland region



Source: F.20: Bree, T., et al. (2019). *Economische Verkenningen Metropoolregio Amsterdam 2019*. Amsterdam.

9.2 ECONOMIC PROFILE

The Metropolitan Region of Amaterdam - MRA

Economically the MRA performs very well. Growth is expected in population as well as jobs, more than the mean of the Netherlands (Copping et al., 2017). In total, the amount of companies in each sector is growing faster in the MRA than elsewhere in the Netherlands. The economic growth of the MRA is relatively high compared to many other European metropolitan areas (Bree et al., 2019). Employment growth occurs especially in the sectors information and communication and specialistic and other business services. In terms of added value, the industry, logistics and storage sectors are significant (F.25). While employment in these sectors has decreased (F.26).
Currently, the biggest employment opportunity growth occurs in service sectors. This is due to the role of digitalisation in economic development of the past decade. This has reduced the role of the industry. Which, in 1995 was still the biggest employer in the MRA. Even though industry and logistics still play a significant role in the added value of economic growth in the MRA, its employment opportunities have decreased mainly due to outsourcing to other countries in the past, but also to some degree due to digitisation and automation.

There are more people commuting out of the Zaanstreek-Waterland area than coming to this region for work. (F.23). The biggest share of commuters going out go to Amsterdam. This is one of the biggest commute to work directions in the entire MRA. Probably, due to the favourable location and many employment opportunities in Amsterdam. As the workforce is growing faster in the Zaanstreek-Waterland region than the amount of jobs (Gemeente Zaanstad, 2019b), commutes are expected to increase. Compared to the mean of the MRA, there are more secondary or vocational educated people living in the Zaanstreek-Waterland region. The demand of higher educated workers is currently met by commuters coming from Amsterdam.

- There are not enough employment opportunities in Zaanstad to match the increasing workforce.
- Good public transportation options and suitable housing environment are needed to attract a higher educated workforce to Zaanstad.

Zaanstad

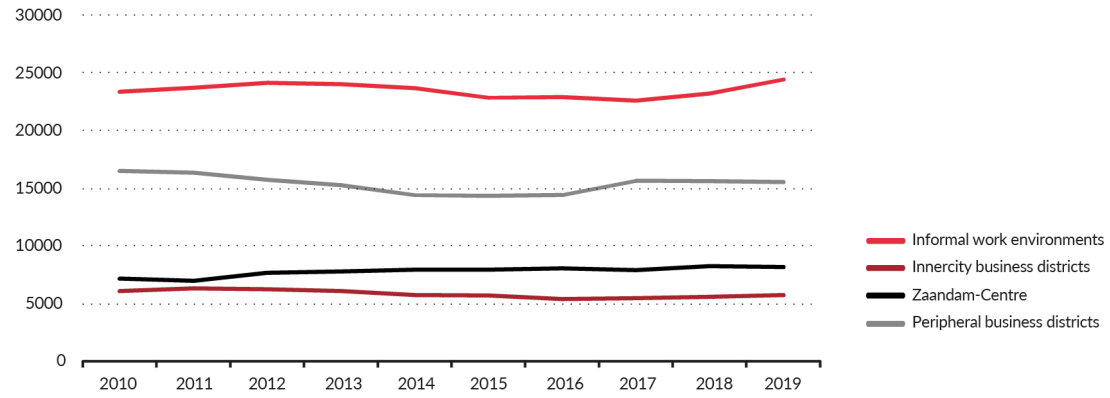
Currently, 70% of the businesses consist of one employee. This is a significant increase compared to the 60% in 2010. Most of the businesses are small (1 employee) or medium sized (2-10 employees). Only 122 companies have more than 50 employees in Zaanstad. However, these businesses do provide for about 40% of the employment in Zaanstad. Between 2010 and 2018, the amount of businesses with more than one employee has been slowly decreasing (Gemeente Zaanstad, 2019b).

The amount of employment opportunities has increased the fastest in informal mixed-work environments (F.24), particularly in more central locations (F.25). About 45% of all jobs in Zaandam are situated in mixed working environments. Between 2009-2018 the amount of jobs in mixed working environments has increased significantly. Suggesting an increasing demand for mixed informal environments (Gemeente Zaanstad, 2019b). In particular, more central locations are preferred (Versteegh et. al., 2019). At the same time, the amount of businesses in Zaanstad are increasing. Especially, due to an increase of freelancers and start-ups, an increasing demand can be seen for small business premises.

According to a survey executed by the municipality of Zaanstad (Gemeente Zaanstad, 2019b) important factors for firms to choose their location are first accessibility, second costs, third sufficient space and lastly the services of the municipality. Businesses seemed to be most satisfied with the accessibility of suppliers and buyers. 15% of all the businesses indicated that they have the ambition to expand but lack the space. When looking only at medium to large businesses with more than 10 employees, 24% indicated to have expansion ambitions. Particularly in the wholesale and retail, healthcare, recreation and tourism sectors. Moreover 20% of the big firms have plans to expand on their existing location. A quarter of the businesses plan to relocate, of which a little more than half in Zaanstad and the smaller half outside of the municipality.

- Growing demand for informal mixed work environments.
- Growing demand small business premises due to increase of freelancers, one employee companies.
- Expansion options are needed for medium sized and large businesses. Particularly for wholesale, retail, healthcare, recreation and tourism sectors.
- Accessibility, costs and expansion options are important localisation factors for industies in Zaanstad.

F.24 Development of employment opportunities 2010-2019 according to type of location in Zaanstad

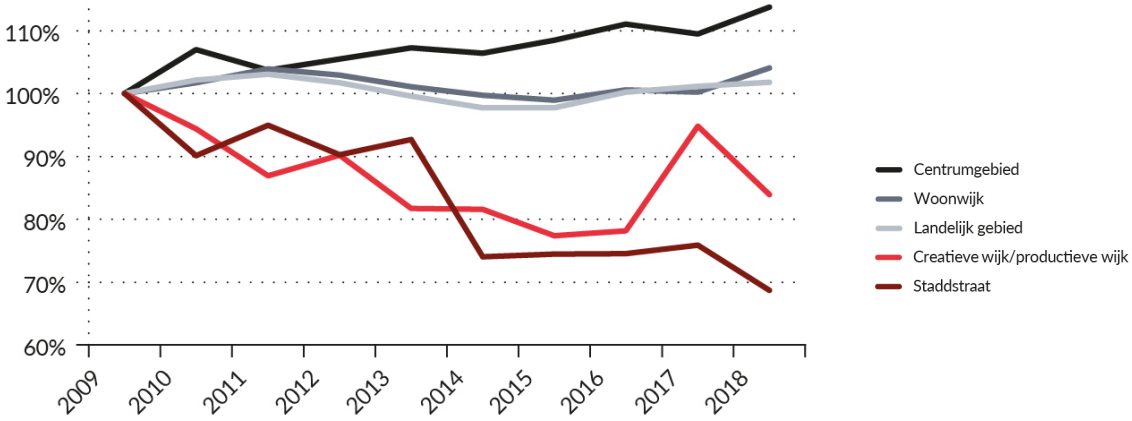


F26 Added value per sector Zaanstreek Waterland 1996-2017

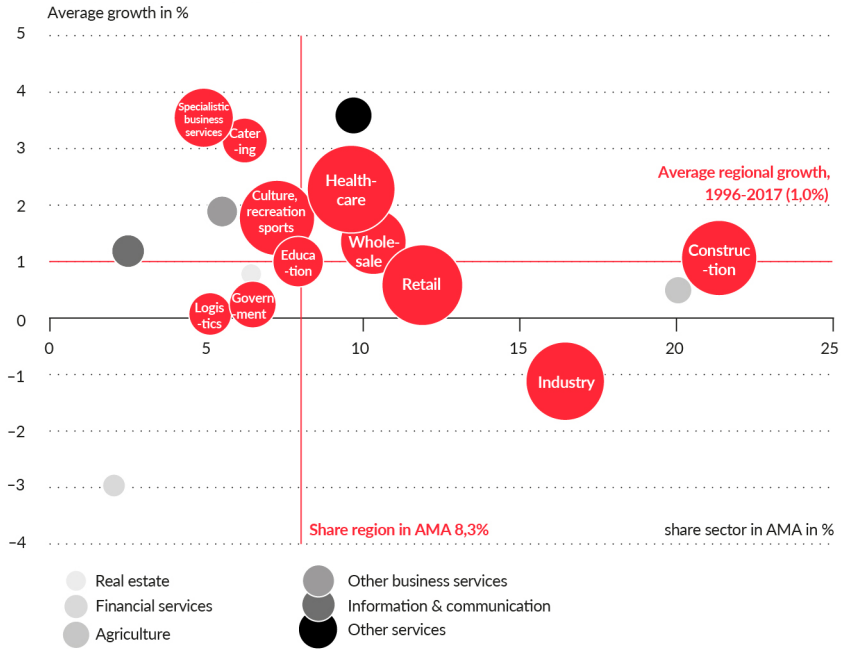


Source: F.21: Source: Gemeente Zaanstad. (2019b). Werken langs de Zaan 2019. Zaandam, The Netherlands.; F.22: Versteegh, B., et al. (2019). *Monitor Plabeka: Ontwikkelingen werklocatie markt MRA 2018-2019*. Metropool Regio Amsterdam.

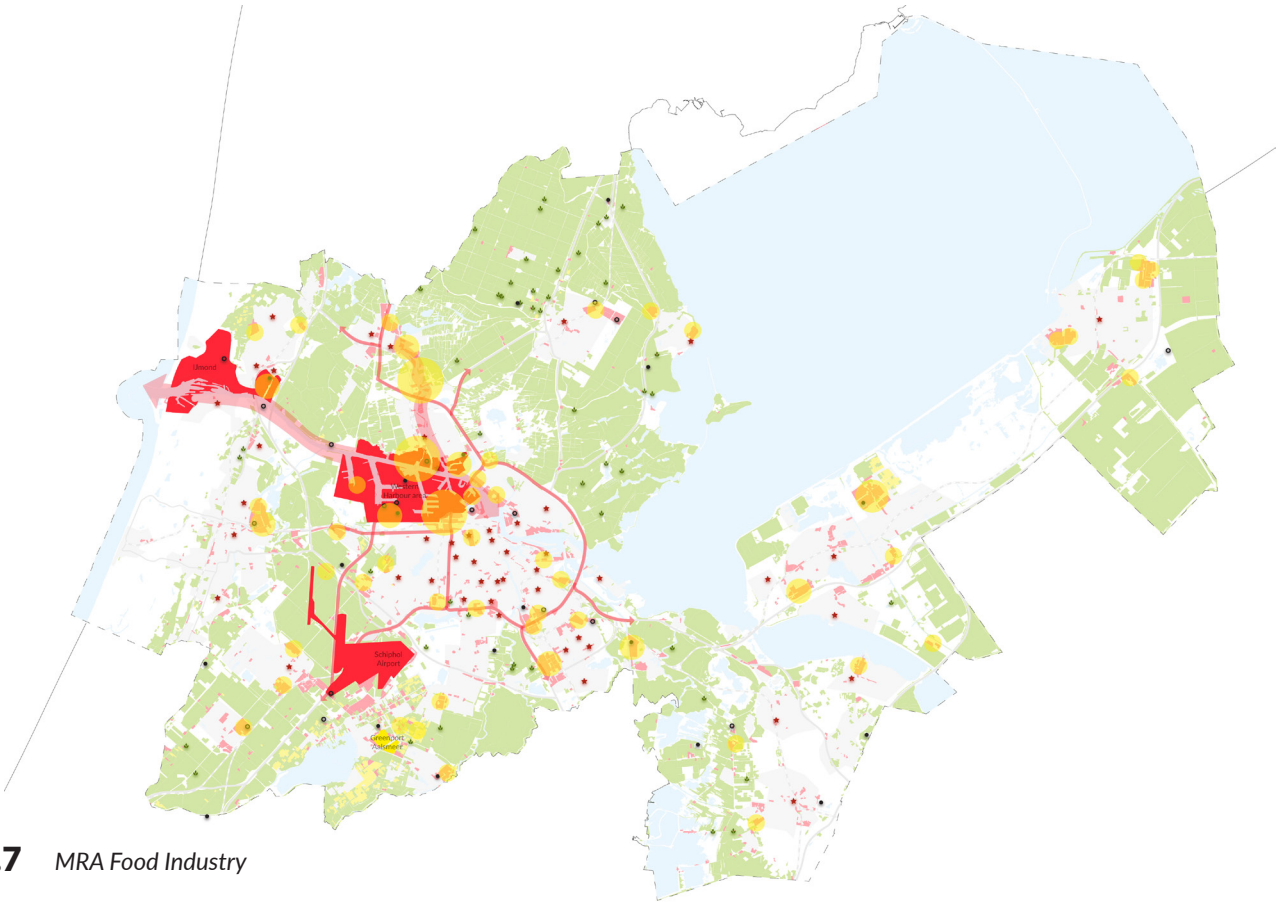
F.25 Development of employment opportunities per type of mixed work environment in Zaanstreek-Waterland (indexnumbers, 2008 = 100)



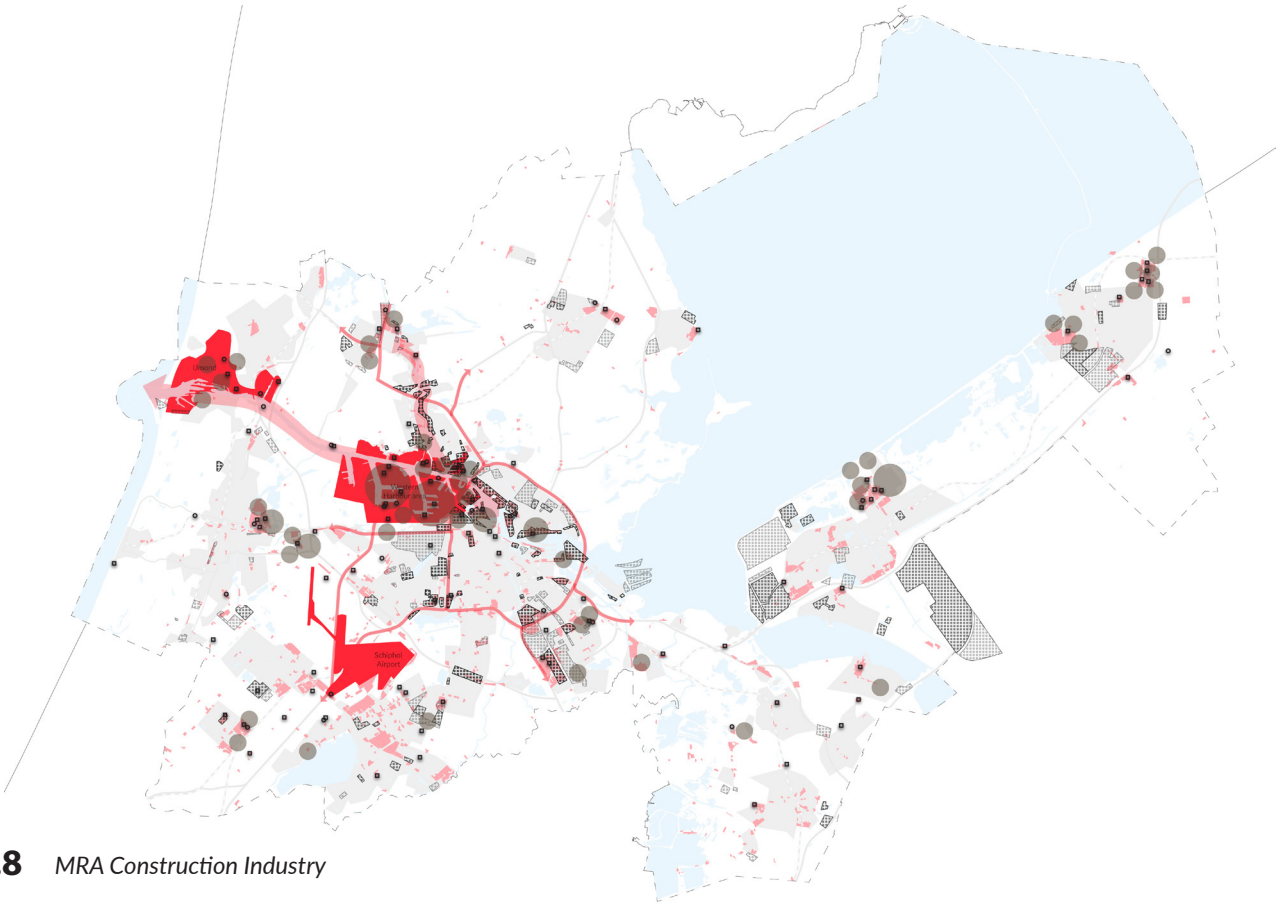
F.27 Employment opportunities (fte) per sector Zaanstreek Waterland 1996-2017



Source: F.23-24: Bree, T., et al. (2019). *Economische Verkenningen Metropoolregio Amsterdam 2019*. Amsterdam.



M.7 *MRA Food Industry*



M.8 *MRA Construction Industry*

0 5km 50km

Source: maps.amsterdam.nl; maps.noord-holland.nl; Circular Amsterdam 2016, googlemaps.



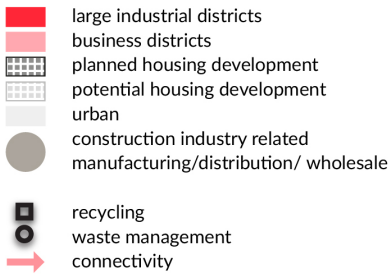
Zaanstad

The food industry and construction, characterise the economy of the Zaanstreek and are spatially organised along the Noordzeekanaal and the Zaan. Zaanstad houses several multinational companies in these sectors. Even though the role of industry has reduced in the MRA as a whole, the Zaanstreek-Waterland area (and Amstelland-Meerlanden) have been the exception (Bree et al., 2019). In the Zaanstreek-Waterland region the industry grew significantly in added value between1996-2017 (F.23), Due to digitisation and automation in the industry sector job opportunities are decreasing. While, employment opportunities are increasing slowly in construction sector (F.24). Still, industry remains the biggest sector in Zaanstad in terms of jobs.

MRA - Food Industry

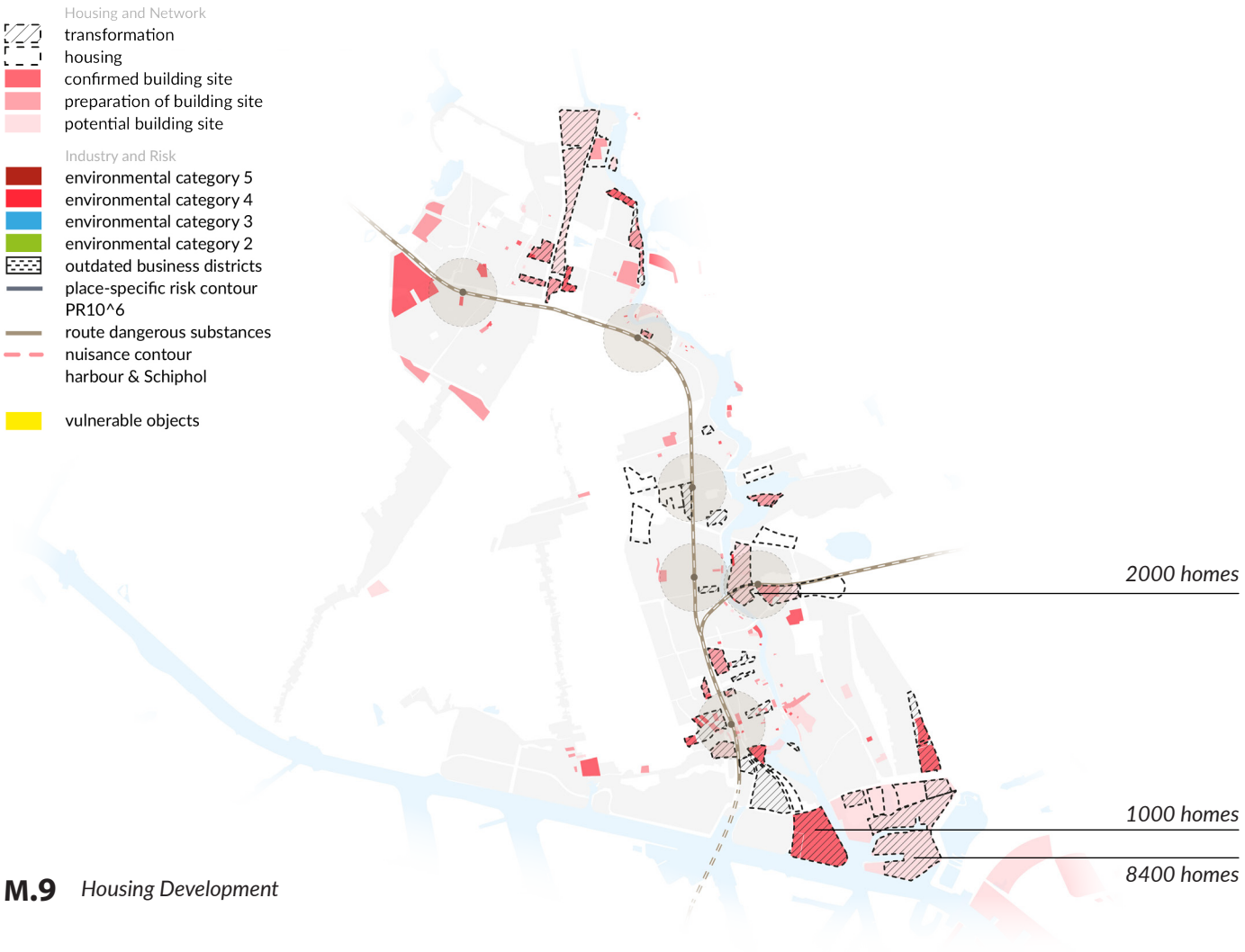
There are several clusters of food manufacturing, storage and distribution in Zaanstad. Especially in Koog aan de Zaan and along the Noordzeekanaal in Westerspoor and Achtersluispolder. These areas well connected with the region. In rural regions of Zaanstreek-Waterland there is a lot of agricultural activity that provide regional products. These farms provide products for the markets in the different cities. Zaanstad does not have that many markets.

➜ Opportunity to connect local agricultural activity with new (food)markets on central locations in Zaanstad. In this way, connect with the regional agricultural activities and its products.

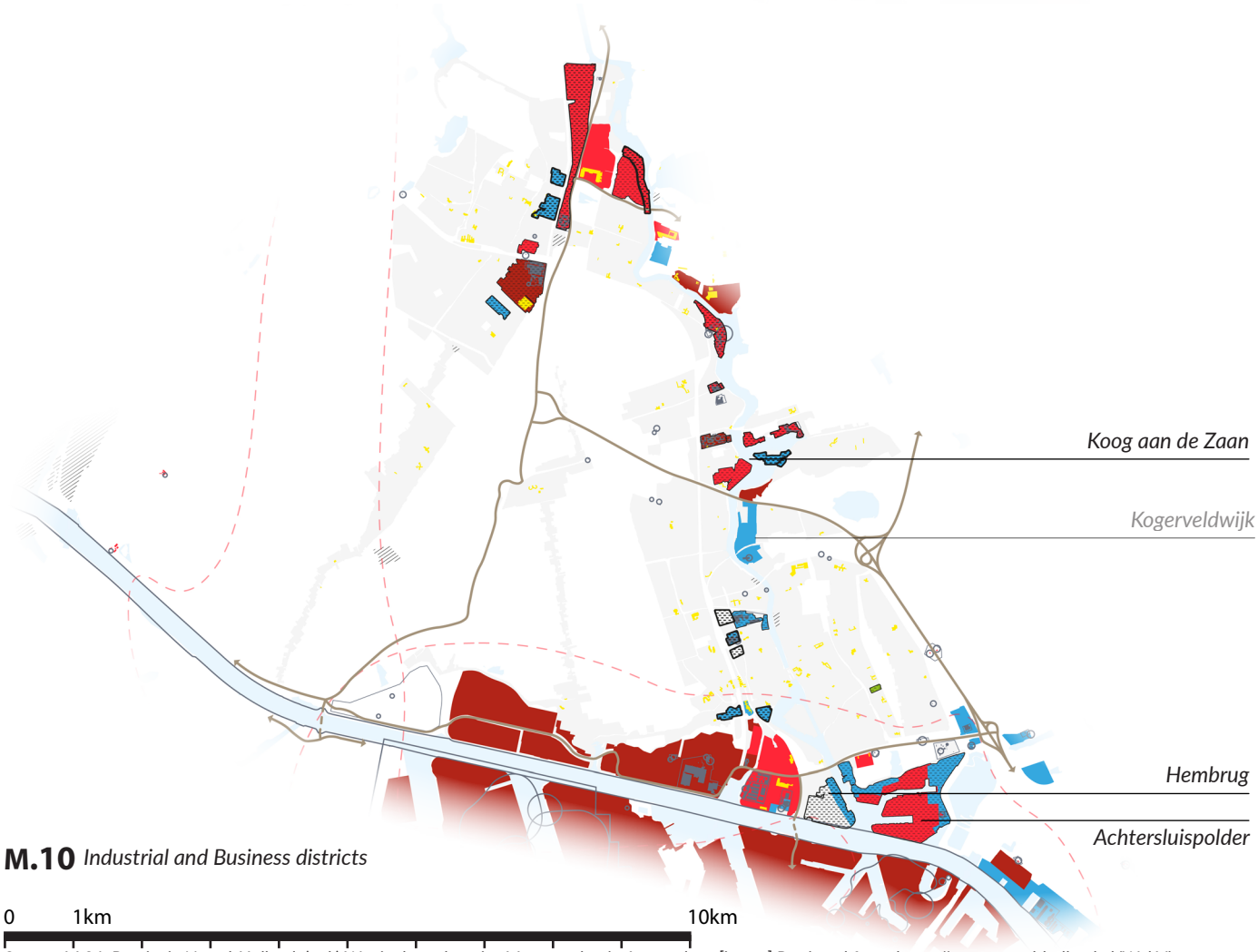


MRA - Construction Industry

The construction sector is shown together with the related manufacturing of wood, metal, chemicals or minerals such as cement or asphalt. There are some clusters along the Noordzeekanaal, and some activity way in the North of Zaanstad in Noorderveld and Assendelft. Again, the highway going through Zaanstad and the ring around Amsterdam are important routes connecting the businesses to the rest of the region. The Noordzeekanaal also plays an important role in the distribution of goods.



M.9 *Housing Development*



M.10 *Industrial and Business districts*

Source: M.34: Provincie Noord-Holland. (n.d.) Woningbouwlocaties Metropoolregio Amsterdam. [image] Retrieved from: https://maps.noord-holland.nl/WebViewer
M.35: Risicokaart.nl (n.d.) Kaartviewer. [image]. Retrieved from: risicokaart.nl,

10. INTENTIONS

State of development of housing and Industrial districts

As urbanisation is taking place in the MRA more people will want to live in or nearby cities. The population in Zaanstad is expected to grow. In 2040 the municipality of Zaanstad expects to grow to 181.000 inhabitants, from 15.885 in January 2019 (Gemeente Zaanstad, n.d.). The ambition is to grow to about 200.000 inhabitants, this means an increase of 15.000-20.000 homes. The pressure on the housing market is rising. Consequently, the municipality of Zaanstad has stated in its aims to increase the production of 600 homes per year to a minimum of 1000 homes per year (Gemeente Zaanstad, 2019a; Maak.Zaanstad, 2016).

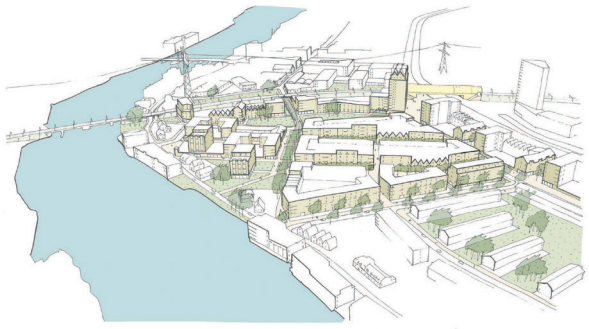
M.9 shows the housing developments planned for the coming years until 2040 (see Appendices 0.0 for detailed map). Many of the confirmed housing developments are in proximity of train stations. The confirmed developments are mostly residential areas, adding some commercial activities and amenities. A large proportion the housing development is suggested to be realised with the transformation of business districts. Due to nuisances from industries on site but also from the Western Harbour of Amsterdam. It remains an issue whether and when it is possible to develop there.

M.10 shows the state of the existing business and industrial districts, together with its environmental category, objects, buildings and routes of risk. These are shown in relation to the vulnerable objects* in the area. The industrial districts along the Zaan have high environmental categories situated right next to residential neighbourhoods. Some of the districts are out-dated. But many of these industries are still in operation.

It will be interesting to see how the municipality will integrate the functioning industries with residences in the transformation locations. Currently, there are no concrete development framework or designs that have been published yet for these areas. There is one vision for Boerejonkerbuurt and Kogerveld that deals with the transformation of a mixed working area near a train station. Though in the documents, it is explicitly mentioned that it is not the aim to push industries out of this area and that it is important to realise a good mix of living and working. It is not explicitly shown how this will be realised. The design proposals predominantly show the places of residential development and related street interventions. Not how the industrial traffic of the cacao industry along the Zaan river will move through these streets as well.

To gain more insight in how these transformations are planned an interview was conducted with a spatial planner from the Municipality of Zaanstad. It was indicated that there already have been a lot of workshops and preparatory events for the development of the transformation plans. The report Maak.Zaanstad 2016 was the result of several participation workshops with inhabitants as well as businesses organised by the municipality. It is an ambition document, broadly describing the strategies for the different making areas and mixed use environments. Using the structure of analysis, perspective and strategy. Achtersluispolder is quite a particular making area, as it is a place where two cities meet each other. In several years, it will be part of the metropolitan area. Currently, it is still a zoned business district and it is not possible to develop housing there. The intention is to keep it like this for the coming 20 years. The aim is to start pre-sorting the companies according to future transformation plans.

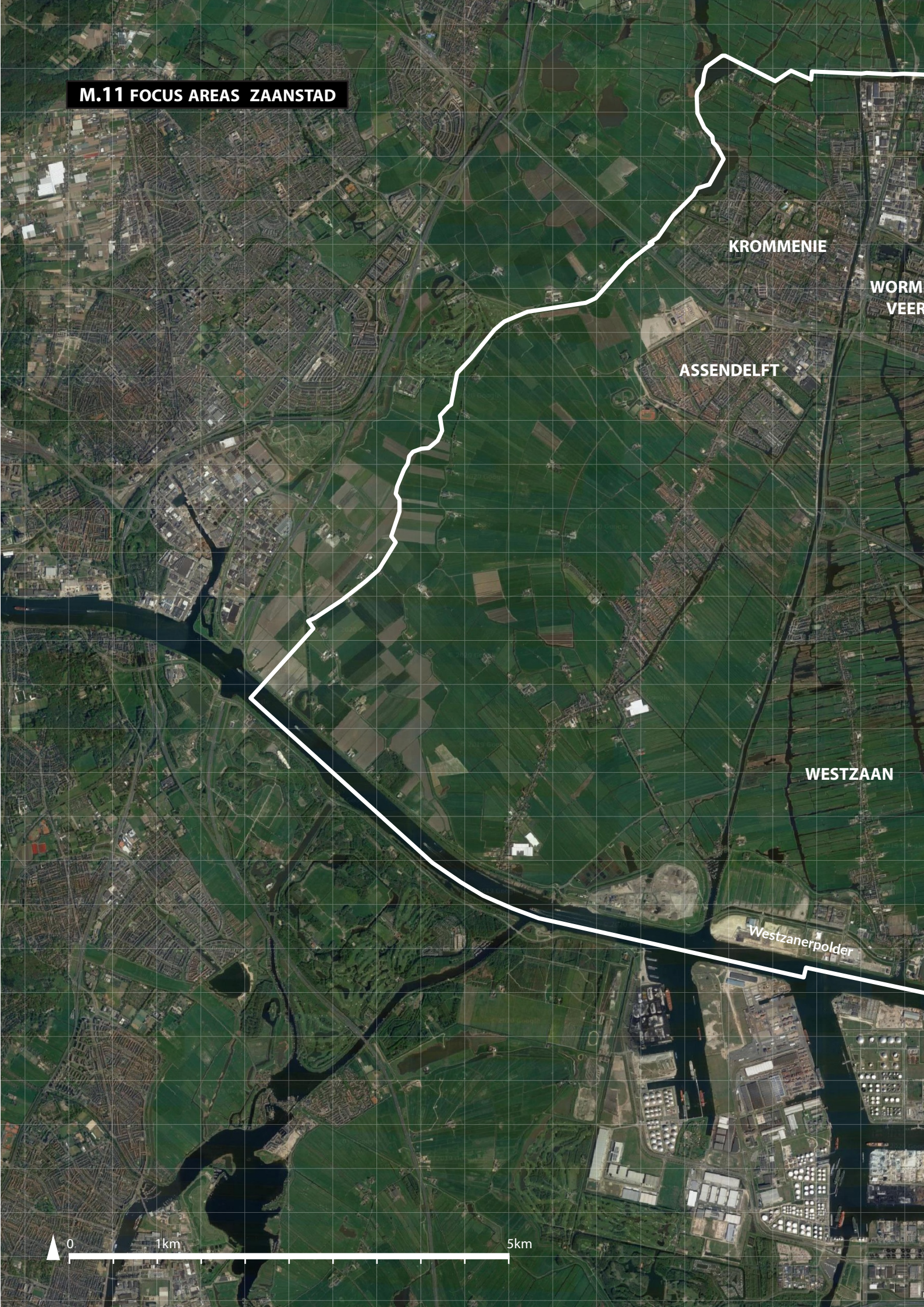
At the moment, the municipality is still preparing a development strategy. Many of the entrepreneurs indicated that they just want certainty. The municipality tries to realise this by preparing a clear phasing of development. Which areas will be developed first and which areas will not be developed in the following years. The municipality safeguards spatial quality (for example architecture, design, typologies) with the use of supervisors. The ambition is to keep many of the businesses in the area, for now it is still mainly about starting the conversation with the businesses. A lot of regulations and policies are still not in place, so there are no means to enforce.



F.28 Impression of Hofwijk, Gebiedsperspectief Kogerveldwijk

* Vulnerable objects consist of buildings in which many people may reside or where people stay who are not self-reliant, such as the elderly or children. The vulnerable objects shown here consist of schools, hospitals, hotels with more than 10 beds.

Source: F.25, Gemeente Zaanstad. (2019c). Gebiedsperspectief Kogerveldwijk 2040. Zaandam, The Netherlands: Gemeente Zaanstad.
Anonymous, Municipality of Zaanstad. (2020, May, 7). Personal interview [Personal interview].


M.11 FOCUS AREAS ZAANSTAD
KROMMENIE
WORM
VEER
ASSENDELFT
WESTZAAN
Westzanerpolder
0
1km
5km

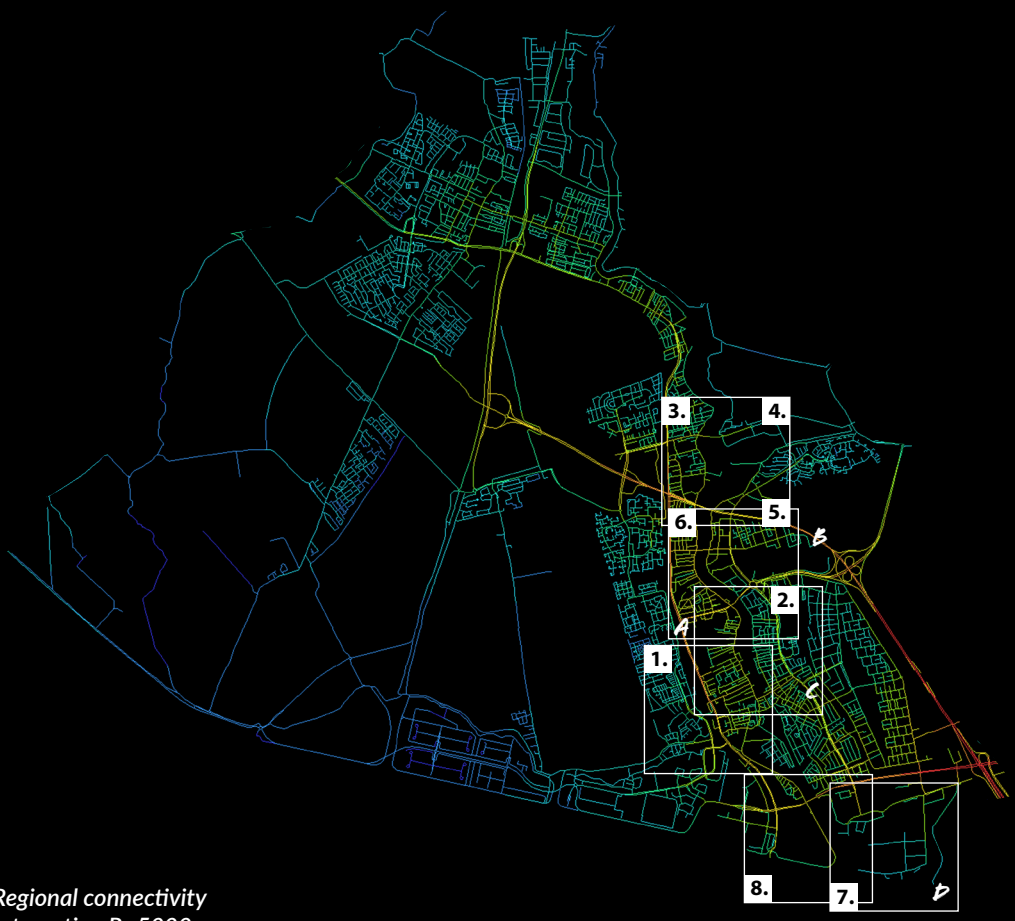
11.

11. PRELIMINARY ANALYSIS

To view all the analytical maps from the preliminary analysis see Appendices 6. M.13-16 show the opportunities and challenges concluded from the analytical maps.

The different squares refer to the 8 spatial profiles defined in Chapter 6.3. The concluded opportunities and challenges are shown on city scale. But these have implications for the different spatial profiles on local scale.





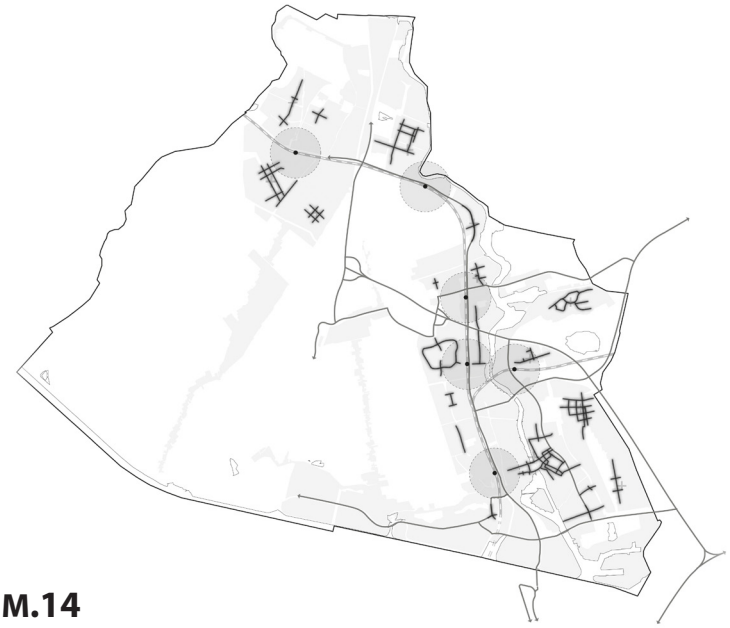
M.12 *Regional connectivity*
Integration R=5000m



M.13 *Local centralities*
Integration R= 400m

0 1km 10km

local centrality
main network
public transport stations



M.14

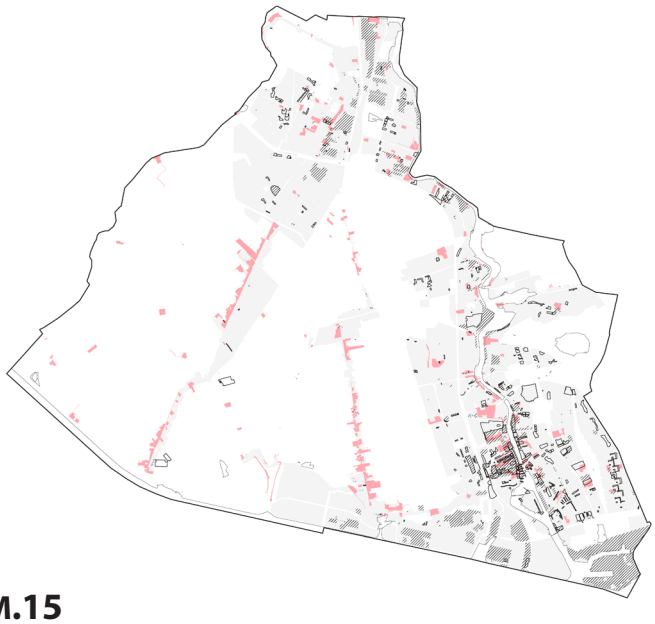
Networks

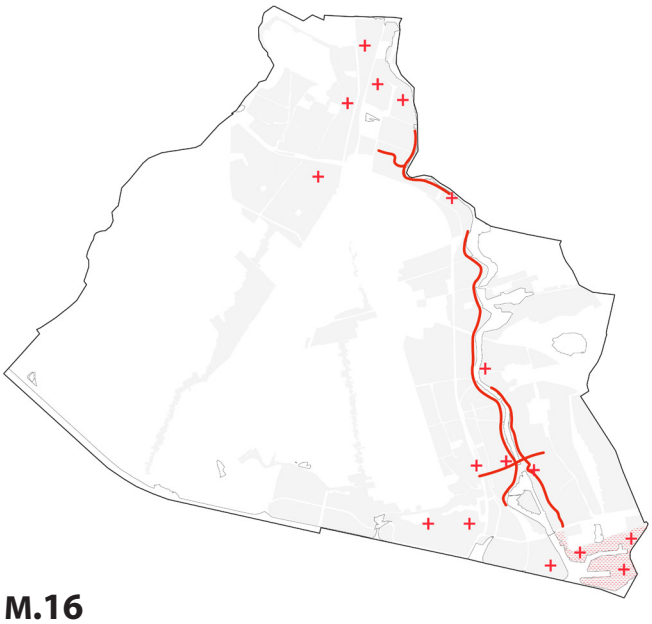
The space syntax integration analysis showed that on a regional level the highway and provincial roads play an important role for the connectivity in the area. These are important routes for the accessibility of industries. And potential sites for new ones.

Local horizontal connections especially around Oud Koog and Kalf, Achtersluispolder and Hembrug are missing. Achtersluispolder is well connected to the regional network but not to the rest of the city. The public transport stations and the main road network are linked.

- The local centralities that are well positioned in the existing network show potential for a mixed-use environment as well as for commercial purposes.
- The local centralities are places with the potential to improve public transportation options.
- Local centralities can be linked to densification potential.
- Local connections in particular between East and West need improvements, this is particularly evident in Achtersluispolder.
- As the access to the main road network is an important localisation factor for industries and it is connected to the train stations, it provides a good opportunity to increase the public transport options for work environments.

work clusters
highstreet
lack of amenities
mixed-use
FSI > 1
GSI > 0.4





M.15

Density and Diversity

Zaanstad consists predominantly out of a low-rise and low ground coverage built environment. Mixed-use environments appear mostly along old ribbon developments. Higher densities are mostly in the city centre, randomly along the Zaan river, or along the high way.

In general the industrial and business districts have high ground coverage but low densities meaning there are a lot of low rise large volumes.

- Create mixed-use development along old urban ribbon developments.
- Develop higher densities along the Zaan, main roads or highway.

M.16

Dispersion of Functions

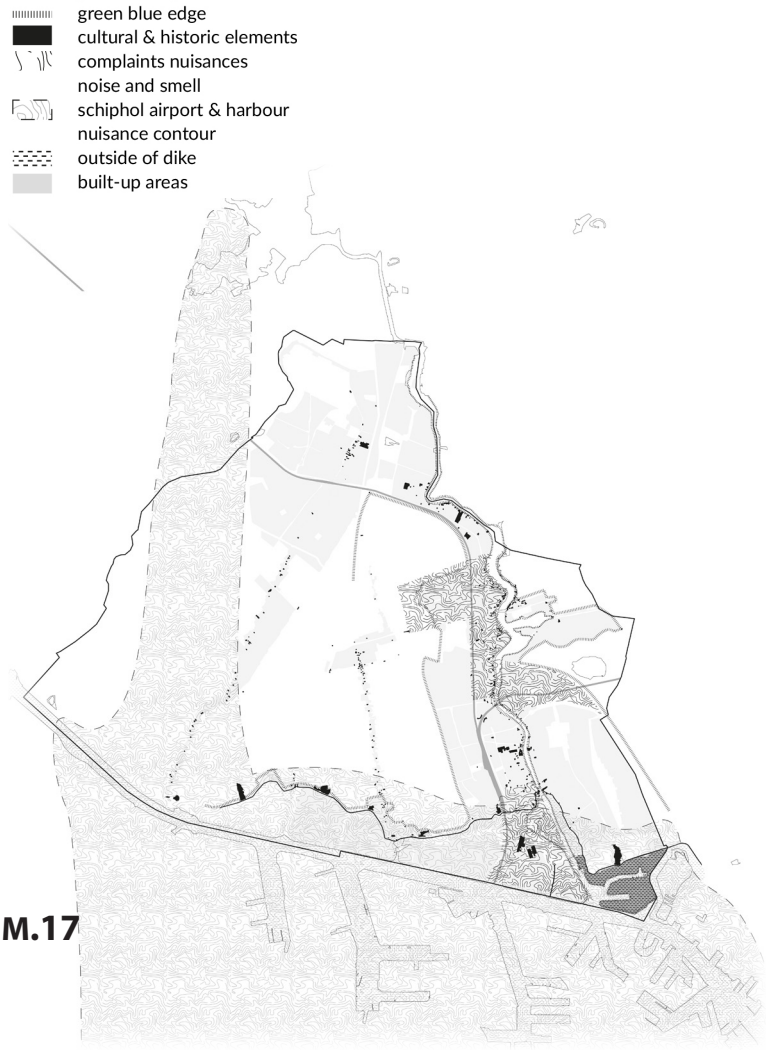
The commercial highstreet is situated along west side of the Zaan river and stretches from Zaandam to Wormerveer in the North. With a short interruption in the North because of a business district. This highstreet has branches in the city centres of Zaandam and Wormerveer.

Clustered work locations of both industries and offices are located mostly on industrial or business districts and in the city centre of Zaandam. Only a few along the commercial highstreet.

In general the amenities (meeting spaces, schools, healthcare and sports) are spread through the whole urban area. Some are found in business districts and none in the Achtersluispolder.

- A work cluster in the Oud Zaandijk - Oud Koog area would create more dispersed work (opportunities) along the highstreet.
- The distance from one centre to the other is relatively large, there is potential for a branch of the commercial highstreet near the Zaanse Schans.

0 1,5 km 15km



M.17

Environmental Quality

Historic monuments appear mainly along the dike and the old ribbon developments. Due to the natural reserves there are distinct water and landscape edges.

Achtersluispolder and the other business districts along the Noordzeekanaal with the exception of Hembrug are on the outer side of the dike, vulnerable to flooding.

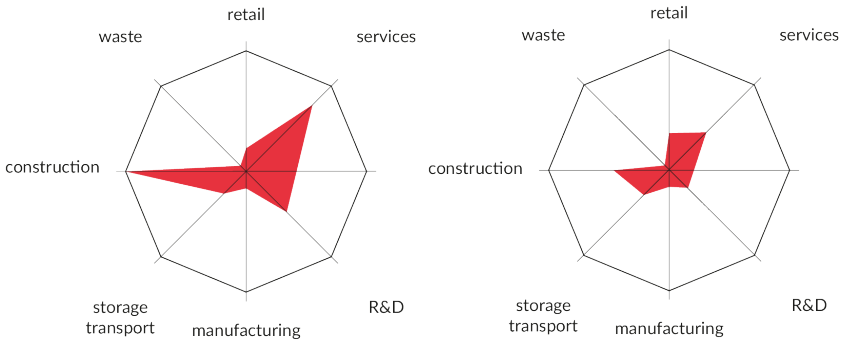
Complaints of smell and noises arise mostly in the Zaandijk, Oud Koog, Kogerveld and Hembrug area. Hembrug is in the nuisance contour of the Harbour. The others are in close proximity of the highway, train track and inner city industries.

- The edges of the landscape and water provide panoramic views.
- Future residential development in Achtersluispolder needs to take extra measures to make the land higher.
- Spatial transitions to noise producers need to be improved.

M.15-18 visualise the opportunities and challenges on city scale, concluded from the preliminary analysis.

V.1 TRADITIONAL ZAAN REGION





F.29 Construction industry and related sectors in relation to each other. Left: Koog aan de Zaan, right: Achtersluispolder

12.1 TRADITIONAL SCENARIO

The scenarios are based on the economic profile of Zaanstad together with the analysis of the future spatial implications for industries and the desirable interventions on city scale.

In the traditional scenario new developments continue in 'the way things are'. Meaning, similar to the development currently present in Zaanstad. There is low degree of digitisation and automation and new employment opportunities in economic activities such as in the construction sector are suitable for the local workforce. Industries such as construction, basic goods manufacturing and logistics and storage, city serving services such as car repair and other related services are the focus. Already many companies in the construction sector are located in the industrial areas of Zaanstad. In Hembrug some interior designers and makers are located. While in the Koog aan de Zaan area, there are more small construction companies and related services and research. In Achtersluispolder there are already recycling companies present together with manufacturing of materials such as metals and wood. Large wood wholesale and logistics businesses are situated in the centre of the neighbourhood. Potentially, Zaanstad could contribute to supplying for the housing demand in the whole region. This way, increases employment opportunities within its own region and takes advantage of existing industries and economic opportunities in Zaanstad.

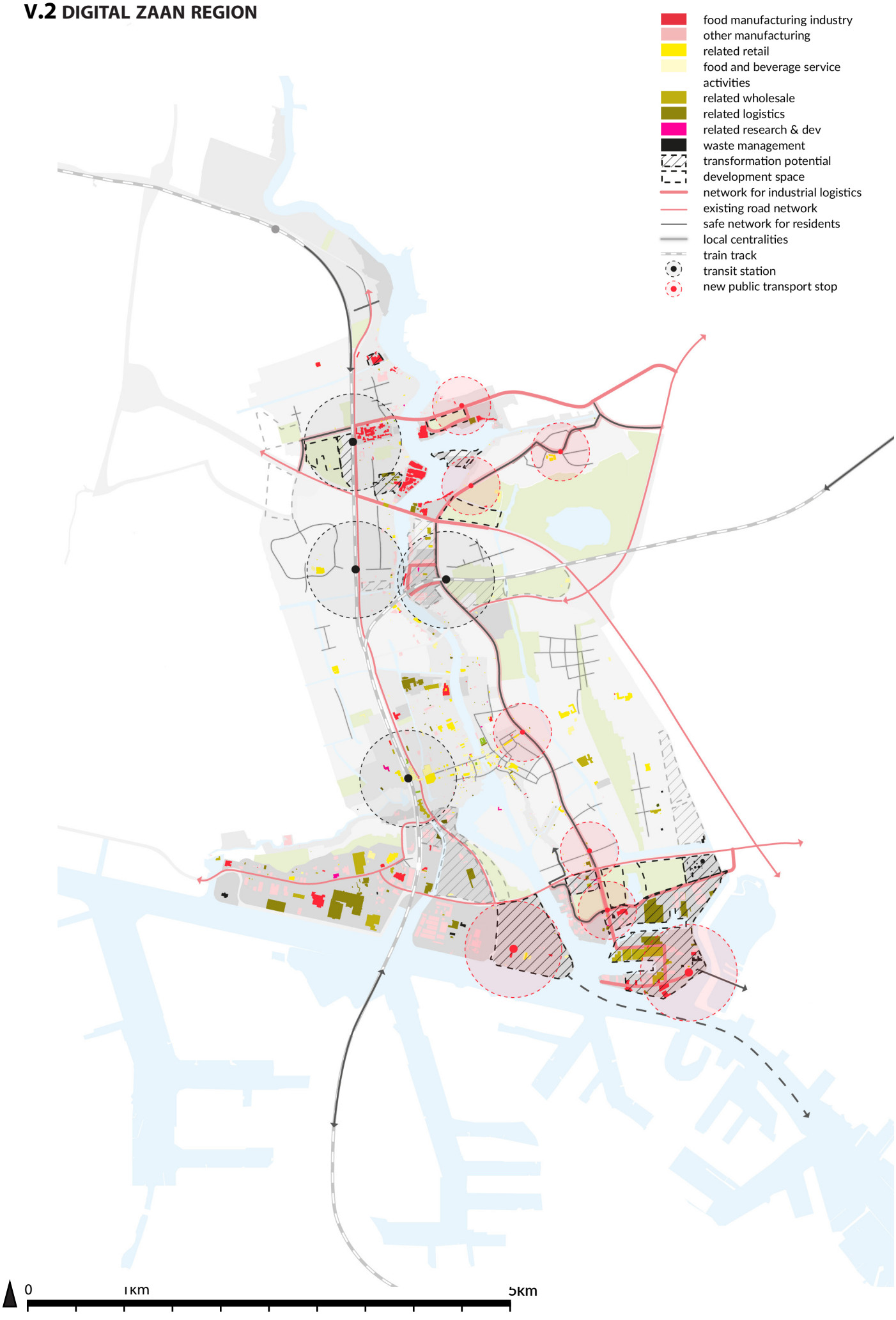
This results in the need for improved connectivity and mobility within the city. Not only the movement of workers and residents, but also the logistics of products to the rest of the region. Better connections between the inner-city and edge of city locations are needed and adding complementary activities and amenities improve working locations for workers and residential environments for inhabitants.

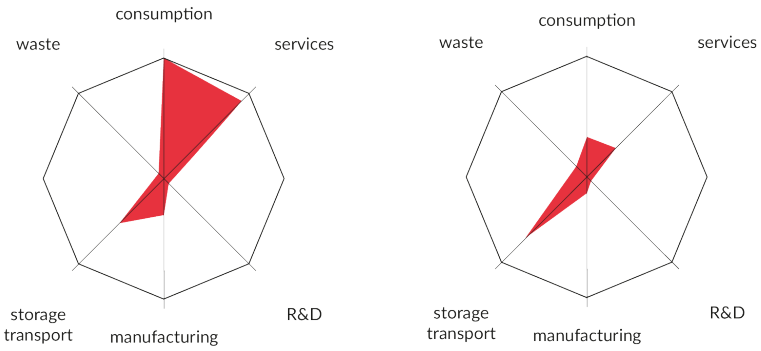
Type of work environment:
Construction, basic goods, manufacturing and logistics and storage prefer a mixed working environment with more and less integrated parcels. Larger parcels are separated from housing, some need to be well connected and others can have secondary connectivity. A place where noise nuisances are possible. Smaller and medium sized volumes can situate in mixed working environment and can be mixed with some housing vertically or horizontally. Moreover, smaller and medium sized volumes along a branch waterway.
A mixed work environment can house buildings with shared facilities and workspaces. The construction industry is clustered with businesses from related sectors. In Koog aan de Zaan the focus of clusters is more on small construction companies, such as freelancers and some medium sized ones. Together with related services and research development offices in more or less mixed environments with housing.
The Northern locations focusses less on storage, logistics and manufacturing. Logistic centres can be placed at the city border, while smaller distributions centres at strategic places in the city deliver to inner city locations. These larger storage, logistics and manufacturing industries are clustered in Achtersluispolder together with waste management and recycling. Parts of the area a designated to industries that need larger nuisance contours.

Type of housing environment:
Zaanstad has a lot of low rise row housing development, some more dense than others. New housing developments will continue in this fashion. Creating row houses, village or workers homes and open blocks with gardens with some low rise slabs or towers. Also some slabs in a green field, or low rise towers along the water. New development is focussed on linear densification. Densifying predominantly along the main road network and local centralities. New local amenities and services, some commercial activity and sports facilities are also introduced. Network improvements focus on the local, such as good pedestrian and cycling routes, and permeability of the neighbourhood.

Source: V.1 and F.26 according to NACE Rev. 2 – Statistical classification of economic activities in the European Community. GIS data.

V.2 DIGITAL ZAAN REGION





F.30 Food industry and related sectors in relation to each other
Left: Koog aan de Zaan, right: Achtersluispolder

12.2 DIGITAL SCENARIO

In the digital scenario, digitisation, automation, robotization in industries are stimulated. The investments are made in advanced manufacturing of the food industry. As Zaanstad houses mainly low and mid educated residents, it will need to attract highly educated people from the region to work in advanced manufacturing. Therefore, transport oriented development and collective mobility hubs are promoted. As higher educated people prefer urban environments with many amenities and services that is well connected to the rest of the region. Qualitative mixed-use environments are needed to attract this target audience to Zaanstad, as firms also prefer to have workers nearby. However, employment opportunities decrease in these sectors for the low and mid educated. It will therefore not contribute to many employment opportunities for the current residents of Zaanstad. Still, manufacturing does have a multiplier effect, it may increase jobs in other services sector such as repair or cleaning.

Energy, water and recycling or waste management could complement the food processing industries present. Many manufacturing industries are located along the Zaan river, focus is put on improving water transportation of goods inland. The ambition is to combine manufacturing with consumption, services and research and development around the inner city manufacturing industries. The related services, such as the growing sector specialistic business services can complement these businesses, to do more research into new food products or marketing of the products.

In the south adjacent to the Noordzeekanaal and with great access to the highway, larger storage and logistic facilities are located together with industries that focus on waste management and recycling. As the activities in Koog aan de Zaan and Achtersluispolder complement each other, the relevant road network connecting these areas need improvements.

Type of work environment:
Larger factories that have historically situated themselves along the Zaan river have turned in to large industries. With the transition to more sustainable versions and digitisation, these industries probably need more space to expand and integrate these activities. As these industries are bound to the water for transport of goods, the waterfronts of the existing industries are kept accessible for work activities and logistics. To encourage settlement of empowered SME's, diverse working spaces are provided in proximity to the manufacturing industries. At the same time, these clustered work environments provide for more commercial activities, amenities, services and creative activities for the neighbourhood. There is a potential for markets selling regional products.

With a higher degree of digitisation and automation, potentially additional intensification of uses is possible. Industries that require a lot of space, with the technological developments and innovation space can be used more efficiently. Potentials for local data centres need to be investigated to support increasing need for big data and direct access to data.

Type of housing environment:
New housing developments focus on densification around public transportation hotspots. The added housing fits the needs of a higher educated workers. Increasing the diversity of housing, creating mixed live work environments that support diverse activities. Higher densities are created in the form of closed (super) blocks, slabs, towers, compact low-rise blocks. Addition of these types diversify the housing stock of the neighbourhood and increase the amount of local commercial activity, amenities and services currently lacking in many neighbourhoods.

Source: V.2 and F.27 according to NACE Rev. 2 – Statistical classification of economic activites in the European Community. GIS data.

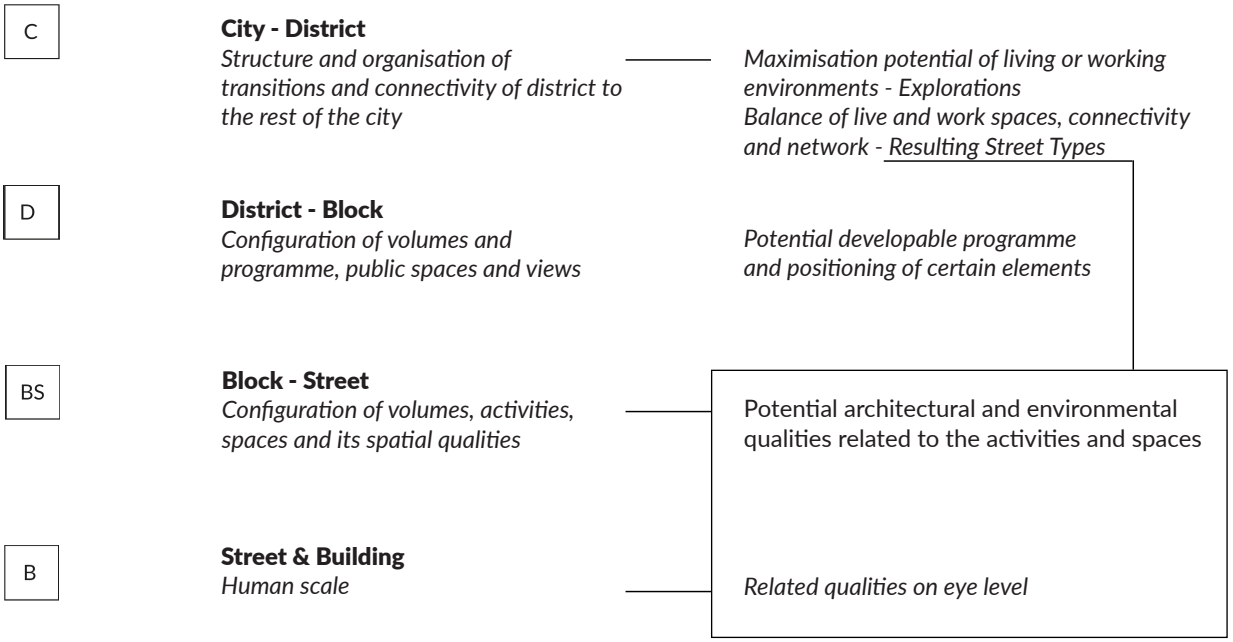
IV

PART IV RESEARCH BY DESIGN

13.1 Explorations	*Explorations on district level reveal possible spaces for desirable interventions for living and working in the framework of the two scenarios.*
13.2 Patterns of Streets	*Description of the design implications for the street types concluded from 13.1.*
13.3 Koog aan de Zaan	*An impression of the results from the implementation of the patterns in the framework of the scenarios in an existing urban built environment.*
13.4 Achtersluispolder	*An impression of the results from the implementation of the patterns in the framework of the scenarios in a transformation location.*

13.5 Patternfield

Testing of patterns on different scale levels:



13.

13.1 EXPLORATIONS OF LIVING AND WORKING

The two cases Achtersluispolder and Hembrug (AH) and Oud Koog, Oud Zaandijk, Kogerveld and Zaanse Schans (OK), are two very different locations, where the intensification of uses and integration of industries and have different design tasks (see M.18-21 p.178 -181).

OK is an inner-city location that is already quite dense and has a high ground coverage. Here, the main design task is to improve public space and hierarchy in infrastructures and logistics. Moreover, how to intensify uses in the existing built environment that does not have a lot of space to develop.

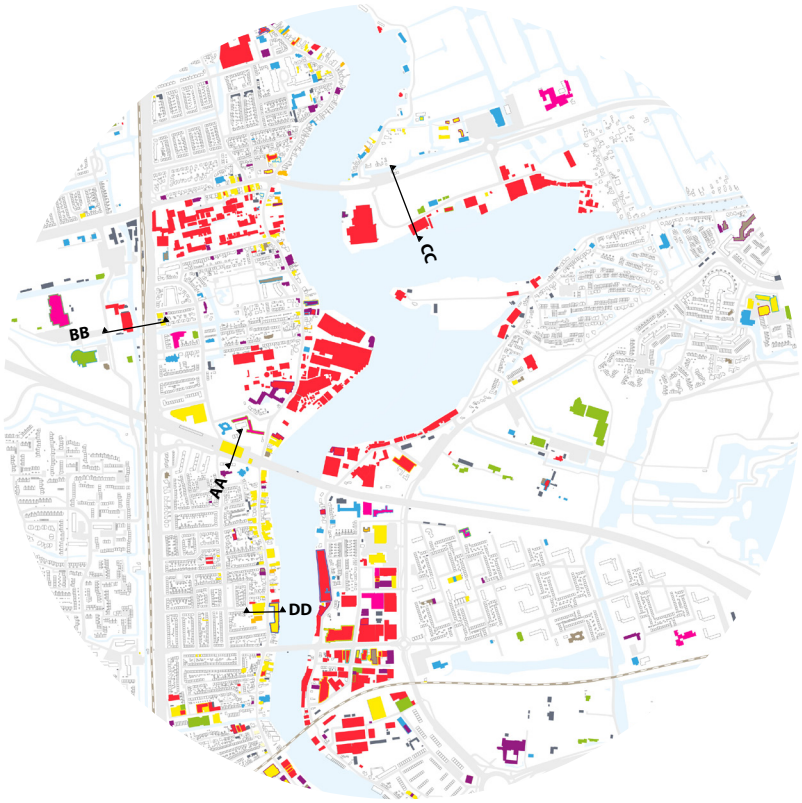
In AH there is a lot of excess spaces surrounding the volumes. Relocation of businesses and more efficient and compact organisation of functions creates new spaces for development. As the spaces are now mainly functional, qualitative public spaces need to be developed practically from scratch. The main task is to integrate housing in the district gradually with industries that have environmental categories. Moreover, to connect the separated district to the city.

First, in the framework of the scenarios, the desirable interventions on district level are explored for adding live work environments in each location. The explorations reveal possible spaces for desirable interventions related to the transition of functions and live work combination. For the maximisation of living environments in the traditional scenario, it means linear densification along main roads or roads with amenities. In the digital scenario, densification takes place around transportation nodes. For the maximisation of working environments, it means keeping the focus industries of each scenario as much as possible in the district. Moreover, clustering related businesses around the larger focus industries that are kept.

Second, for balancing living and working certain patterns were prioritised. As it is considered unrealistic to relocate some of the large industrial estates, these were considered guaranteed spaces for businesses (P.15). From this, appropriate accessibility (N.3) and the transition of functions (P.6) in terms of volumes and spaces were determined. If there was not any room for gradual transition, the organisation of exposed and quiet sides was deciding (ZE.6).

Overlaying the explorations with the prioritised patterns have resulted in the definition and allocation of street types. The desirable programme and potential spatial and environmental qualities, in other words the applicable patterns, were found to be related to the street types to a certain degree. These are described in Chapter 13.2. As a result, the live work typologies from Chapter 6.3 are linked to certain street types. These typologies were used for the design on location. Adjusted to the density ambition of the scenario and relevant patterns.

To show the potential programme, spatial and environmental qualities impressions are developed on different scale levels for OK and AH. First, the desirable programme and transition of volumes and spaces are shown on a district scale level. The zoom ins show the potential architectural quality, environmental quality and the mix of uses and activities on building and block level. The street views give an impression of the human-scale of the resulting live-work environments.

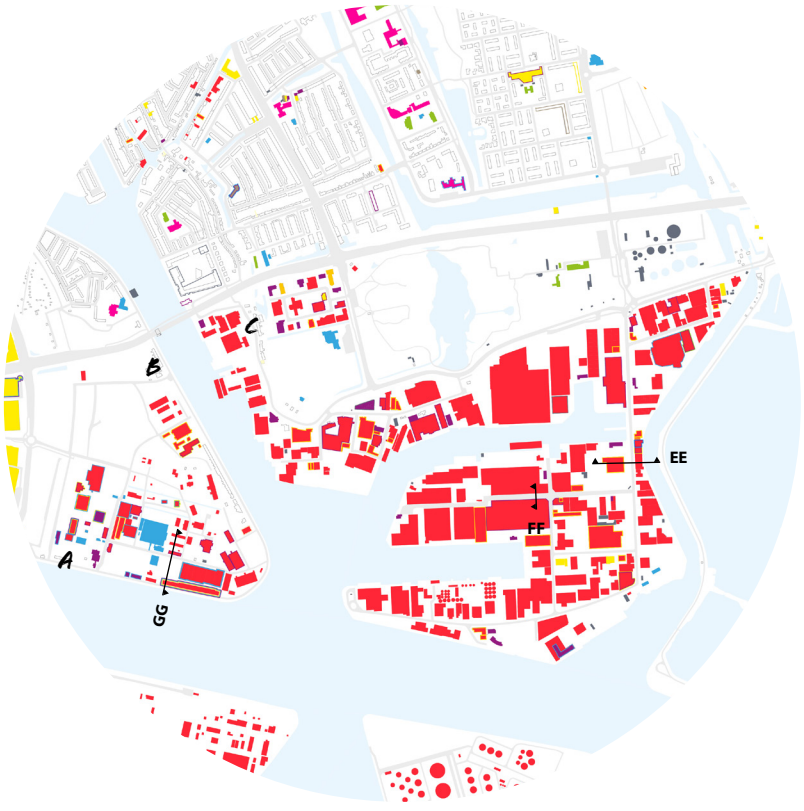


Koog aan de Zaan

Functions
- housing
- industry
- offices
- shops
- restaurant or café
- hotel
- gathering
- sports
- health
- schools
- other

M.18 *Functions*

Currently, the balance of the programme (based on gross area) is 50% residential, 50% other functions. Of the 50%, 30% consists of industrial uses. These is a lot of industrial activity relative to the amount of housing and amenities. Most of these amenities are organised along the highstreet or along branches of the highstreet. More local facilities and amenities seem desirable in central locations in the neighbourhoods. There are a lot of recreational services, sports facilities, clubs, fields, nearby nature reserve etc.



Hembrug - Achtersluispolder

Businesses with environmental categories ranging from 3-5 are situated here.
Currently, the area is not mixed, some housing is present in Hembrug or bordering the city (A, B, C). Transitions are made with fences, parking lots wild growing gardens and garden sheds etc. There almost no local amenities, supermarkets, restaurants or cafés. Transformation would require to add more local facilities.

0 250 m 2,5km

Source: Bag verblijfsobjecten, geodata.



Koog aan de Zaan

Fronts and backs
front
back
entrances
service entrances
messy terrain
terrain
parking
truck parking
fences
bushes

M.19 *Fronts and backs**

There are direct confrontations between industries and housing. The more intensively used terrains of industries are in the interior of the private plots. Plots for parking of trucks are organised near main roads. There are logistics routes going through the private plots for loading and unloading and enough turning and parking space.

Koog aan de Zaan

AA
A8 & Verzetstraat

BB
Provincialeweg

CC
Leeghwaterweg & Diederik Sonoyweg

DD
Zuideinde

Achtersluispolder

EE
Sluispolderweg

FF
Rijshoutweg

Hembrug

GG
Middenweg

1:2000

Source: own illustrations
* See Appendices 7. for map showing fronts and back in detail.



Koog aan de Zaan

Private vs Public
- outlines of buildings with industry
- business districts
- private space
- inaccessible space
- semi public functions
- water
- public space

M.20 *Public space*

In general, the residential blocks are short and allow for a high permeability. Some industrial parcels form large blocks and interrupt the permeability of the neighbourhood. Most of the larger sites are situated spread out along the waterfront along the highstreet, actually not interrupting the permeability. The west side of the Zaan has a high ground coverage and not a lot of open spaces.



Hembrug - Achtersluispolder

The area is not easily accessible by bicycle or public transportation. East-West connections are missing as well as North South connections. This area is separated from residential areas with a large park, cemetery, sports fields and infrastructure. The dyke forms a clear delineation of the industrial business district.

It is very accessible by car. The nearby highway connects the area to the rest of the region. The Sluispolderweg is the only connection of the district to the main network. The parcels or blocks large and not permeable. The streets are the only public space and are mainly functional.

0 250 m 2,5km

Source: Bag verblijfsobjecten, geodata.



Environment
soil contamination
water nuisance
relative temperature

Koog aan de Zaan

M.21 *Heat island effect - Water nuisances - Soil contamination*

Heat accumulates around the large roof surfaces and functional terrains of the industrial estates or in the working district. Similarly, water nuisances are also experiences in these areas.

Some areas are confirmed to have soil contamination. In general, it can be stated that there is soil contamination everywhere to some degree due to the industrial history.



Hembrug - Achtersluispolder

Similar to Koog aan de Zaan, heat accumulates around the large roof surfaces of the industrial volumes. The large functional terrains experience the most water nuisance, the streets come next.



Which buildings could be removed?

Based on building age, energy label, building quality and (industrial) characteristic architecture is has been determined which buildings are desirable and which can potentially be removed.

- <1945
- Energy lable < C
- Municipal, provincial, national monuments

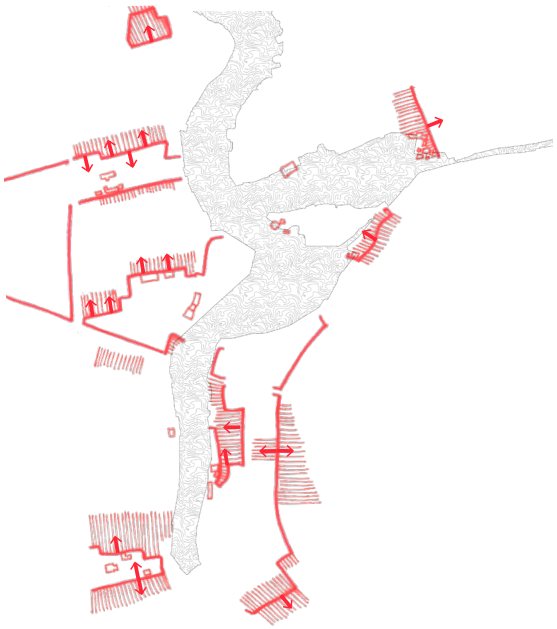


Which industries could be relocated?

It is unlikely that any of the large industrial estates will be relocated. Large investments in machinery make it practically unaffordable.

- maybe relocate
- cannot relocate
- possible to relocate
- possible to water loc
- relocate out of site (shipyard)

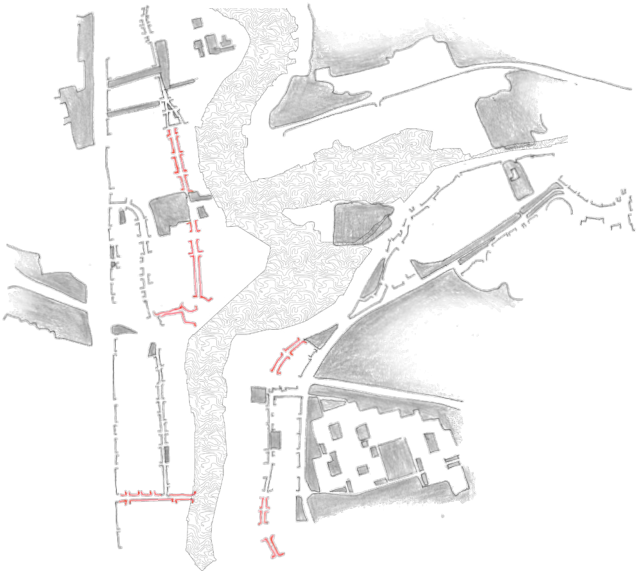
There are a few shipyard in separated locations. If these areas are to be transformed. These businesses possibly prefer relocation.



Shifting borders

These removal spaces along borders between industry and residences determine the capacity of creating transitions between functions.

- border live work
- direction transition possibilities



Mitigation of nuisances

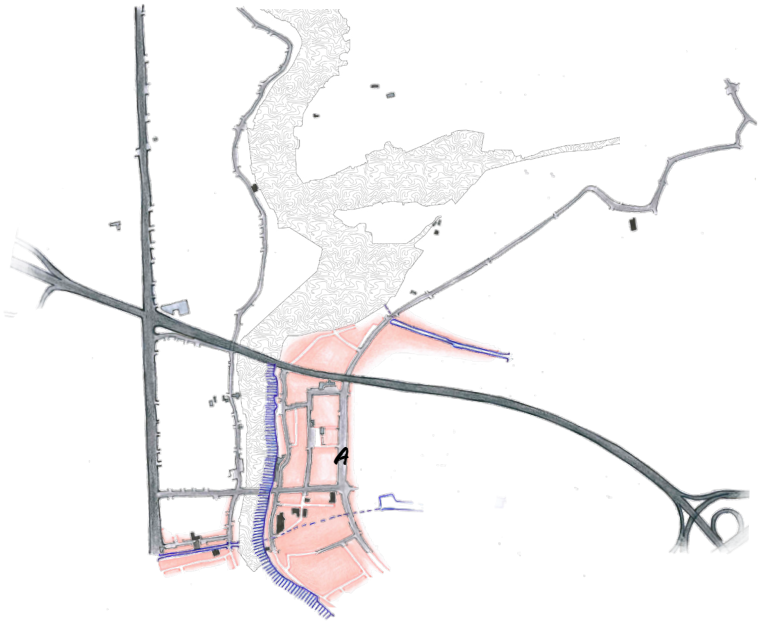
Based on the analysis of the heat island effect, water nuisances, noise nuisances and soil contamination, it has been determined where spatial barriers are needed, green structures and special attention to soil remediation. There are several connections that are desirable to connect the urban green spaces together and with surrounding the natural reserves.

Source: M.32 Nationale Energie Atlas. (n.d.). Kaarten Energielabels voor woningen. Retrieved from: www.nationaleenergieatlas.nl/kaarten



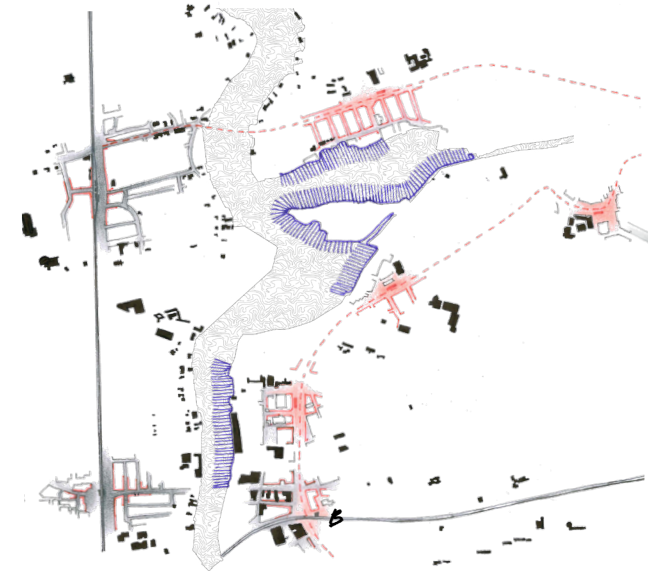
Traditional: Where could space for housing be maximised?*

Along the main roads there is the potential to densify as it now consists of mainly low rise. The plinth should preferably be active, with commercial functions or amenities. These can supplement the ones along the highstreet.
As the large estates along the water are difficult to relocate, there are limited possibilities to open up the waterfront to the public. Only the east side of the Zaan has some options.



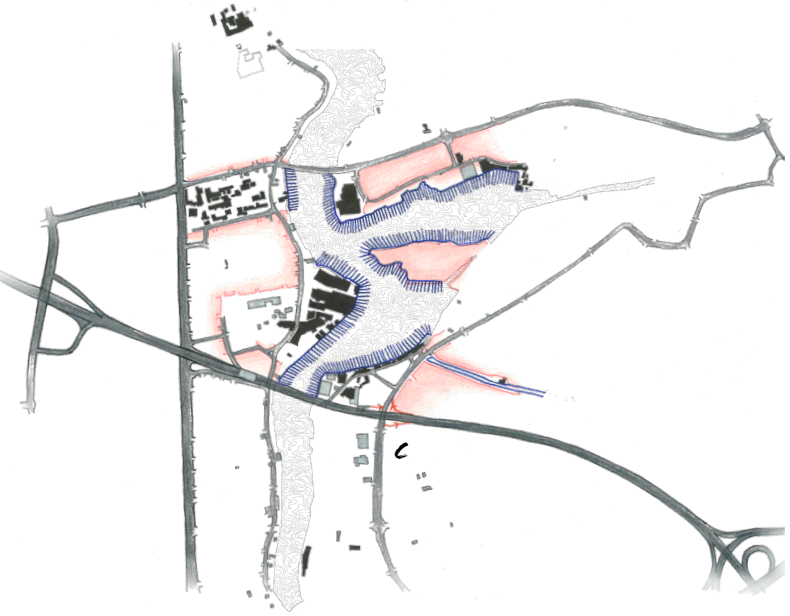
Where could space for industry be maximised?

The construction industry and related businesses are situated mainly in the working district. Clustering of these activities could be stimulated here. There are some smaller waterways where already some businesses are located that are also suitable for clustering of smaller and medium sized businesses. The Doctor H.G. Scholtenstraat (A) is an important road that connects the businesses to the highway.



Digital: Where could space for housing be maximised?*

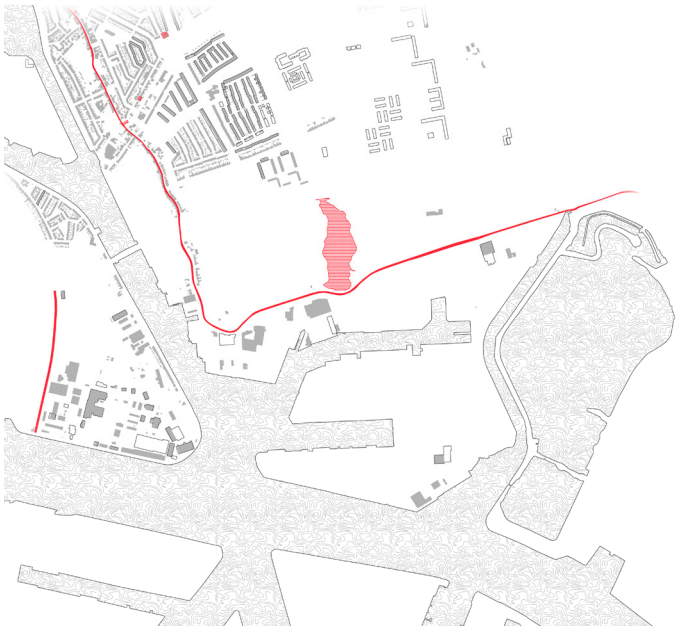
There is some potential to densify around the existing train stations. Particularly, around the Kogerveld station (B). A tram could be introduced that connects the stations to the outer neighbourhoods. These areas are currently lacking public transportation options. Adding a tram stop along the Zaanse Schans is desirable, as it might reduce the amount of bus traffic, transporting tourists and connects the hotspot better to the city. Adding tram stops also increases the amount of places where densification can take place. These new stops are added in local centralities of neighbourhoods.



Where could space for industry be maximised?

The industries west of the Zaan have limited options to expand. On the east side there are several options, Hemmes island or sports field locations. However, the Hemmes is not connected to the main roads. Only water related industries would be desirable here. All the main roads surrounding the large estates appear important for the accessibility and regional connectivity. An extra driveway to the highway at (C) might prevent some truck movements through the neighbourhoods as the business district would then have direct access to the highway.

* in red on the maps are potential additions on location. maximisation housing black = amenities, maximisation industry black = industry, grey = related businesses



Which buildings could be removed?



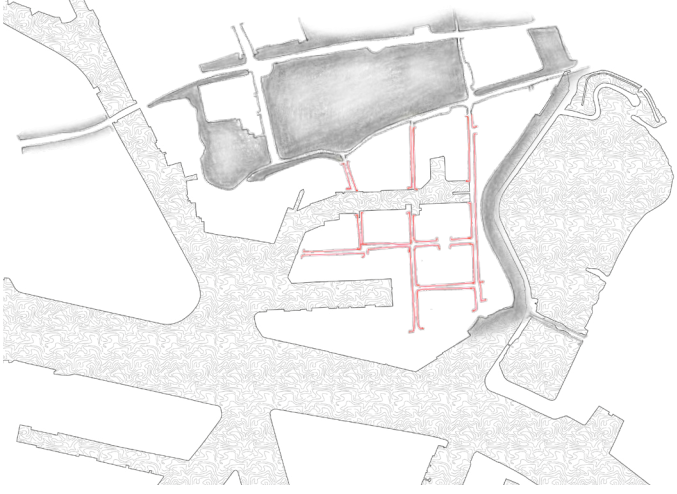
Which industries could be relocated?

For the Achtersluispolder buildings that can potentially be removed cannot be determined this way, as many of the buildings are built relatively recently. In contrast, the older buildings actually show potential structures that can be kept, especially in Hembrug. The dyke is an important historic structure in the area.

<1945
Energy lable < C
Municipal, provincial, national monuments

There are multiple manufacturing industries spread out in the area that are difficult to remove. Especially along the Noordzeekanaal. Some firms have grown and occupy multiple structures on the parcel or even in the district. Relocation can be used as an opportunity for these companies to organise their activities more efficiently on one site, improving their work flow. Logistics centres and wholesale firms are easier to relocate, the new locations just need to be accessible.

maybe relocate
cannot relocate
possible to relocate
possible to water loc
relocate out of site (shipyard)



Mitigation of nuisances

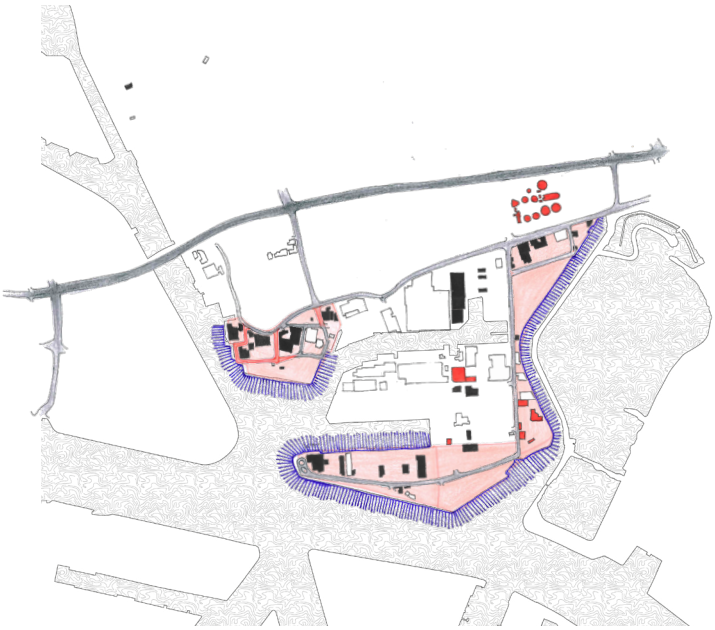
The area is surrounded by a large park and lake. As concluded from the analysis, the large volumes and blocks are not desirable. New development needs to integrate a grid of green spaces that connect to the larger green structures.

Source: M.32 Nationale Energie Atlas. (n.d.). Kaarten Energielabels voor woningen. Retrieved from: www.nationaleenergieatlas.nl/kaarten



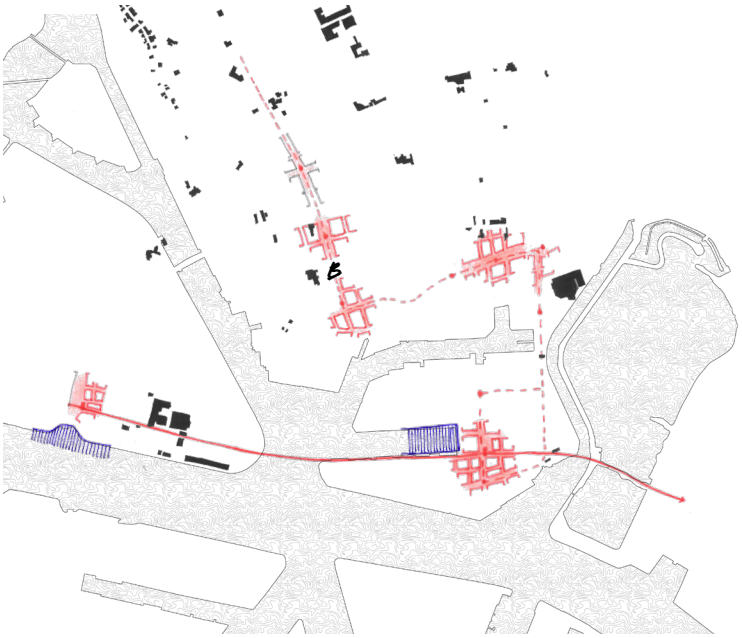
Traditional: Where could space for housing be maximised?*

To really integrate Achtersluispolder in the city multiple connections are needed that at least have good cycling and pedestrian routes (A,B,C,D). These are the extension of roads that currently have some commercial activities and amenities along them. Higher densities can situate along these streets.



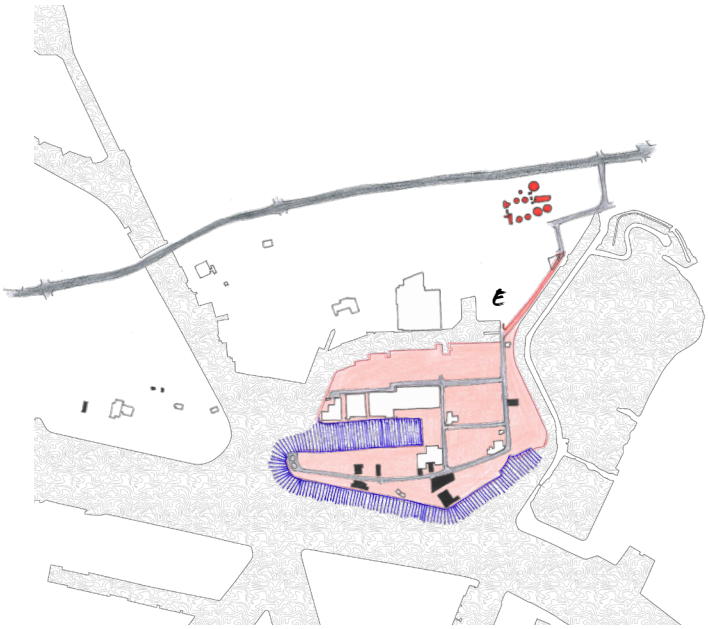
Where could space for industry be maximised?

Businesses related to the construction industry are quite spread out in the area. A lot are situated along the water but do not make use of it for logistics. Clustering and intensification can be stimulated in the highlighted areas around the manufacturing industries. The main road on the dike is crucial for the accessibility of all these companies.



Digital: Where could space for housing be maximised?*

Connecting the North-South metro line to Zaandam has often been mentioned in municipal reports. This is how the course of the track is planned now. An additional tram line connecting the centre and the southern neighbourhoods is desirable to create multiple densification locations at transportation nodes. The Wibautstraat (B) becomes the main connection to the city of Zaandam, while the metro station connects the area to the region.



Where could space for industry be maximised?

Manufacturers and logistics related to the food industry are situated along the Noordzeekanaal. The Sluispolderweg (E) is the only connection to the highway for the industries along the Noordzeekanaal. Clustering of water related industries can take place in the highlighted area. With increased water transport the single connection to the highway does not have to be an issue.

* in red on the maps are potential additions on location. maximisation housing black = amenities, maximisation industry black = industry, outline = related businesses, red - related recycling/ wase management



Koog aan de Zaan

Resulting Street types Traditional Scenario*

The large estates are kept but with limited expansion options. Small and medium sized premises are added in the Boerejonkerbuurt, where construction industry and related businesses are clustered. The street closest to the Zaan becomes a functional street, connected at several points to the main road network. At the crossing of the Zaan it overlaps with an amenities street. Here extra attention is needed for safe crossings, pedestrian lanes and cycling routes. The historic highstreet is extended from the Zaanse Schans, connecting the Zaanse Schans to the neighbourhoods. For the industries along this street, direct connections to the main road network are added.



Hembrug - Achtersluispolder

The main roads are extended from the residential neighbourhoods north to Achtersluispolder, connecting the new neighbourhoods to the city. These streets create the outline of the new live work environments. An internal green grid connects the different blocks to larger green structures and cycling routes.

Next to the sewage management facility it is not possible to build housing. Here, a logistic hotspot can be created together with other logistic and wholesale businesses. As it is at the edge of the city as well as near the highway. Two connections to the main road network are created at the edges of the business area along the Noordzeekanaal. Housing along the dyke is removed, the currently dead end road for truck traffic is connected to the main road network. Creating a continuous route, this way industrial sites can be organised more efficiently without excessive turning and parking spaces.

* To read about the further implications of the Street types see Chapter 13.3 Street types.

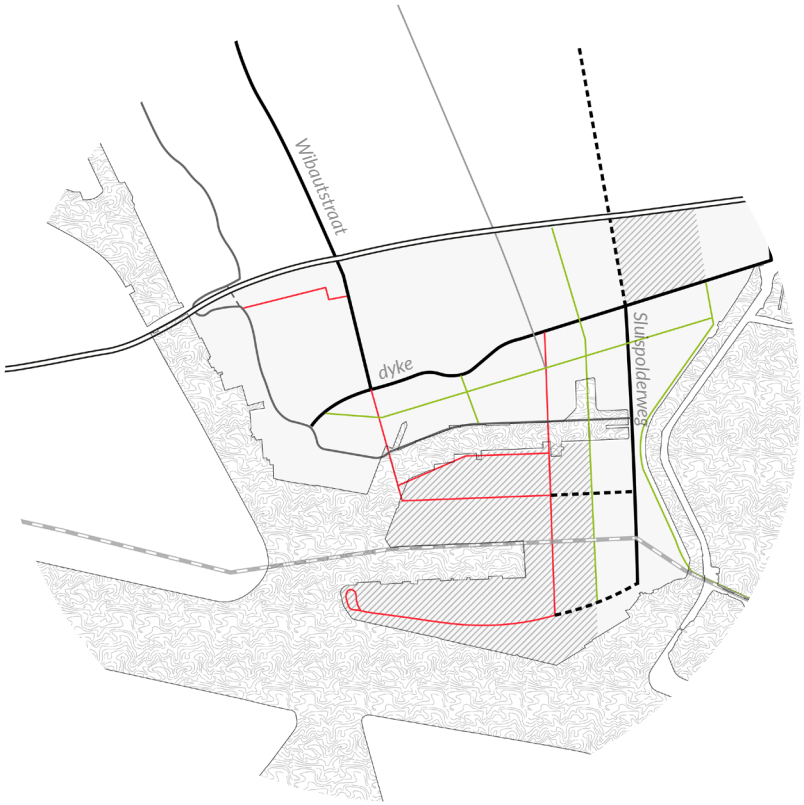


Koog aan de Zaan

Street types
highway
transit streets
highstreet
functional street
amenities street
green corridor
business cluster area

Resulting Street types Digital Scenario

The industries west of the Zaan have limited options to expand. However, part of the highstreet can be turned into a functional street. Separating the residential flows from the functional routes. Local traffic is directed to central street in neighbourhood. Crossings with truck traffic are safer than trucks along with cyclists in same street. Functional streets situate along nuisance sources, highway or train track. South of the Zaanse Schans the streets along the water remain functional wit a safe crossing to waterfront for pedestrians.



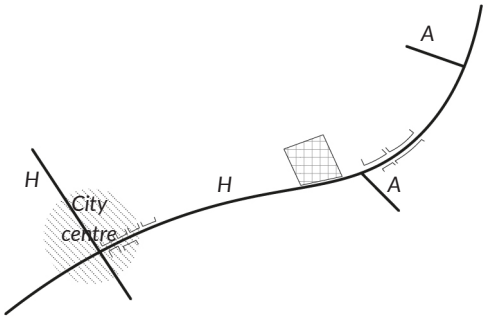
Hembrug - Achtersluispolder

There is one main connection to the city for cars, that also includes a tram route. Other connections focus on pedestrian and cycling routes.

Lifted functional streets connect the business area along the Noorzeekanaal to the main road network along the dyke. The Sluispolderweg is no longer the main entrance to the business district.

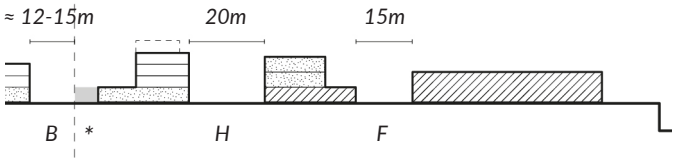
The highstreet is extended from north to south and continues along the canal uninterrupted by the functional streets. Green corridors connect the different blocks in the neighbourhoods and to the larger green structures and cycling routes. The cycling routes connecting Zaandam to Amsterdam are improved adding a route along the Noordzeekanaal.

Highstreet - *H*
(Backstreet) - *B*
Amenities street - *A*
Transit - *T*
Functional - *F*
Green corridor - *G*
Residential - *R*

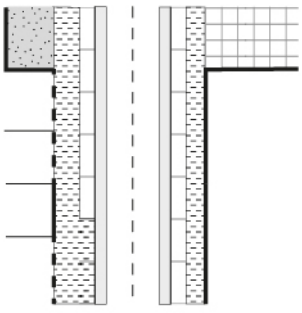


13.2 PATTERNS OF STREETS

Highstreet

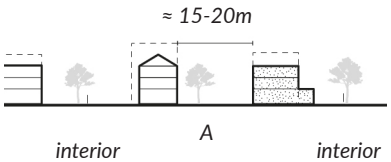


Context: The highstreet connects the city centre with the rest of the city. The edges of blocks along the highstreet close to the city centre are short for a high permeability, but can become longer further away from the centre.
Network: The industry has to be situated near a fast transit road or highway, to minimise the use of the highstreet by trucks. The highstreet allows two-way traffic, with cycling lanes.
Activities and mix: Attracting, primary functions are located along the highstreet and can be mixed vertically with residences. Such as shops, services, offices, drug stores, small supermarkets. This could be for people from the neighbourhood but also for the rest of the city. Secondary functions locate along branches of the highstreet, (see amenities street) or along the backstreet parallel to the highstreet. The backstreet functions as an extra route to



supply shops that have a larger logistical need. Areas with shops that are have a smaller attracting function can also do without the backstreet and supply their shops from the highstreet. Instead, it becomes part of the block and the backsides of the shops meet the back gardens of residences*.
Public space: The parking strip is continuous adjacent to industries to prevent trucks from blocking traffic. Along the side of attracting functions, this strip can also be used as presenting space for goods, bicycle parking or small strips of greenery. The hard edge can be interrupted at certain spots for a small public space or for the industry some space to turn their trucks or enter their plot.

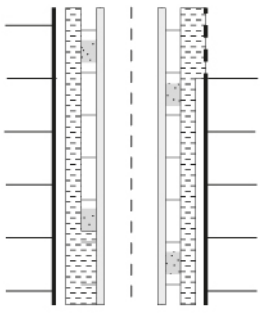
Amenities street



1:2000

Context: Amenities or, secondary functions locate along branches of the highstreet.
Network: There is no little to no truck traffic. Amenities streets connect different neighbourhoods locally.

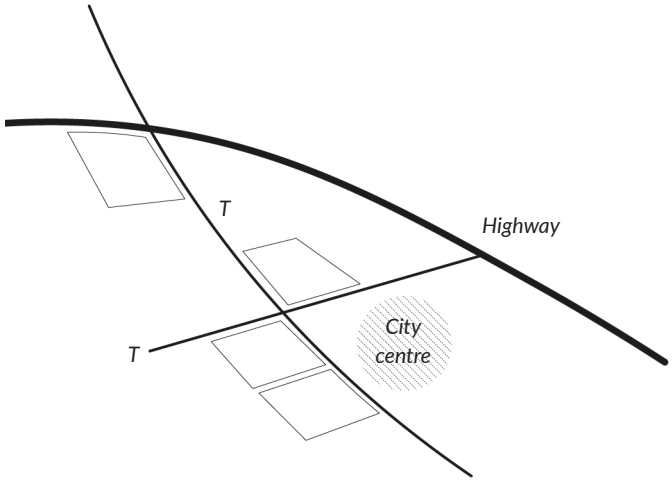
Activities and mix: This could be healthcare such as a doctor or physiotherapist, repair service, primary school, a kindergarten or day-care etc. with a local focus. Functions are mixed horizontally, located predominantly at corners of blocks.
Public space: There is enough space for the houses to have a small front garden of about 1,5m. To create a soft public private transition. While for the amenities this space can be used as a presenting space or their products if needed. If the street is more narrow, it can be reduced to 1 parking strip. There are cycling paths on both sides.



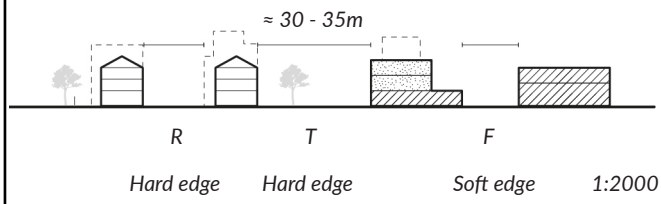
1:1000

Densification potential: There is a limited height for buildings along the highstreet, as it is not very wide. Densification could take place in the form of adding levels on top, with a setback. Along amenities streets densification could take place by adding levels on top or replacing the existing volumes with a closed or open block forms with apartments with collective gardens on the inside of the block.

F.1 F.4 F.5 F.8 F.9 F.10 P.1 P.2 P.9 P.11 P.14 N.1 N.2 E.3
E.4 P.1z P.2z P.5z P.11z E.3z P.2 P.6 P.8 E.4



Transit street



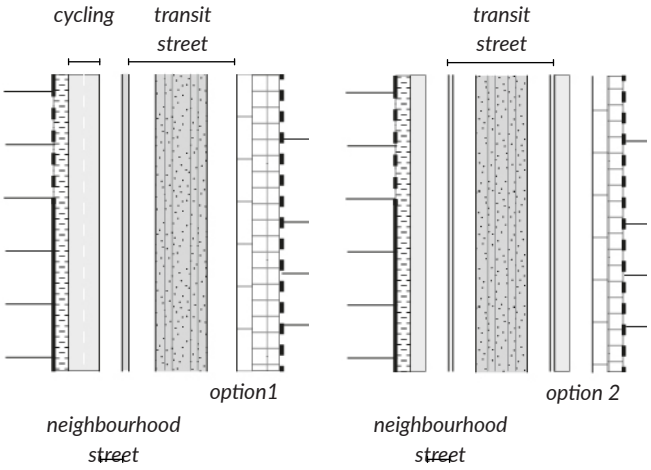
Network: Many forms of traffic need to use this road as it connects the neighbourhoods to the rest of the city and is used to travel in and out of the city.
Context: The (fast) transit street can be 30-35m wide. It can intersect with or run parallel to the train track. In Zaanstad, there are not any fast transit streets going through the city centre, but runs along the edge and is connected to the highstreet of the city centre. The highstreet intersects with the fast-transit street at several other points in the city. Especially where the industrial estates are situated. This way, the industrial estates can easily access the highway.

Activities and mix: At corners of blocks situated along this street amenities can be located for the neighbourhood. Such as a small supermarket, café or convenience stores. Because transit streets are well connected to the rest of the city and region. Larger businesses that attract regional customers can also locate along this road. Or a small working district with small to medium sized premises for businesses with a regional focus and logistical need. This can be for example a wholesale store like Gamma, Ikea or Asian market. Small and medium sized businesses locate directly along the transit street. While larger premises locate behind it, having the option for private terrains, parking etc.

Public space: As the street needs to accommodate all kinds of traffic, work and residential traffic need to be carefully managed. In *option 1* the work side of the street does not have a separate car lane but has temporary parking spaces and a wide path for short loading and unloading. On the residential side, the separated lane is combined with a cycling path going both directions. In *option 2* both sides of the transit lanes have separated destination car lanes. Along the residential it is combined with a single cycling path. On the work side the cycling lane is flipped to the other side of the road so it does not interfere with parking or loading and unloading traffic. There are good crossing places for pedestrians needed so neighbourhoods on both sides are connected. Preferably connecting local centralities.

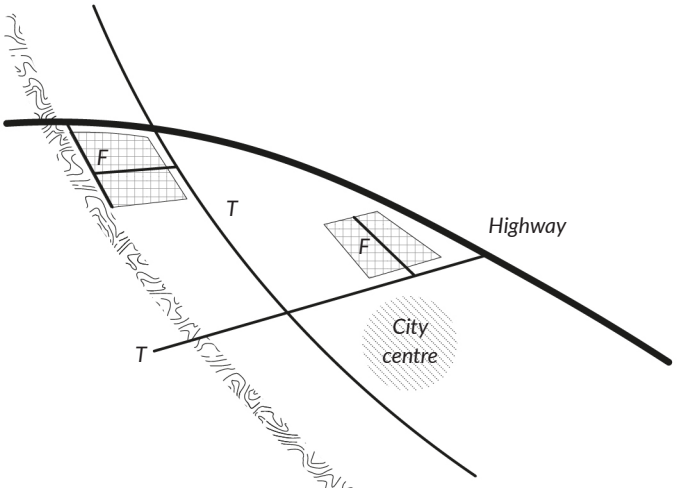
Branching streets from the transit street to the neighbourhood are not that frequent as within the neighbourhoods. Every 2-3 blocks a street from the neighbourhood may intersect with the transit street. While it does connect to the separated lane in front of residences along the transit street. This way, the main traffic is separated from destination traffic and safe cycling lanes can be created.

Densification potential: Because of its wide street profile, residential buildings with a higher density and height can be placed along this street or at corners of the block. A set back on the side of the residential neighbourhood can preserve the human scale. Working districts can also situate along this road.

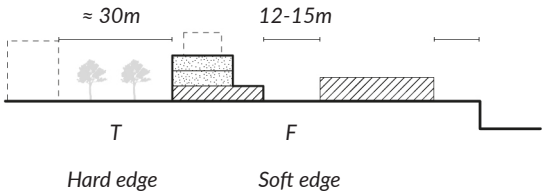


F.6 F.8 F.10 F.11 P.1 N.2 N.6 N.8 E.3 E.4 F.7 F.5 E.6 E.7

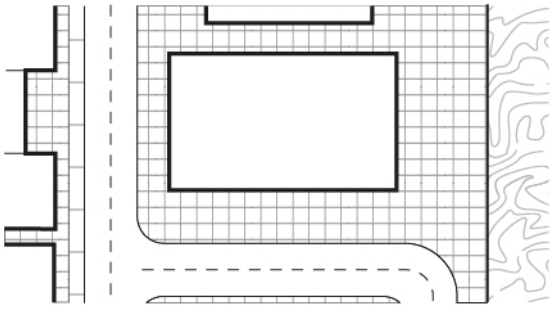
Patterns *Zaanstad Patterns*



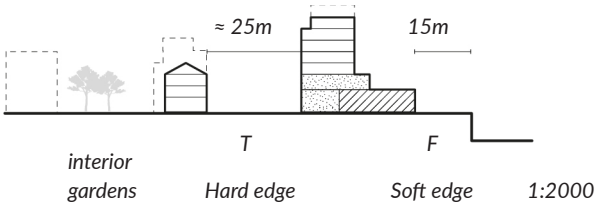
Functional street and waterfront



Context: The functional street is a kind of backstreet but for industries. It can be 12-15m wide and is well positioned in the area to serve the logistic need of the businesses. It is directly connected to the transit street or even the highway.
Network: The functional street needs to connect to a transit street that provides a clear route to the highway. In some cases, for businesses that are reliant on good logistic connectivity, the functional street needs to be connected directly to the highway.
Public space: To make efficient use of the space, the streets are not extremely wide. Due to the soft edges and the configuration of volumes, extra spaces are created for loading and unloading, parking etc. Industries situated a long the waterfront needs to be balanced with parts that are accessible to the public. A street along the waterfront ensures public accessibility. Parts of the continuity of the street can be



interrupted to create waterfront access for water related industries. Open spaces between the volumes along the waterfront ensure the visibility to the water from the street.
Activities and mix: Along the functional street all types of businesses activities are possible.
Densification potential: Multistorey factories can locate here, for large estates enough space surrounding the premises is needed. Small and medium sized premises do not, they can share open spaces.



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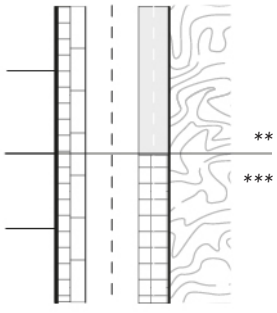
Context: In the case of a functional road that needs to pass through a residential area. Certain transitions from the functional street can be made possible. In this case the functional street runs along a waterfront*.
Network: The street along the water is a functional street connecting industrial areas to the highway, separated from residential traffic and the residential neighbourhood.
Activities and mix: Functions along the water front are not (heavily) water related as the street is used by other functions along the water as well. The work spaces are integrated in the residential volume to create a lifted street on top of the volume. This way, the waterfront is both accessible to businesses as well as residents. A cafe, shared office space or community centre can locate on the second level. By creating entrances to the businesses on residential side of the block. These workspaces can be accessed by its workers from both sides.

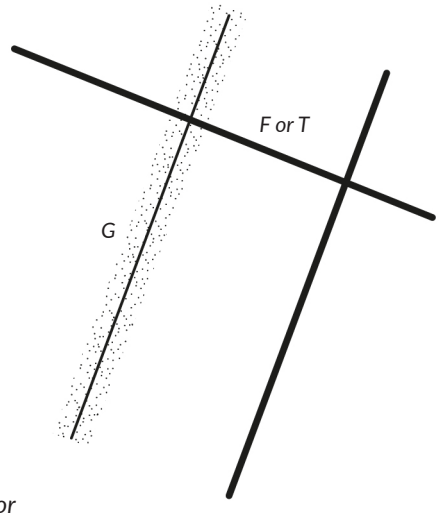
1:1000



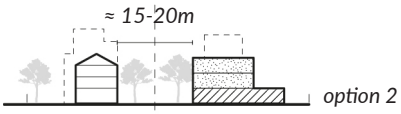
Public space: A well designed rooftop garden or terrace provides public spaces on the waterfront side on top of the functional volumes. A two way cycling path can be placed along the waterfront to provide safe and attractive cycling routes**. As that side will not interfere with the loading and unloading of trucks. The space can also be used as additional terrain for the work activities of businesses or provide access to water transport in small amounts***.

F.1 F.7 F.8 F.9 P.1 P.2 P.3 P.4 P.5 P.12 P.14 P.15 N.1 N.2
N.3 N.7 N.8 E.5 E.7 P.5z F.1 F.2 F.3 P.9 N.1 E.3 E.6

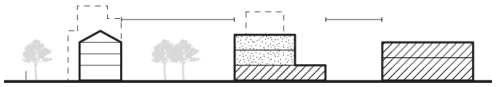
* In other cases the functional street can also be a transit street transitioning to a more business focussed area, instead of a waterfront. See transit street.



Green Corridor

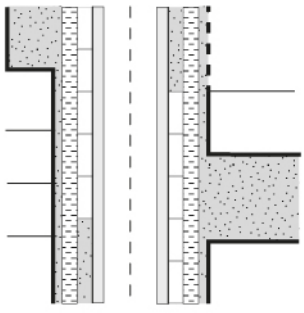


Soft edge



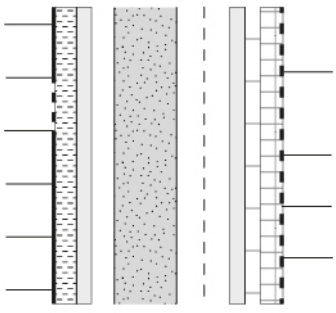
Hard edge

Context: The green corridor is positioned centrally in the neighbourhood. The street is the green lung of the neighbourhood.
Network: In an existing neighbourhood it is a local centrality, a walkable street from the whole neighbourhood.
Public space: Public spaces are dispersed along this street. Playgrounds, greenery, benches, fixed sports equipment etc. can be placed in these spaces. If the street is not wide, this is done by creating pockets in the existing blocks creating a relatively soft edge. Some plots for public spaces can be combined with branching streets. These spaces can also go through the whole block, increasing permeability of the neighbourhood. Or connect to collective interior gardens on the inside of residential blocks. Parking spaces are alternated with spaces for trees. A small front garden in front of the houses allows for a smooth private to public transition.



Activities and mix: If the street is at the border of a residential neighbourhood and mixed or work district, the public spaces can be used by both workers and residents. It is important that the facade of the businesses has a representative front and functions are mixed horizontally. It is possible to mirror the left or right side of the section*. In case of the left side, it is a residential neighbourhood. Functions that situate along this road are incidental, locally oriented and do not attract a lot of traffic or logistics. Mirroring the right side, the green corridor is situated in a mixed working district. The created public spaces can be shared by (clustered) businesses, to meet, have lunch etc.

Context: This street type can also be used to create a transition between a residential and more mixed neighbourhood.
Network: The street is not heavily used, the businesses along it are not require a lot of logistic activity.
Public space: The blocks along the street create a hard edge, and the businesses have a representative front along the green corridor. Instead of interrupting the blocks with small public spaces, the wide street profile integrates a larger park in the middle of the street. This way the street both acts as a nuisance barrier as well as public space.
Similar to the transit street, the cycling path can be combined on the residential side. To separate residential and industrial traffic. When there is not a lot of logistic traffic, the car lanes can be reduced to one lane on each side of the park or two lanes on the side of the park where the businesses are located.



Activities and mix: Functions along the green corridor can be regionally or locally focussed, depending on the position in the street network relative to the transit streets and highway. The dimensions of the plots along this street are small to medium sized, do not attract a lot of logistical traffic, (or this is organised on the backside of the buildings), and the noise level of the activities is relatively low. Work activities take place predominantly during the day.

F.3 F.4 F.5 F.11 P.7 P.9 P.13 N.1 E.3 E.6 F.3z E.6z

F.2 F.8 P.4 P.6 P.7 E.8



source: Amsterdam Economic board. (2016). Hemmes-MIR20100519-7408 [image]. Retrieved from: https://amsterdameconomicboard.com/hemmes-mir20100519-7408

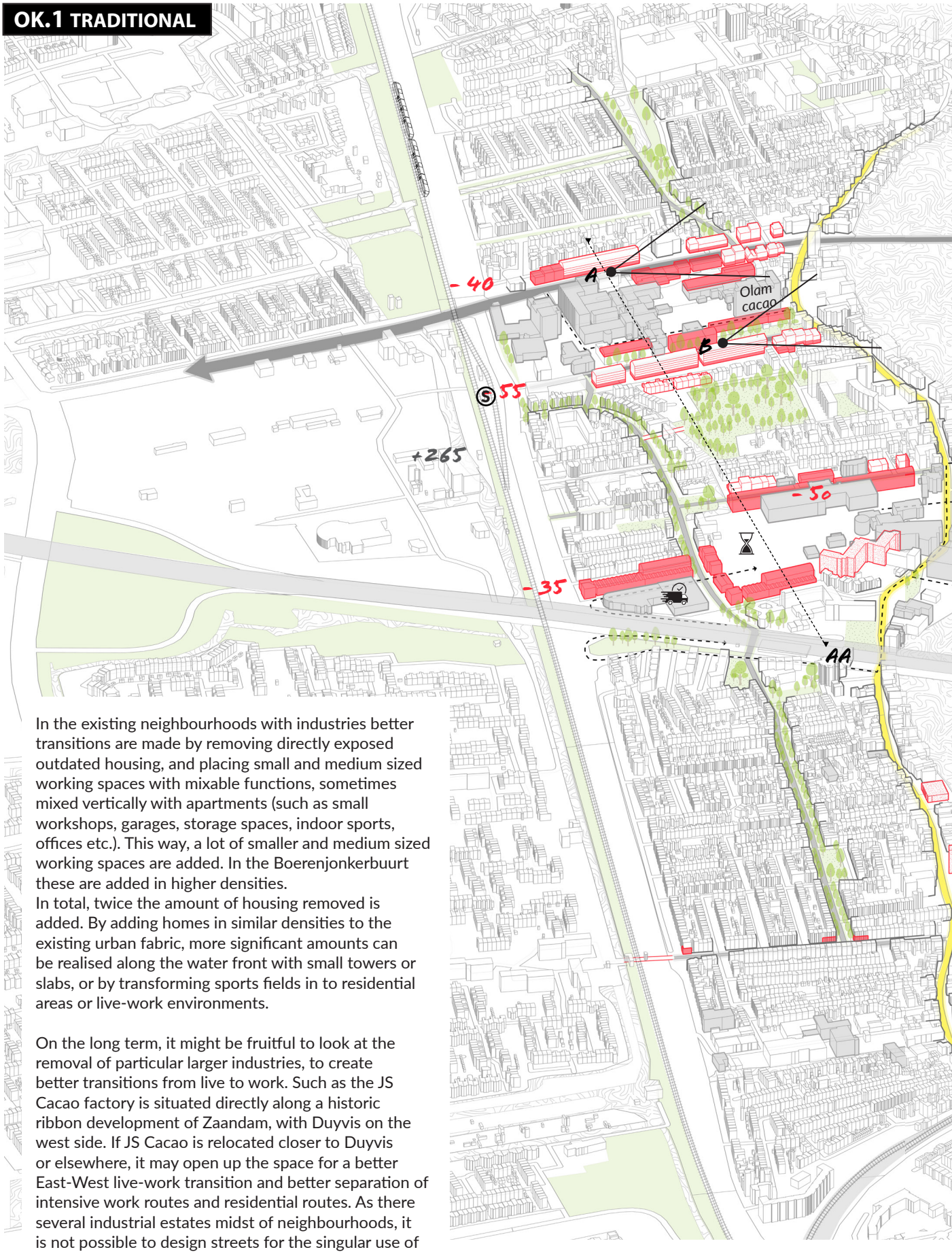
13.3 KOOG AAN DE ZAAN

The following pages show the spatial implications of the street types and related patterns in the area Koog aan de Zaan. As there are several larger estates situated in this area, transitions between industries and residences are revised using the patterns. The resulting interventions of each scenario are compared to each other. First the transition of volumes and spaces are shown on a district scale level. The zoom ins show the potential architectural quality, environmental quality and the mix of uses and activities on building and block level. The street views give an impression of the human-scale of the resulting design.
In the text, this area is referred to as 'OK' (Oud Koog, Oud Zaandijk, Zaanse Schans, Kogerveld)



De Zaan, the Netherlands

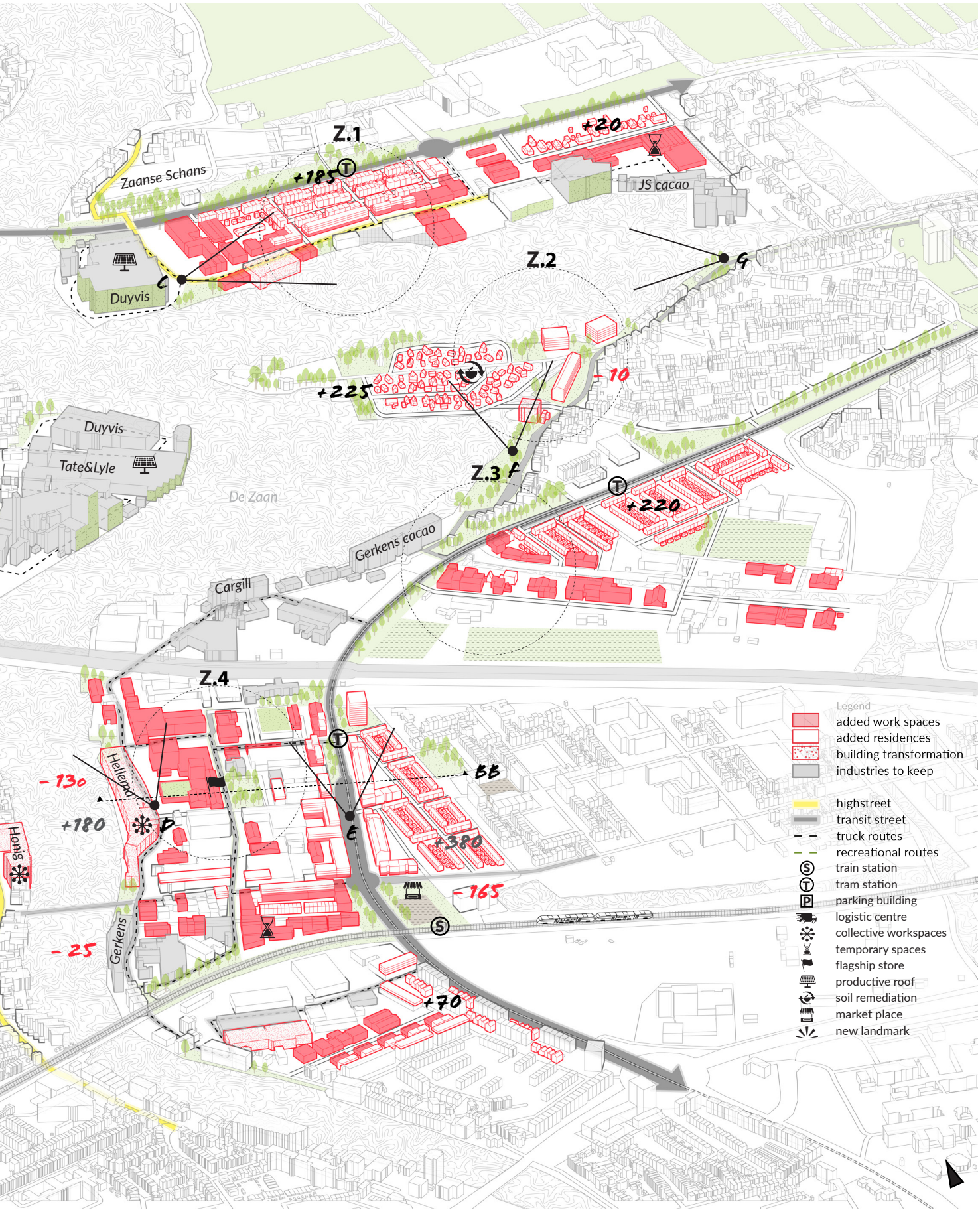
OK.1 TRADITIONAL



In the existing neighbourhoods with industries better transitions are made by removing directly exposed outdated housing, and placing small and medium sized working spaces with mixable functions, sometimes mixed vertically with apartments (such as small workshops, garages, storage spaces, indoor sports, offices etc.). This way, a lot of smaller and medium sized working spaces are added. In the Boerenjonkerbuurt these are added in higher densities.
In total, twice the amount of housing removed is added. By adding homes in similar densities to the existing urban fabric, more significant amounts can be realised along the water front with small towers or slabs, or by transforming sports fields in to residential areas or live-work environments.

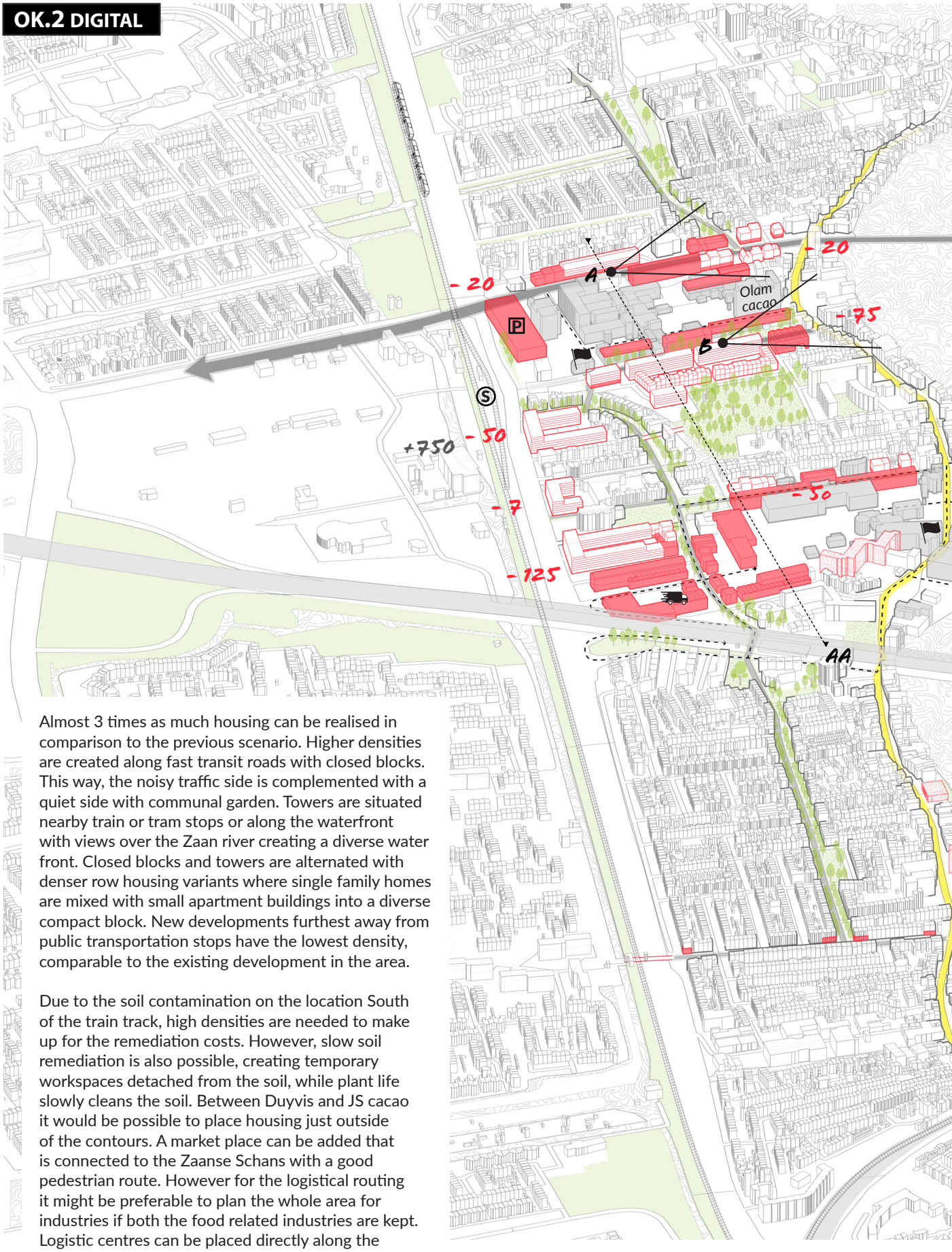
On the long term, it might be fruitful to look at the removal of particular larger industries, to create better transitions from live to work. Such as the JS Cacao factory is situated directly along a historic ribbon development of Zaandam, with Duyvis on the west side. If JS Cacao is relocated closer to Duyvis or elsewhere, it may open up the space for a better East-West live-work transition and better separation of intensive work routes and residential routes. As there several industrial estates midst of neighbourhoods, it is not possible to design streets for the singular use of industrial logistics (functional streets). Logistic centres can be placed directly along the highway, where packages are distributed to smaller trucks or busses.

REMOVED HOUSING	- 510
REMOVED INDUSTRY	- 2 L
	- 5 M
	- 40 S
TOTAL	- 17 500 M2



GF		+ 96 000	PHASE 1		+ 720
FLOORS		+ 44 500	PHASE 2		+ 825
TOTAL M2		+140 500	NEW		+1525
TOTAL ADDED		+123 000 M2	TOTAL ADDED		+1015

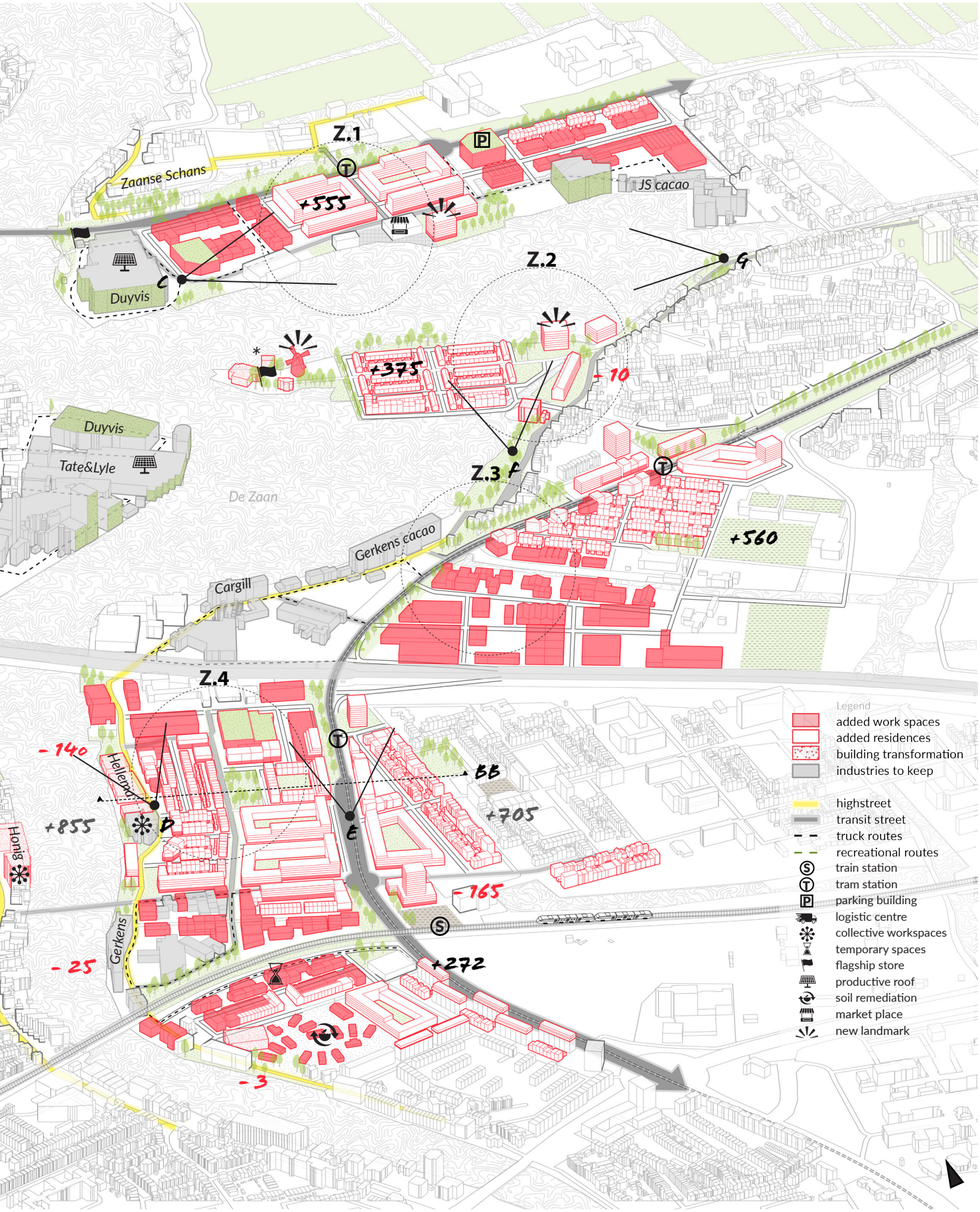
OK.2 DIGITAL



Almost 3 times as much housing can be realised in comparison to the previous scenario. Higher densities are created along fast transit roads with closed blocks. This way, the noisy traffic side is complemented with a quiet side with communal garden. Towers are situated nearby train or tram stops or along the waterfront with views over the Zaan river creating a diverse water front. Closed blocks and towers are alternated with denser row housing variants where single family homes are mixed with small apartment buildings into a diverse compact block. New developments furthest away from public transportation stops have the lowest density, comparable to the existing development in the area.

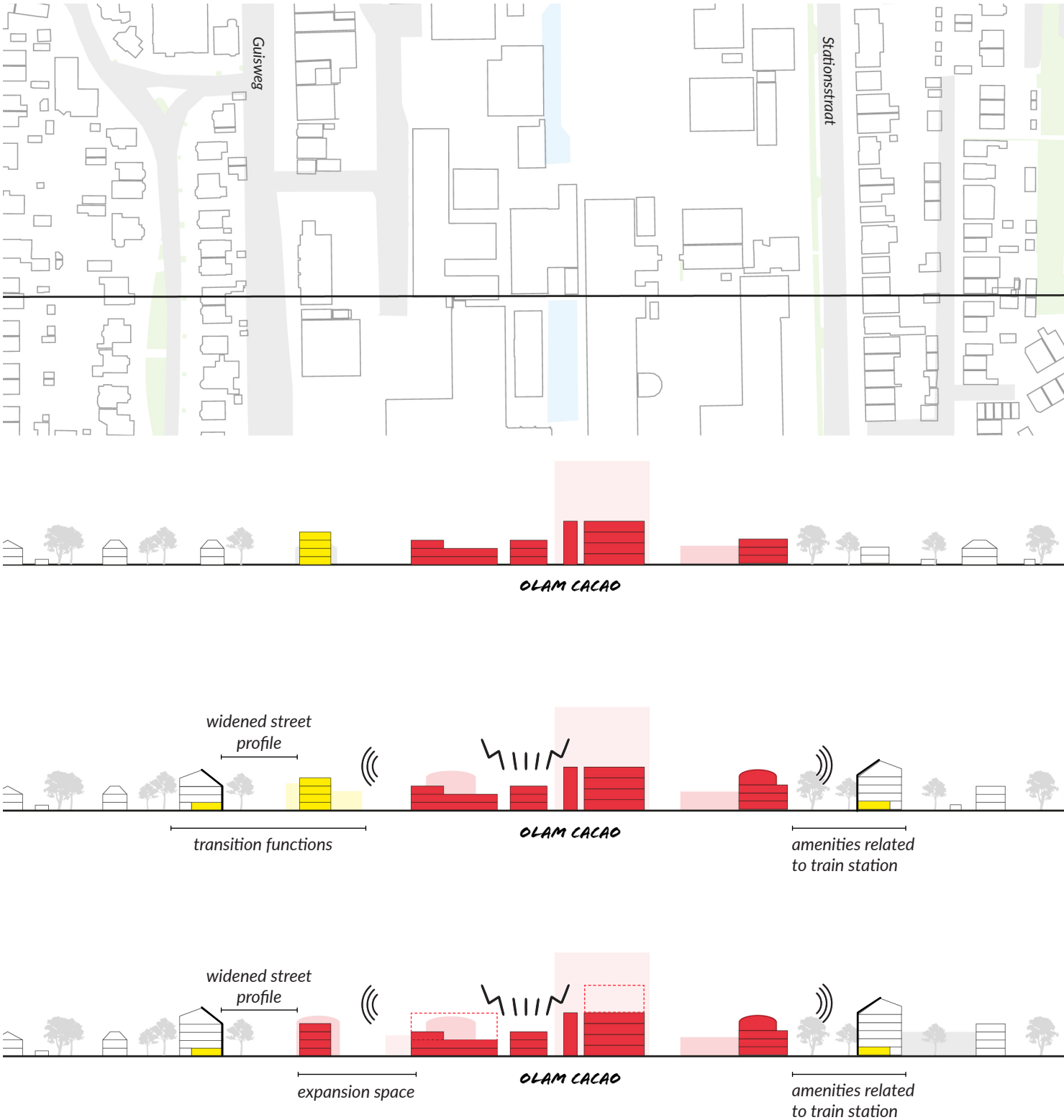
Due to the soil contamination on the location South of the train track, high densities are needed to make up for the remediation costs. However, slow soil remediation is also possible, creating temporary workspaces detached from the soil, while plant life slowly cleans the soil. Between Duyvis and JS cacao it would be possible to place housing just outside of the contours. A market place can be added that is connected to the Zaanse Schans with a good pedestrian route. However for the logistical routing it might be preferable to plan the whole area for industries if both the food related industries are kept. Logistic centres can be placed directly along the highway, where packages are distributed to smaller trucks or busses. On the tip of the Hemmes a new landmark and transformation of existing structures show the various industrial periods. A boat tour can stop here to visit the experience and store with local products.

REMOVED HOUSING	- 690
REMOVED INDUSTRY	- 17 L
	- 36 M
	- 80 S
TOTAL	-100 000 M2

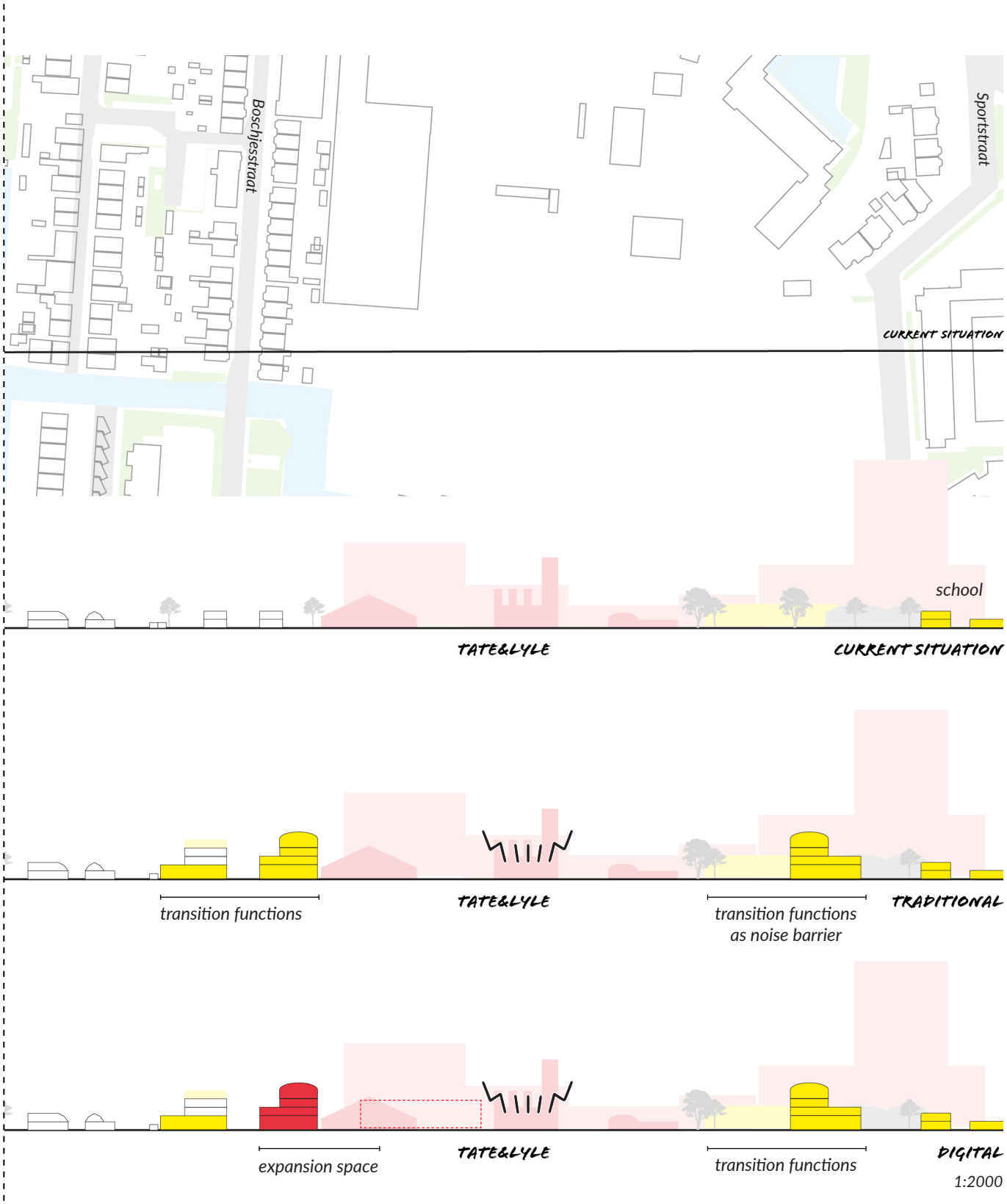


GF	+ 130 000	PHASE 1	+ 1760
FLOORS	+ 80 000	PHASE 2	+ 1675
TOTAL M2	+ 210 000	NEW	+3435
TOTAL ADDED	+ 110 000	TOTAL ADDED	+2745

CROSS SECTION.1 AA -



In the current situation houses are situated directly next to the industries that have increased in size significantly over the years. A better transition is needed. As the area is already quite densely built, this transition need to be created by placing volumes.
These transition functions can be sports facilities, offices or small workshops. In the traditional scenario these spaces can be used for locally oriented small workshops for repair facilities, bike store and repair, manufacturing of furniture, interior design and production etc.

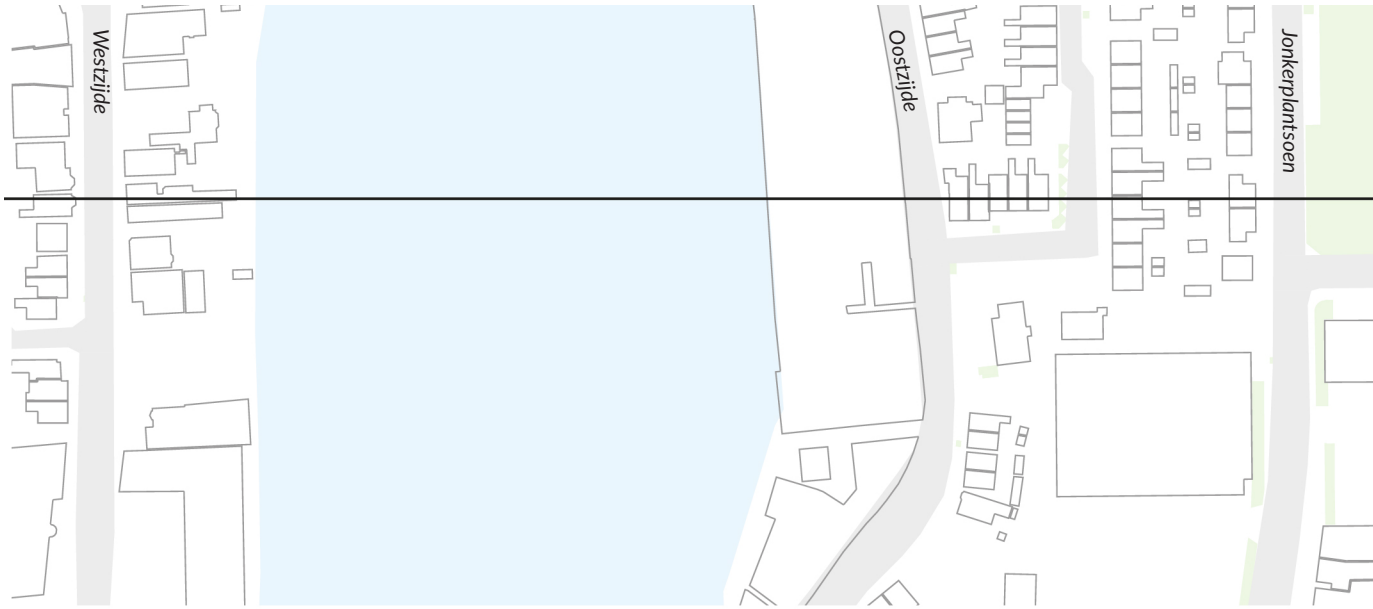


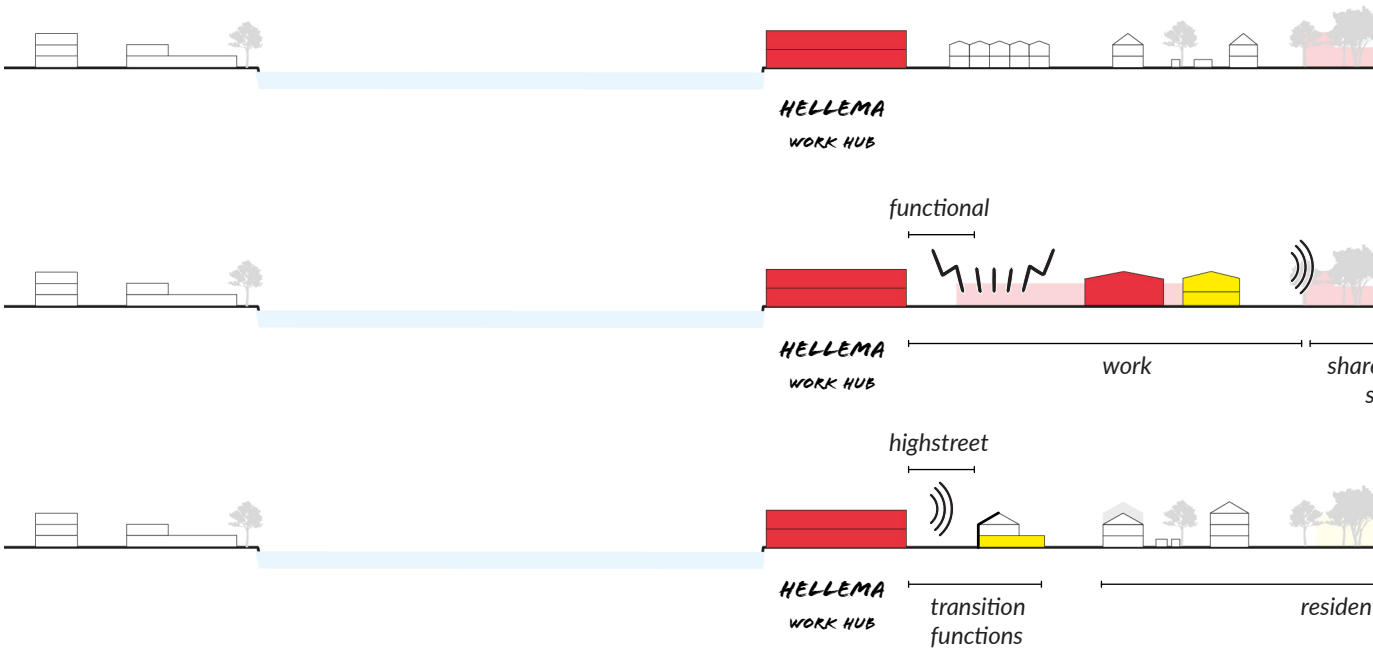
In the digital scenario, these functions can be related to the food industries. Kitchens for catering services, cooking workshops, manufacturing of artisanal food products related to the Zaanstreek etc. The spaces between the industries and busy streets are added to the parcel of the industrial estate as expansion space is needed to allow for digitisation of the industry or making it more sustainable.

Housing that is situated between industries and a busy road is removed. Housing situated on the other side of such a road is built back in higher densities, creating a noise barrier and a noisy side and quiet side of the building.

Next to the Tate&Lyle estate also medium sized spaces are available for businesses. These can be for functions that need more storage or have more logistical needs, and can also have a more regional focus. These spaces are perfectly positioned in the regional network, as it is close to the highway.

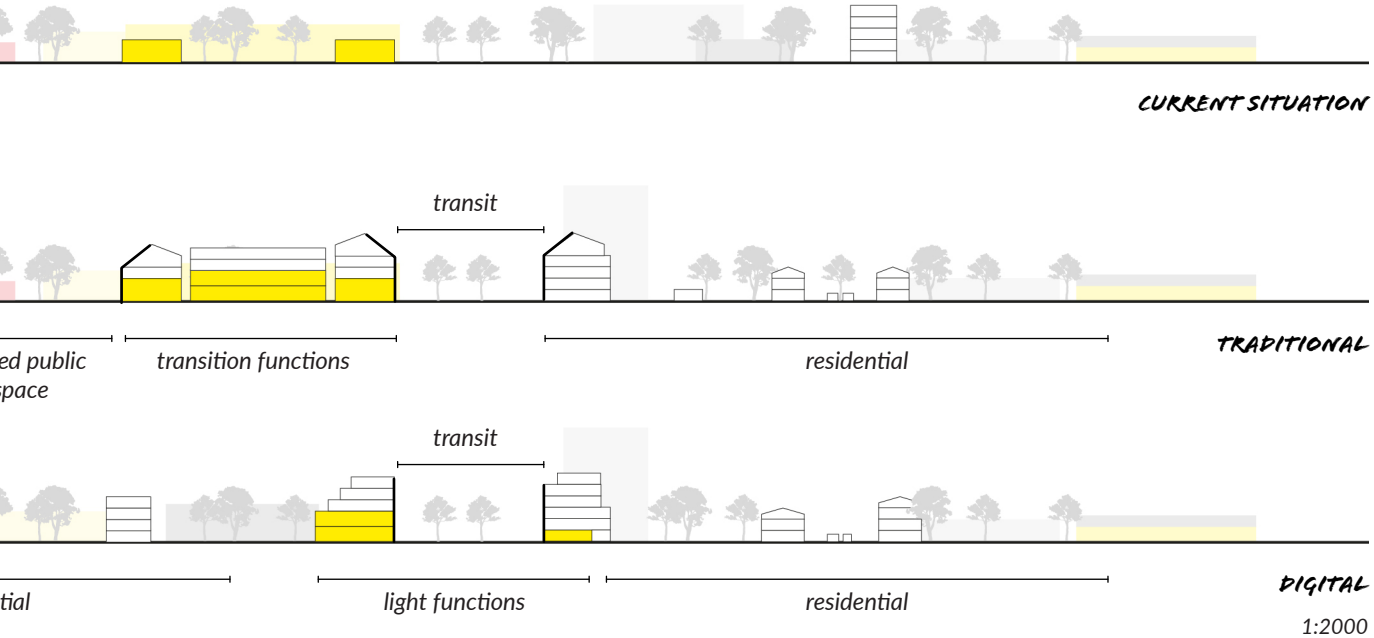
CROSS SECTION.2 BB -





In the current situation houses are situated in the mixed working district. Manufacturers and houses are directly next to each other. The street between the Hellema factory and the houses is very narrow. Moreover, businesses with a lot of logistic activity aer situated along the fast transit street (Doctor H.G. Scholtenstraat). There is a sub street parallel to this street, but this makes the street very busy while it is also an important connection for inhabitants to the rest of the city.

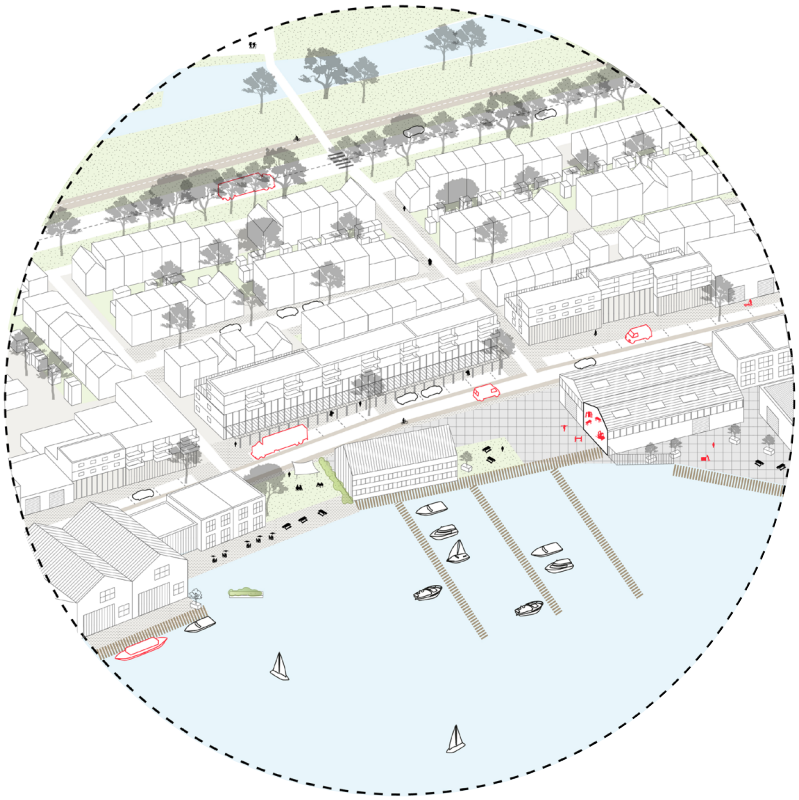




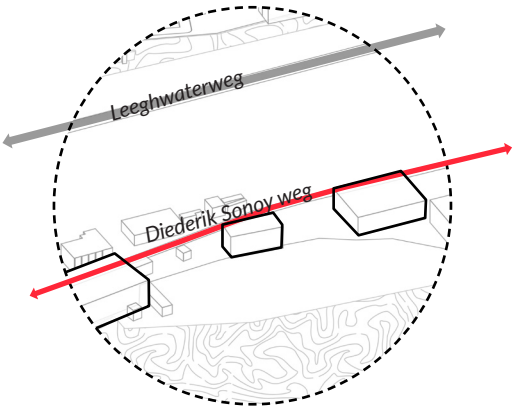
In the traditional scenario, the work character of the neighbourhood remains. Most of the construction industry is situated in the Boerejonkerbuurt, by relocating the larger manufacturing or logistics businesses along the Doctor HG Scholtenstraat better transitions can be created towards the housing district of Kogerveld. The street profile is wide enough to allow for good access to the buildings with spaces for parking and loading. Most of the logistic activity happens within the work neighbourhood along the functional road. This way, separating residential traffic and industrial traffic.

In the digital scenario, the Hellema work hub remains but does not house intensive manufacturing industries. These can be workspaces that do not need a lot of logistics. Oostzijde is reclaimed as a highstreet and some functions are mixed vertically with housing. The Hellema factory is divided into several volumes so residences have views towards the water.

Z.1

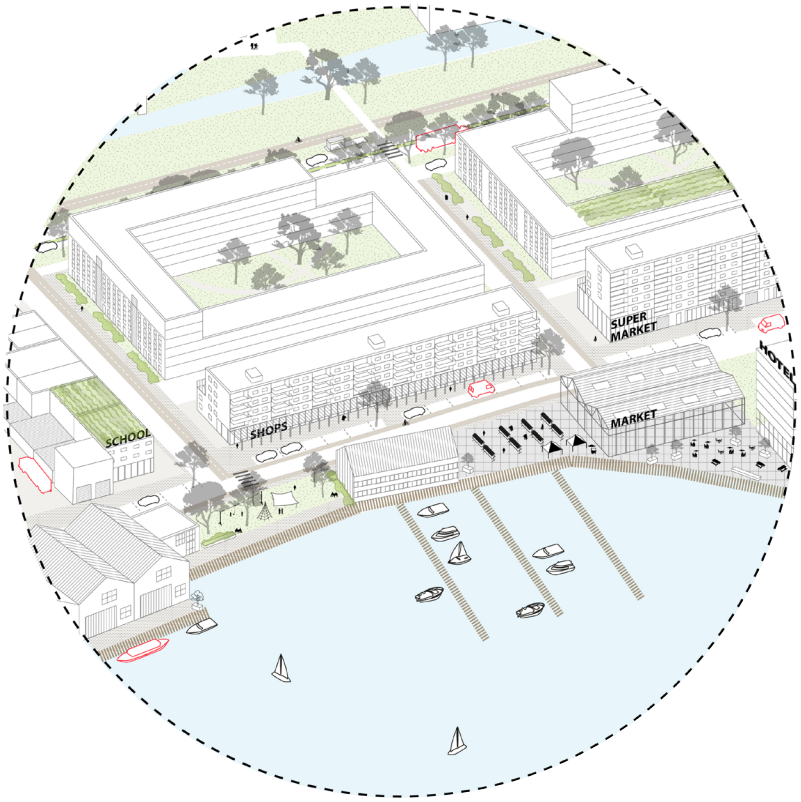


TRADITIONAL



CURRENT SITUATION

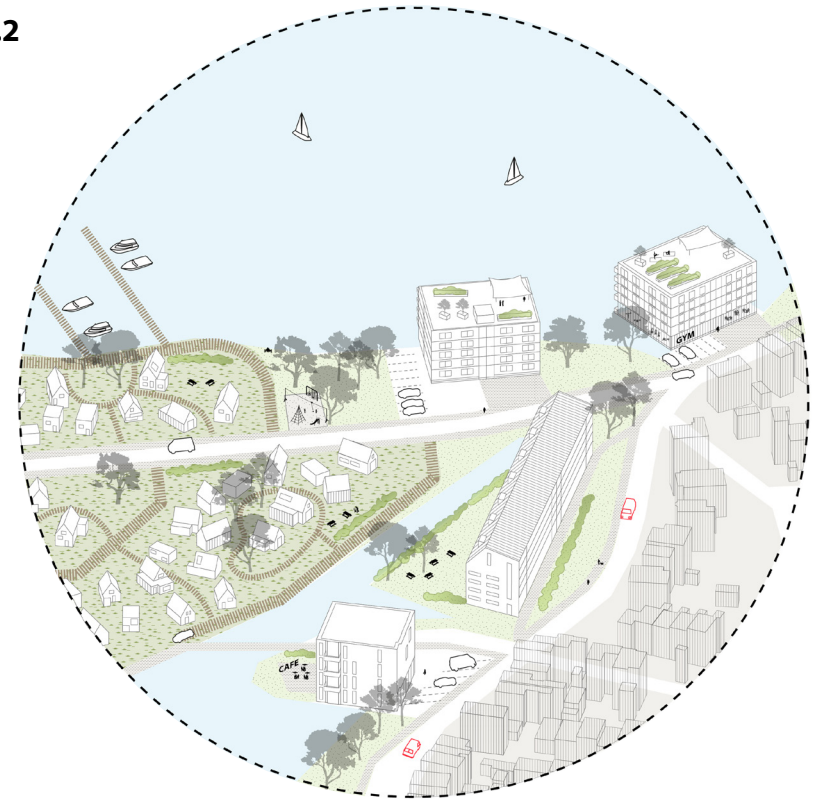
The old storage space is turned into a shared workspace with collective facilities. For example for furniture makers. The Diederik Sonoy is restored as a historic ribbon development and is turned into a highstreet. Creating a connection between the touristic site and the local neighbourhoods. Some trucks drive through the street to access the functions along the highstreet. A parking lane provides temporary loading and unloading spaces. A gallery in front of the plinth provides safe pedestrian lanes. The waterfront is opened up to the public. Trucks of the larger estates take the shortest route to the Leeghwaterweg.



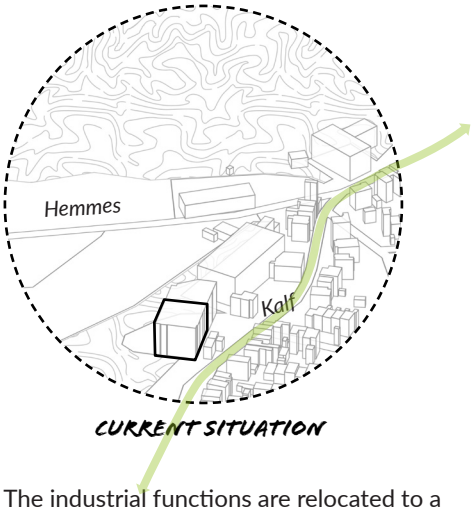
DIGITAL

A route for pedestrians from the Zaanse Schans towards the waterfront is created, with safe crossings over the transit street and functional street with shops and amenities. Eventually reaching the waterfront, large public spaces make room for a street market. The old storage building is transformed into an indoor market. A hotel along the waterfront has views over the Zaan river, its industries and on the top level towards the Zaanse Schans. The roof can also be used as a panorama view point. The water sports club is kept, but their terrain is turned public. The pier towards the boats is closed off to the public.

Z.2



TRADITIONAL



CURRENT SITUATION

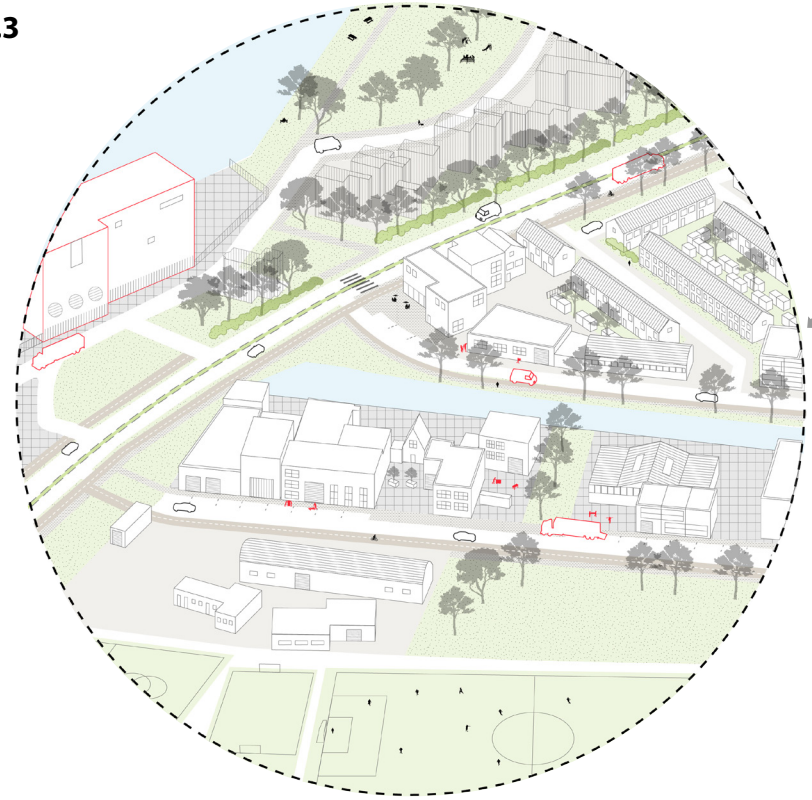
The industrial functions are relocated to a cluster location. Some amenities, offices, a restaurant or cafe, are located in the plinths of the new buildings.
On the Hemmes island plots are available for tiny houses or portable homes in a natural green environment. The homes are placed detached from the soil to allow slow soil remediation. The tiny houses can be in the style of the characteristic 'Zaanse huisjes'.



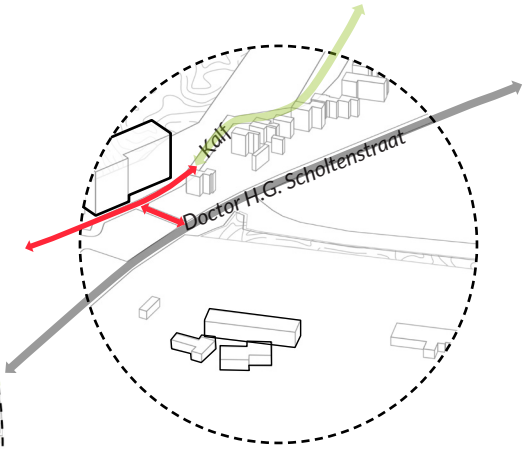
DIGITAL

Interventions are similar to the traditional scenario. The new residential development along the water can be higher, providing apartments with views over the water.
On the Hemmes low-rise residential development. Higher densities are difficult here as it is quite isolated from the main road network.

Z.3

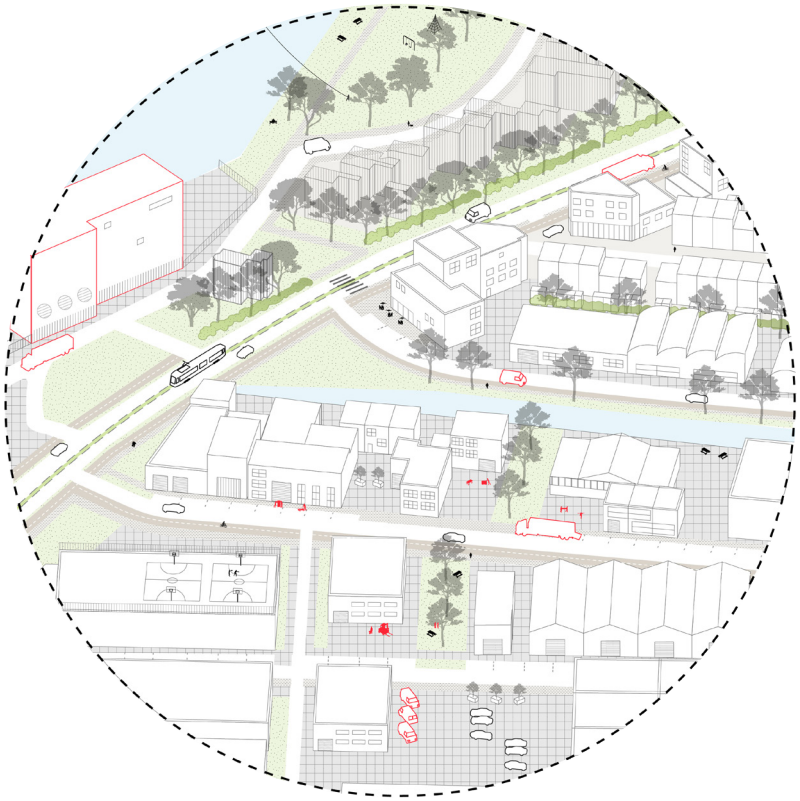


TRADITIONAL



CURRENT SITUATION

The sports fields can be replaced with industrial buildings with the sports fields on top. A mixed working district here can create a hub connected to the Boerenjonkerbuurt. It creates a gradual transition from the industrial estate to the residences. It can have a more green character, while the Boerenjonker buurt is more urban and densely built. The destination street to residential neighbourhood runs parallel to the transit street.

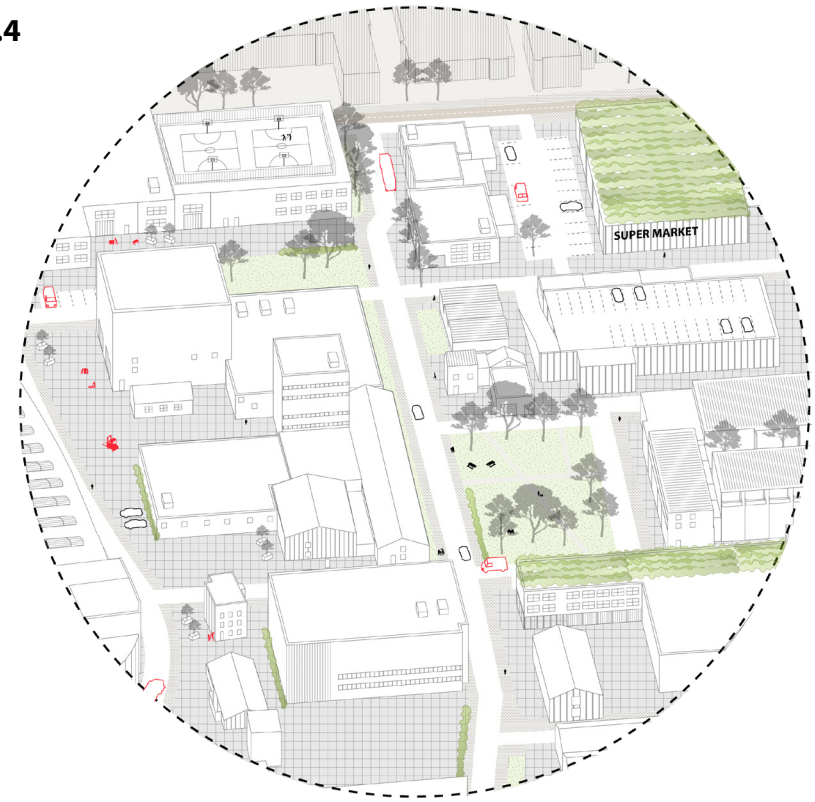


DIGITAL

Transitions are created similar to the traditional scenario. Only along the highway spaces for large sized businesses are made available. The ones with nuisances situate closest to the highway. A new driveway to the highway ensures that the new businesses are easily accessible for logistic activities. A logistics centre can be placed here, where packages are distributed to smaller trucks or busses. Larger premises have enough space surrouding the building. The buildings are built in such a way that the height can be increased when expansion is needed.

A new tram line connects the different neighbourhoods and improves the public transporation options for the residents. As well as good accessibility of the working areas for the workers.

Z.4



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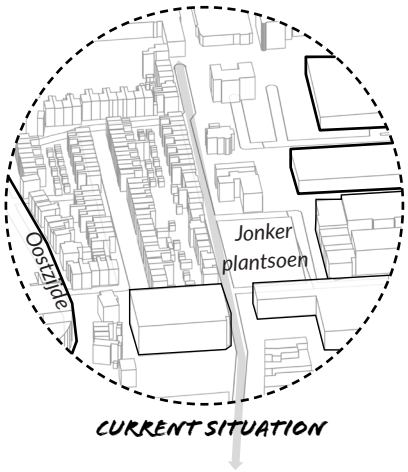


CURRENT SITUATION

The supermarkets are kept on location, however the roofs are innovated with a green roof or parking facility. Large roofs of wharehouses are made available for sports. The houses are removed and replaced with some vertically organised work spaces with enough excess spaces along the functional road. The park provides a qualitative space for the workers, visitors of the supermarkets, the school and the residents on the east side of the neighbourhood.



DIGITAL

Functional spaces are organised along the highway North of the Boerenjonkerbuurt. Where also the functional road allows for trucks to supply the supermarkets. The supermarkets are grouped together and its roofs upgraded to green roofs or urban farms.
New residential development provides qualitative interior spaces, private and collective. The industrial heritage along the Zaan remains in use as workspaces for diverse activities.

View A.



Guisweg



Fast transit

View B.



Stationsstraat



Amenities street

In view A. the old buildings are removed and replaced with new apartments. The alignment of the buildings are pushed back, widening the street. This way it can turn into a proper transit street with enough room to separate the traffic flows. A green strip adds environmental quality and increases the distance to the traffic physically and mentally. The functions on the right side of the view are accessed on the backside for loading and unloading activities.

In view B, the unused green patch on the industrial estate is made available for public use. Creating a green route from the station to the highstreet. On the other side, functions in the plinth situate in the new apartment blocks with temporary loading and unloading in front of it for good access of delivery of goods.

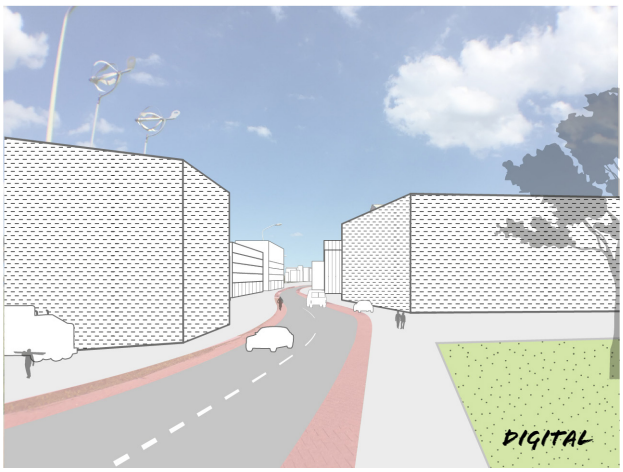
View C.



Diederik Sonoy weg



Highstreet



Functional street

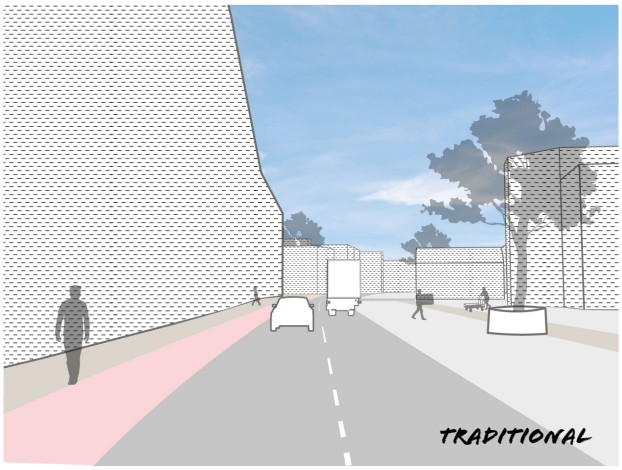
In the traditional scenario smaller and medium sized business premises situate along the highstreet. There is also vertical organisation of functions. Permeability through the blocks and pockets in the blocks allow for excess spaces for work activities.

In the digital scenario, larger premises transition to smaller premises closer to the residences. In each case, the fenced off spaces are opened up to the public and provide a qualitative public space along the waterfront.

View D.



Oostzijde



Functional street



Highstreet

In the traditional scenario the soft edge creates open spaces that facilitate easy loading and unloading and other work activities.

In the digital scenario, the street becomes part of the highstreet and a representative facade and hard edge is created along it. A parking strip allows for some loading and unloading activities.

View E.



Doctor H.G. Scholtenstraat



Fast transit



Fast transit

On the left side, amenities or commercial functions are situated in the plinth. A strip along the main street is added for temporary loading and unloading activities. The larger logistics activities take place on the backsides.

The cycling path is situated on the left so it does not conflict with the traffic going in and out of the neighbourhood on the right, where the supermarkets are situated. Moreover in the traditional scenario, many other businesses.

View f.



Hemmes



Waterfront



Waterfront

In both scenarios, due to its isolated positioning, low-rise residences are realised. Qualitative homes can be realised with private gardens and views over the water.

View G.



Kalf to Duyvis



Waterfront



Waterfront

In each scenario the waterfront is made more accessible to the public. While in the traditional scenario the volumes along the waterfront remain functional. In the digital scenario, apartment towers can be placed along the waterfront. This can even be a hotel, for the tourists of the Zaanse Schans. The new height accents complement the landmarks along the waterfront.



source: Port of Amsterdam. (2013). Het Noordzeekanaalgebied in 2040 [image]. Retrieved from: https://www.portofamsterdam.com/nl/nieuwsbericht/het-noordzeekanaalgebied-20

13.4 ACHTERSLUISPOLDER

The following pages show the spatial implications of the street types and related patterns in Achtersluispolder. As this is a transformation location, relocation of businesses and determining which areas are suitable for housing are the main issues. How are transitions between industries and residences realised. The resulting interventions of each scenario are compared to each other. First, the relocation potential of businesses is determined. Second, the transition of volumes and spaces are shown on a district scale level. The zoomins show the potential architectural quality, environmental quality and the mix of uses and activities on building and block level. In the text, the area is referred to as 'AH' (Achtersluispolder and Hembrug).



Noord Zee Kanaal, the Netherlands

AH.1 TRADITIONAL

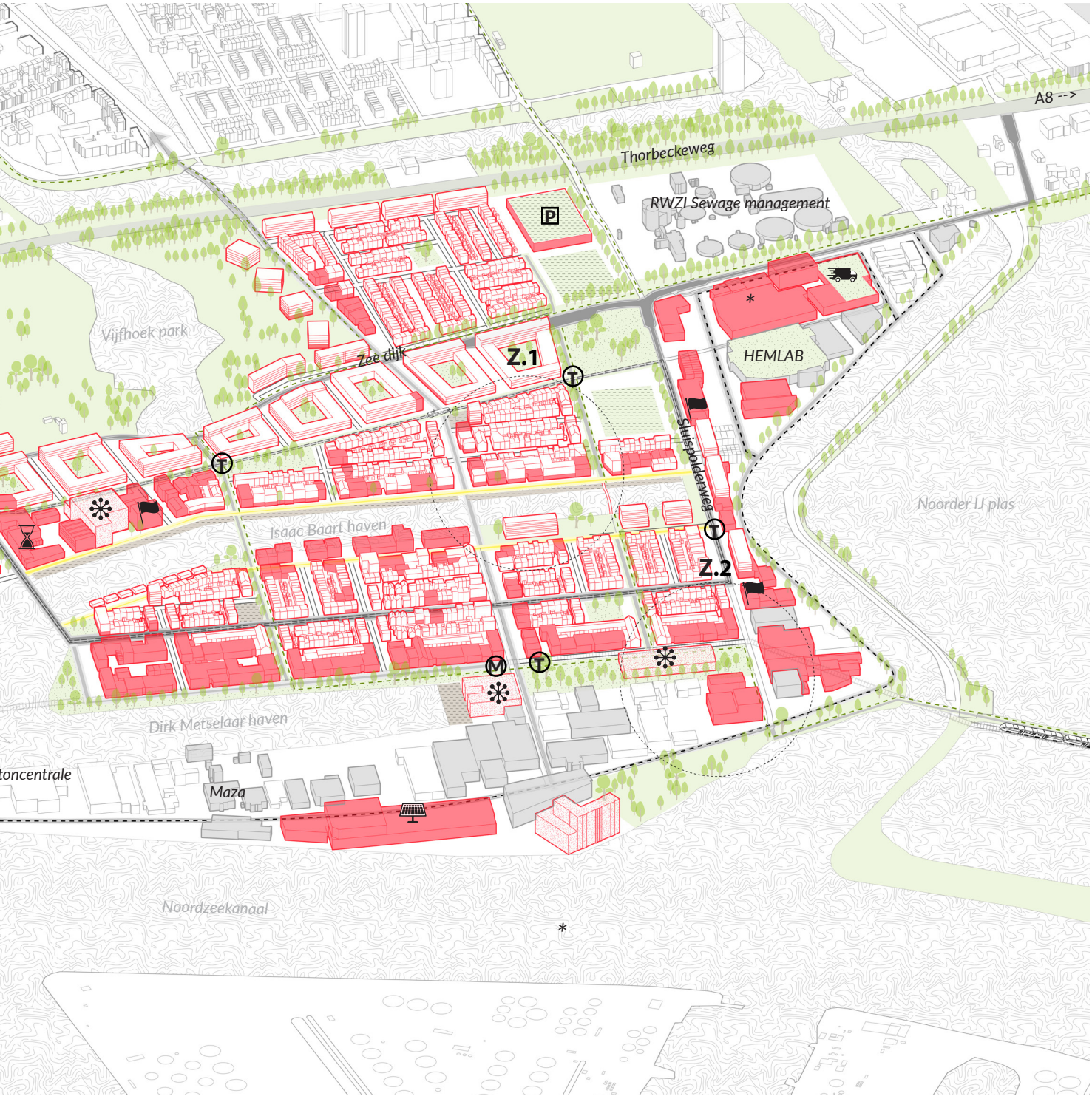


Along the Zuiddijk several construction related industries are situated, for this reason it is chosen to cluster businesses on this location. A connection is made through the business district to the Wibautstraat. The mixable businesses relocate to more informal environments and make room for businesses that do not prefer an informal environment and need high accessibility. Some of the logistics businesses are relocated to and clustered with other logistics and storage centres around the sewage management facility. Many of the businesses there are relatively mixable and can relocate closer to residential areas or mix on block level. Small and medium sized working spaces with mixable functions, such as workshops, repair, garages, storage spaces, indoor sports, are organised at the borders to residential areas. Especially along the Dirk Metselaar haven, these work spaces situate between the residences and the nuisance contours of the manufacturers along the Noordzeekanaal. Therefore, the volumes directly along the water cannot be residential. However the waterfront can be made public with a park as an additional nuisance barrier.

The sports fields are reorganised to act as a transition space between residential and business activities. Along the green corridors, pocket spaces, small parks and sports fields in the different neighbourhoods are linked to the larger green structures in the area. The new tram line passes through the green corridors.

Higher densities are created along the Zeedijk, where the functions can mainly be residential. A highstreet is developed along the waterfront of the Isaac Baart haven. A pedestrian route runs along the harbour on the water. Along this highstreet, uses can be mixed horizontally and vertically. Creating both commercial activities and amenities for the neighbourhoods as well as apartments with qualitative views to the waterfront. Some apartment blocks or towers can also situate along the waterfront, maximising the available open spaces along the water. At some places a pier is created for pleasure boats to harbour. On one side, the street is located along the water front. On the other side it is not. This way workspaces and living spaces along the waterfront are made possible.

* Relocated businesses



Legend

- added work spaces
- added residences
- building transformation
- industries to keep
- highstreet
- transit street
- truck routes
- recreational routes
- metro station
- tram station
- parking building
- logistic centre
- collective workspaces
- temporary spaces
- flagship store
- productive roof
- soil remediation
- market place
- new landmark

AH.2 DIGITAL



As the food industries cluster along the Noordzee-kanaal and the Dirk Metselaar haven these areas are kept as business districts. Along the canal, the high environmental categories cluster. Gradually, more north of the district, it transitions to businesses without a lot of nuisances.

Again the logistics and wholesale businesses are clustered around the sewage management facility as these areas are very accessible and not suitable for residences. The roofs are used for additional sports facilities. These spaces are connected to the other neighbourhoods by a green corridor moving centrally through the district. One vertically, creating a soft transition between the live work environment and the business district with a shared park. One horizontally, running parallel to the Zeedijk connecting the pockets spaces in the neighbourhoods.

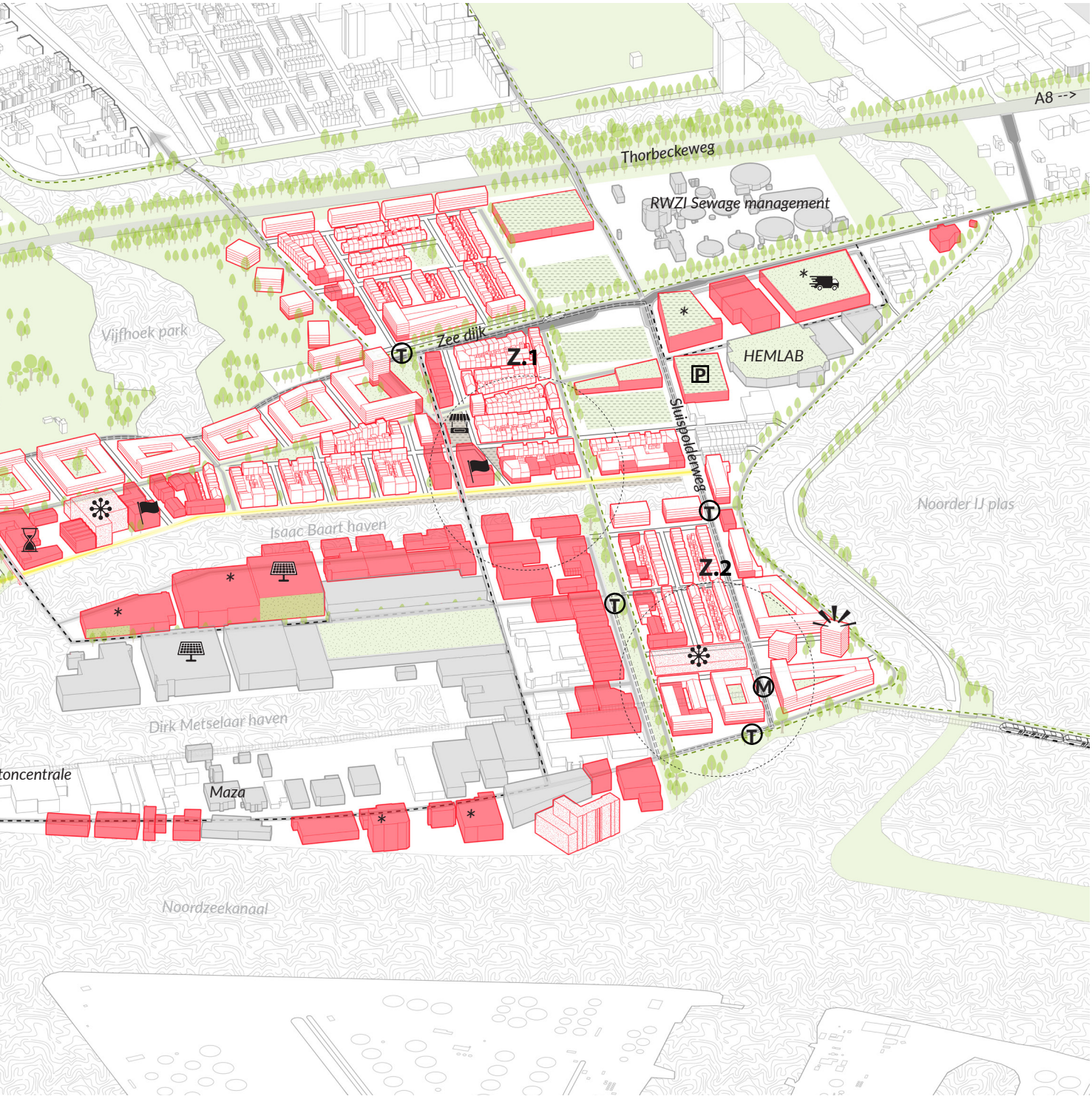
A recreational route is created along the Noorder IJ plas that connects Amsterdam and Zaandam for cyclist.

Along the borders of the businesses areas transitions are created with mixed blocks, of residences and small and medium sized premises creating closed blocks with qualitative interior spaces.

The highstreet is extended from the city centre towards Achtersluispolder. Along the Zuiddijk some commercial functions, amenities and workshops can locate. It continues along the waterfront on the North side of the Isaac Baart haven. It is uninterrupted by the lifted functional streets, that connect the business area directly to the main road network. Here, also medium sized businesses cluster wrap around the functional streets in the residential neighbourhoods.

Densities are created around new transportation nodes. In this scenario the tramline runs from the Wibautstraat to the Zeedijk, turns to the Sluispolder weg to the new metro stop that connects Amsterdam with Zaandam. Along these stops, higher densities are developed with some towers.

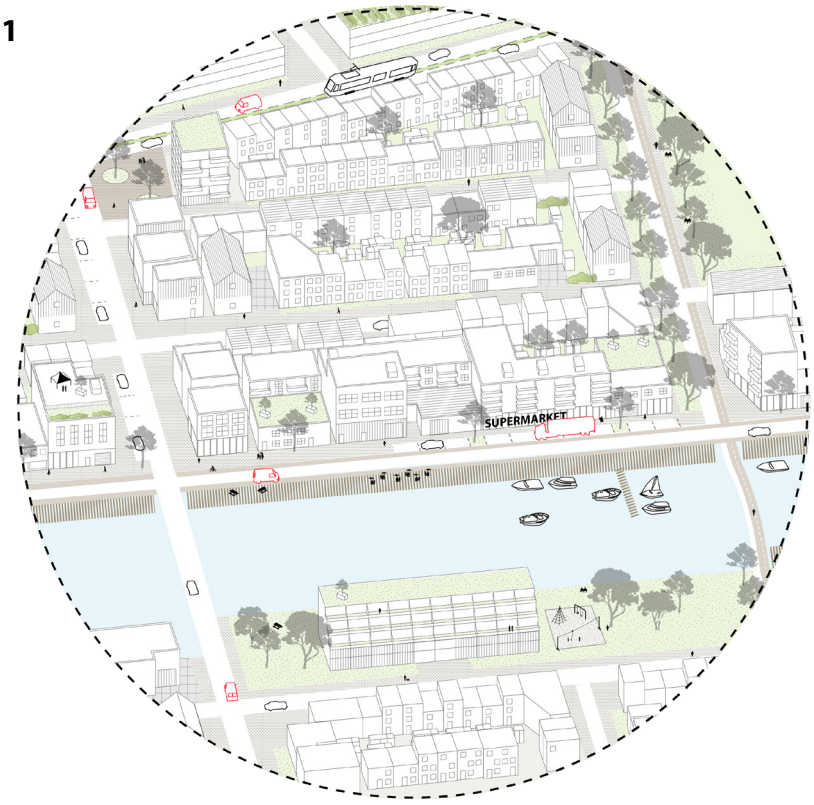
* Relocated businesses



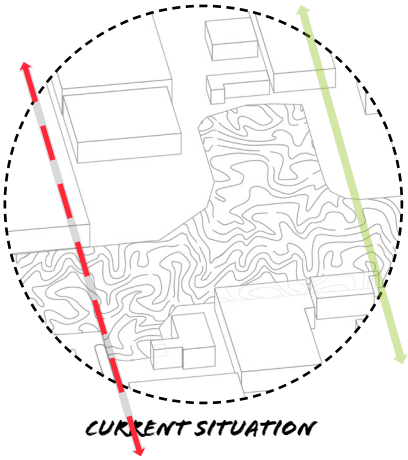
Legend

- added work spaces
- added residences
- building transformation
- industries to keep
- highstreet
- transit street
- truck routes
- recreational routes
- metro station
- tram station
- parking building
- logistic centre
- collective workspaces
- temporary spaces
- flagship store
- productive roof
- soil remediation
- market place
- new landmark

Z.1



TRADITIONAL



CURRENT SITUATION

Additional bridges over the canal improve the permeability of the neighbourhood. Along the waterfront, terraces of restaurants or cafés can locate on the pier. Functions are mixed vertically with apartments on top along the highstreet that have views over the canal. A small harbour can be made for pleasure boats. Terraced apartments along the water provide qualitative private spaces as well as nice views.

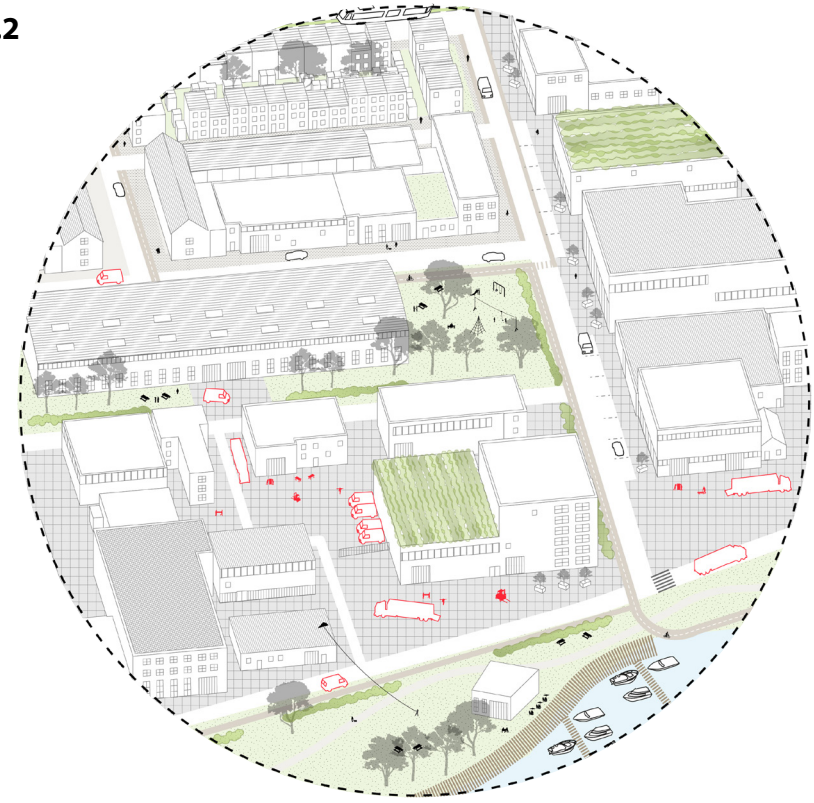


DIGITAL

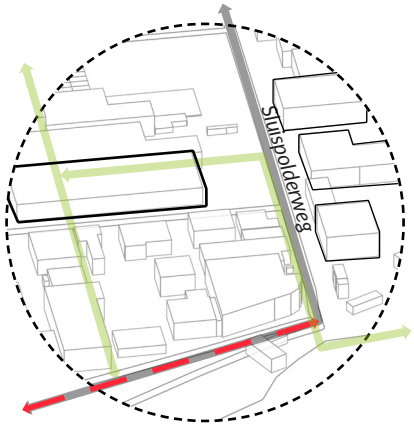
A lifted street separates the logistic traffic from the residential flows in the highstreet. This way the businesses are connected directly to the main road network, without difficult crossings. Along the lifted street, small and medium sized work spaces are organised. Wrapping the lifted street. But also creating the potential for access by trucks to the second floor.

The highstreet continues underneath. The other bridge connects the neighbourhoods together with the different public spaces along it. There are also work spaces available along the waterfront.

Z.2

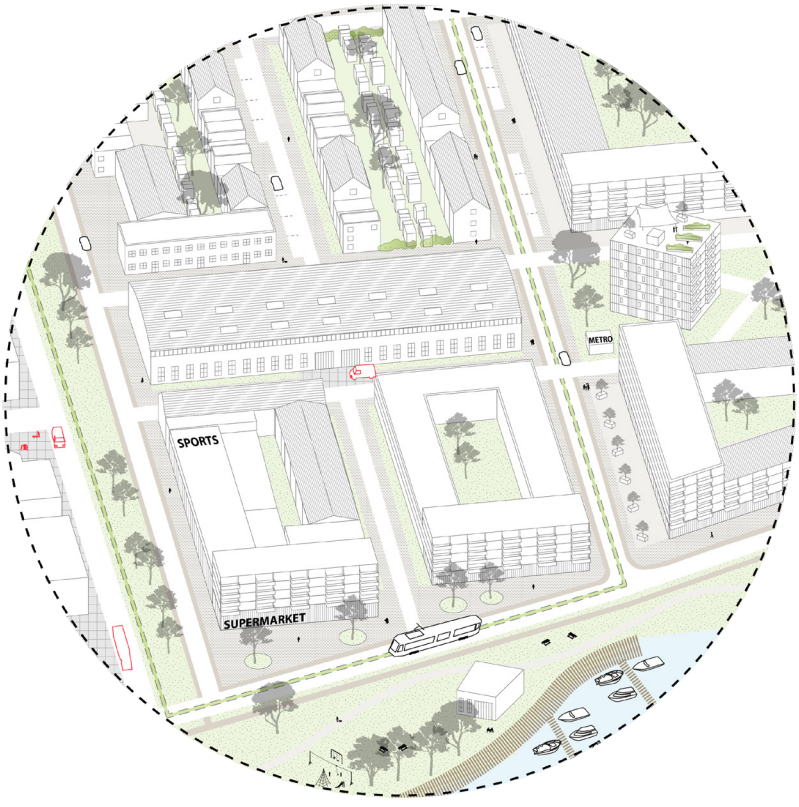


TRADITIONAL



CURRENT SITUATION

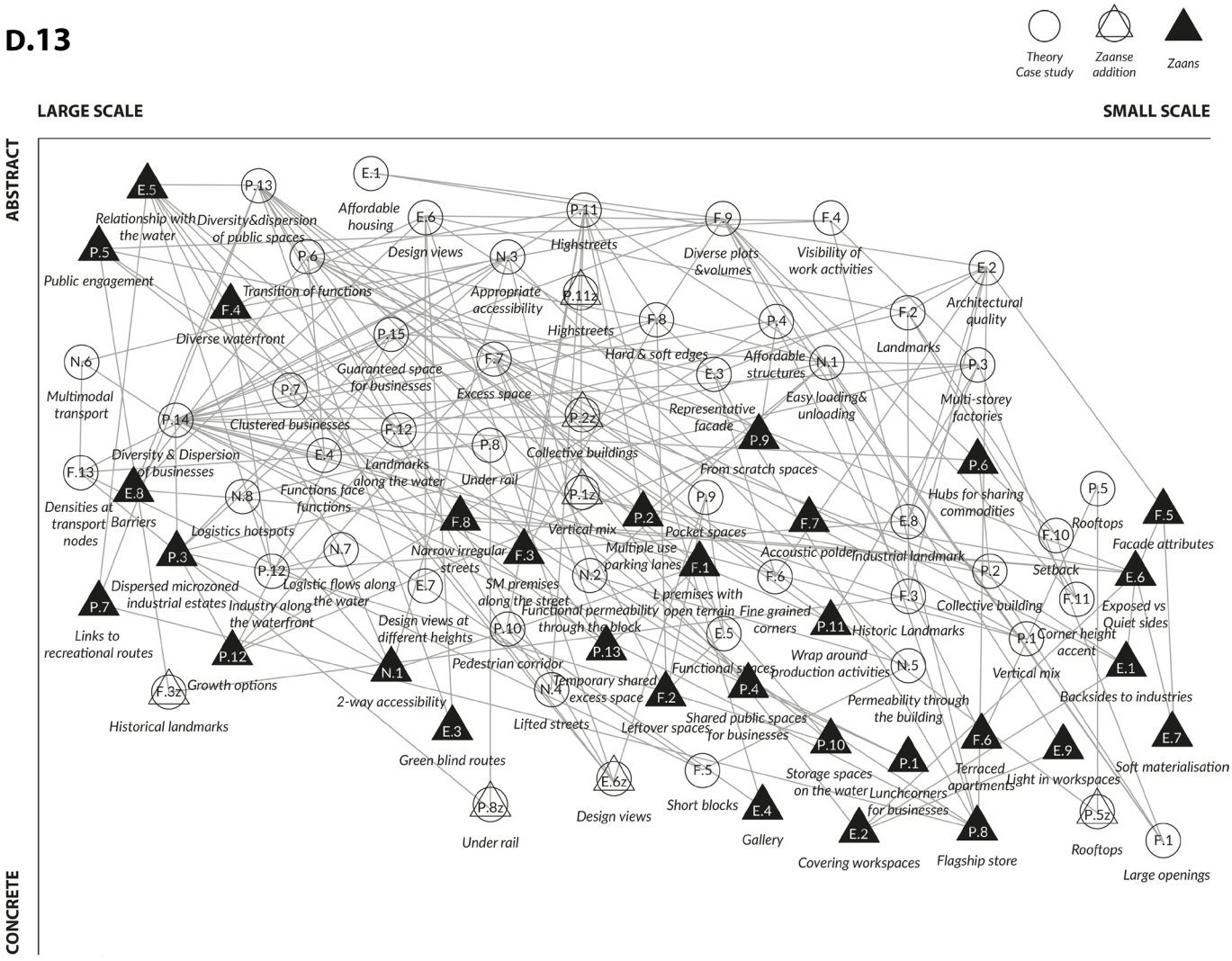
Part of the industrial structure can be transformed into an affordable workspace or collective work space for businesses. It is situated along the green corridor, the building is surrounded by a park. The transformed structure is used as a transition volume between the residential and industrial environments. On the business district side large openings allow loading activities. The cycling route is directed from the green corridor around the building towards the Noorder IJ plas. Small and medium sized businesses have a representative front along the Sluispolderweg, while the backside provides access for loading activities.



DIGITAL

Around the new metro station higher densities are created. A transition is created from residential (right) to more industrial (left). The blocks near the residences along the green corridor integrate small and medium sized businesses, with light activities. The other side of the green corridor is more functional but a hard edge is created along the park towards the residences, with some excess spaces for work activities. But the activities with nuisances are situated on the backside of these buildings together with the logistical access. The former closed off marina is opened up to the public with a park. A recreational route runs along the waterfront.

D.13


Theory
Case study
Zaanse addition
Zaans
LARGE SCALE
SMALL SCALE
ABSTRACT
CONCRETE
E.5
P.13
E.1
Relationship with the water
Diversity&dispersion of public spaces
Affordable housing
E.6
P.11
F.9
F.4
P.5
P.6
Design views
N.3
Highstreets
Diverse plots &volumes
Visibility of work activities
E.2
Public engagement
F.4
Transition of functions
Appropriate accessibility
P.11z
F.8
P.4
F.2
Architectural quality
Diverse waterfront
P.15
Highstreets
Landmarks
N.6
F.7
Hard & soft edges
Affordable structures
N.1
P.3
Guaranteed space for businesses
E.3
Multimodal transport
P.7
Excess space
Easy loading& unloading
Multi-storey factories
P.14
Clustered businesses
F.12
P.2z
Representative facade
P.9
Diversity & Dispersion of businesses
E.4
P.8
Collective buildings
P.6
F.13
Landmarks along the water
Under rail
From scratch spaces
E.8
N.8
Functions face functions
P.1z
P.9
Hubs for sharing commodities
P.5
Densities at transport nodes
Barriers
F.8
P.2
F.7
E.8
F.5
Logistics hotspots
Vertical mix
Pocket spaces
Rooftops
F.10
Facade attributes
P.3
N.7
Narrow irregular streets
F.3
Multiple use parking lanes
F.1
Accoustic polder
Industrial landmark
P.2
Setback
E.6
P.12
Logistic flows along the water
E.7
SM premises along the street
N.2
F.6
F.3
F.11
Dispersed microzoned industrial estates
P.7
Industry along the waterfront
Functional permeability through the block
L premises with open terrain
Fine grained corners
P.11
Collective building
Exposed vs Quiet sides
Design views at different heights
P.10
E.5
Historic Landmarks
P.1
Corner height accent
Links to recreational routes
P.12
P.13
Wrap around production activities
N.5
E.1
N.1
Pedestrian corridor
Functional spaces
Vertical mix
F.3z
Growth options
N.4
Temporary shared excess space
F.2
P.4
Backsides to industries
2-way accessibility
Permeability through the building
Historical landmarks
E.3
Lifted streets
Leftover spaces
Shared public spaces for businesses
E.7
P.10
F.6
E.9
Green blind routes
F.5
P.1
Soft materialisation
E.6z
Storage spaces on the water
Terraced apartments
Light in workspaces
P.8z
Short blocks
Lunchcorners for businesses
P.5z
Design views
E.4
Rooftops
P.1
Under rail
Gallery
E.2
P.8
Large openings
Covering workspaces
Flagship store

13.5 PATTERNFIELD

Based on the design research the interrelation is between the patterns is determined and which ones form the backbone of the design. The relations between the patterns are shown in D.13.

During the design process, guaranteed spaces for businesses (P.15), appropriate accessibility (N.3) and transition of functions (P.6) were prioritised. Based on the many relations found between other patterns and diverse plots & volumes (F.9), diversity& dispersion of businesses (P.14) and public spaces (P.13) and the developed designs, it can be concluded that these also form the foundation of the design. In relation to appropriate accessibility, the highstreet (P.11) and easy loading & unloading (N.1) are key.
More specifically for Zaanstad, the relationship with the water (ZE.5) appeared to be fundamental as well.

In relation to the street types, groups of patterns have emerged. Each street type is connected to a group of patterns that are linked to each other. The street types also excludes other patterns that conflict with it.

V

PART V EVALUATION CONCLUSION REFLECTION

14.1 Live Work Transitions	*Design Evaluation.*
14.2 Adaptive Capacity	*Design Evaluation.*
14.3 Planning Strategies	*Evaluating the method of using Patterns to steer Urban Design.*

15. Conclusion & Reflection

14. DESIGN EVALUATION

In the following chapter the proposed designs for the two scenarios area evaluated. The transition of functions in each scenario, as well as the adaptive capacity of the design interventions have been assessed. This section also considers the use of patterns as a potential spatial planning tool. The application of patterns for the development of a framework, a spatial planning tool.

The following sub questions from Chapter 3. Methodology are discussed:

SQ How can urban design patterns be used to mediate conflicts between industry and other functions, in particular housing?

SQ To what extent can industry be integrated in the city with regard to liveability? What are the spatial limits?

SQ What is the adaptive capacity of the proposed design?

SQ What criteria should guide contemporary compact and mixed-use spatial development and transformation?

14.1 LIVE WORK TRANSITIONS

SQ How can urban design patterns be used to mediate conflicts between industry and other functions?

Based on a qualitative assessment of the design on location (D.14, D.15 p 230), it is determined whether the qualities found important by residents and businesses improve compared to the existing location. The following conclusions have been drawn.

Public space

Between the work focussed part of the neighbourhoods and the residential part of the neighbourhood diverse public spaces and types of greenery can provide for qualitative spaces for both environments. At the same time, it can function as a soft nuisance barrier between the two neighbourhoods.

Clustering

Clustering small to medium scale informal work activities near manufacturing industries in an urban environment can increase the amount of commercial activities and amenities available to the neighbourhood. Moreover, these cluster can act as transition volumes between larger industries and residential activity.

Noise

The gradual transition of functions, volumes and spaces according to *rust*, *reuring & ruis* (peaceful, lively, noisy) create diverse environments. An important aspect is that especially in lively and noisy neighbourhoods residential development should be oriented in such a way that limits the potential nuisance sources to one side of the building.

There are also a lot of architectural as well as spatial organisation solutions to mediate noise nuisances on the exposed side. Consequently, noise does not necessarily have to be the main issue of integrating industries in cities.

Expansion options

For businesses located along functional roads options are available. The soft edges mean not all of the plot is built completely and allow some flexibility. Cluster areas around large manufacturing estates that cannot relocate, ensure spaces for businesses as these are undesirable locations for residences.

Along highstreets and transit streets more investment is needed in the premises to create a representative facade. Expansion options can be made available vertically instead of horizontally. This should be stimulated especially along these types of streets.

Accessibility

Firms that have a lot of logistical activities need to be connected directly to the main road network to minimise traffic through neighbourhoods. The main road network should allow for truck traffic with its wide street profiles and separated cycling lanes and destination traffic lanes.

At least a two way option to the main road network is needed to prevent heavy traffic from moving through the neighbourhood.

Clear road signs from the highway to the relevant industries are needed to avoid lost drivers driving through neighbourhoods.

Transformation of a business site can lay the foundation for developing public transportation options such as tramlines or metro stops. This way improving the multimodal options for the kept business areas.

Relocation

Shipyards in transformation locations are likely to prefer relocation as they do not benefit from an urban environment. These structures can used as collective work spaces or provide affordable spaces for businesses.

Businesses in wholesale, logistics or with large storages are suitable for relocation. Preferably these should cluster together in an accessible location. The large roofs of these spaces should be used productively or combined with other uses such as parking or sports fields.

Some companies that are situated on fragmented locations can be stimulated to relocate and situate more efficiently on one site. In this way open up space to create better transitions and develop more efficient and compact environments.

SQ To what extent can industry be integrated in the city with regard to liveability? What are the spatial limits?

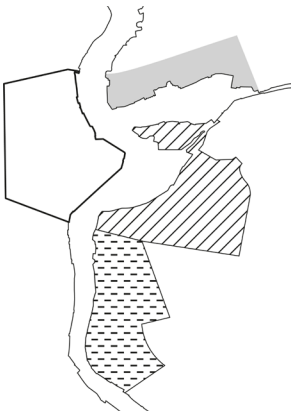
Interventions facilitating reorganisation and development of more gradual transitions between intensive work environments and residential environments can create more qualitative live and work environments on the whole.
In the existing urban fabric it is more difficult to develop gradual transitions, noise nuisances are inevitable.
Reorientation of housing can improve it to a certain extent.
As there are no existing residences next to heavy industries in transformation locations, it is possible to create more gradual transitions.

In inner-city locations expansion options are limited for large scale industries. Some estates still have some excess space left to expand. For transformation locations it is important that enough excess space is left surrounding the premises to allow for future expansion. These excess spaces can be used for temporary uses by other companies or residents under certain terms.
For water related industries it may be an option to expand along multiple parcels along the waterfront. As is done by cacao industry along the Zaan.

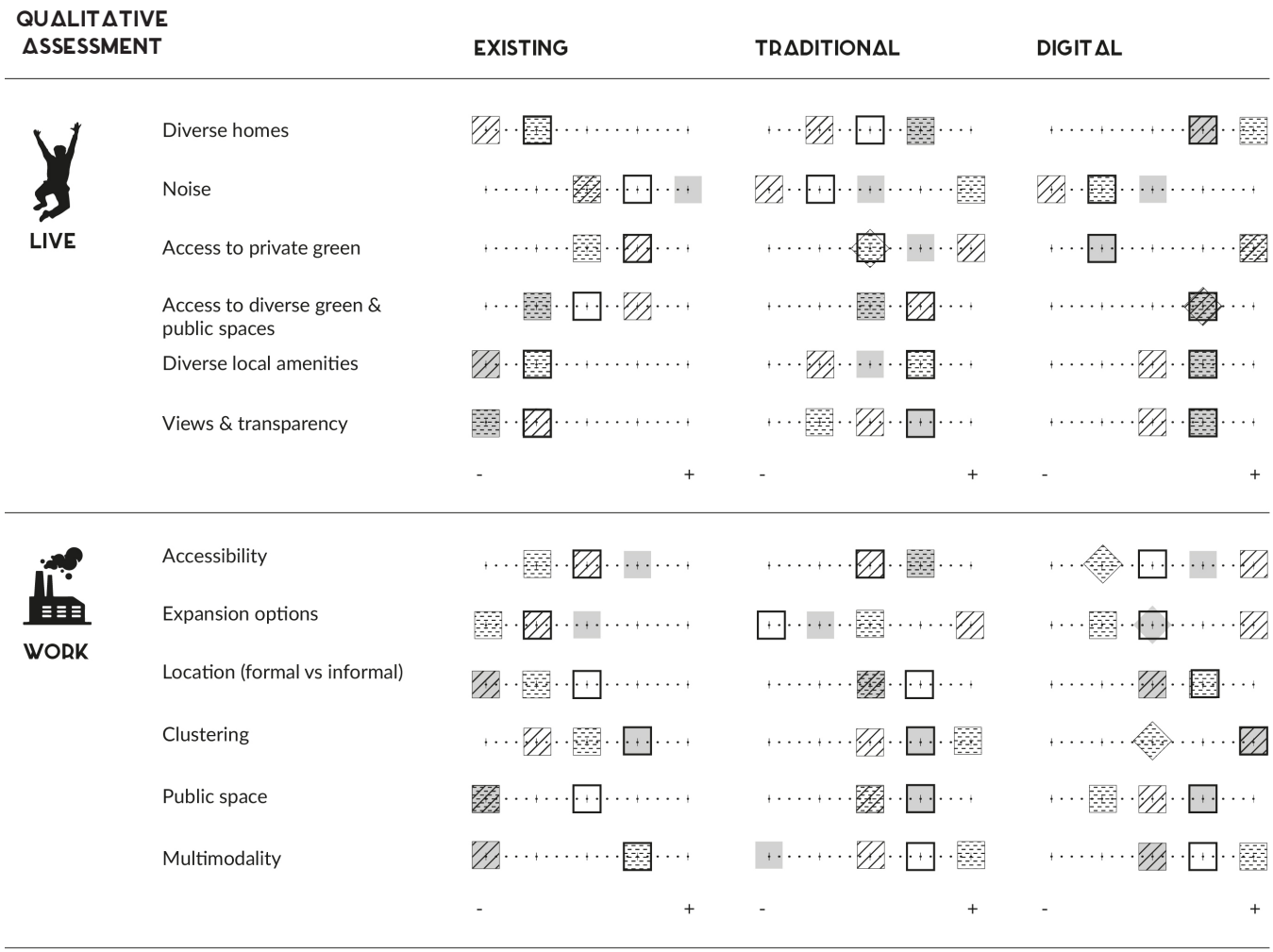
The transformation of a business district can create more attractive environments for the businesses, more informal work environment with amenities and public spaces nearby. However, still some businesses would like it nearby but do not want to situate directly next to residences. For these businesses it is still important to zone certain areas exclusively for businesses. These areas can be along nuisance sources such as the highway or train tracks or at the borders of large manufacturers.

The waterfront needs more spaces that are accessible by the public. Clustering large scale water dependent industries closely prevents this, more dispersion would be desirable.

Respective densities can be achieved if businesses are willing to enable vertical organisation of work activities. This should be stimulated especially in areas where they also profit from the environmental qualities.

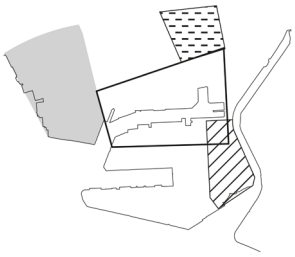


D.14 OK

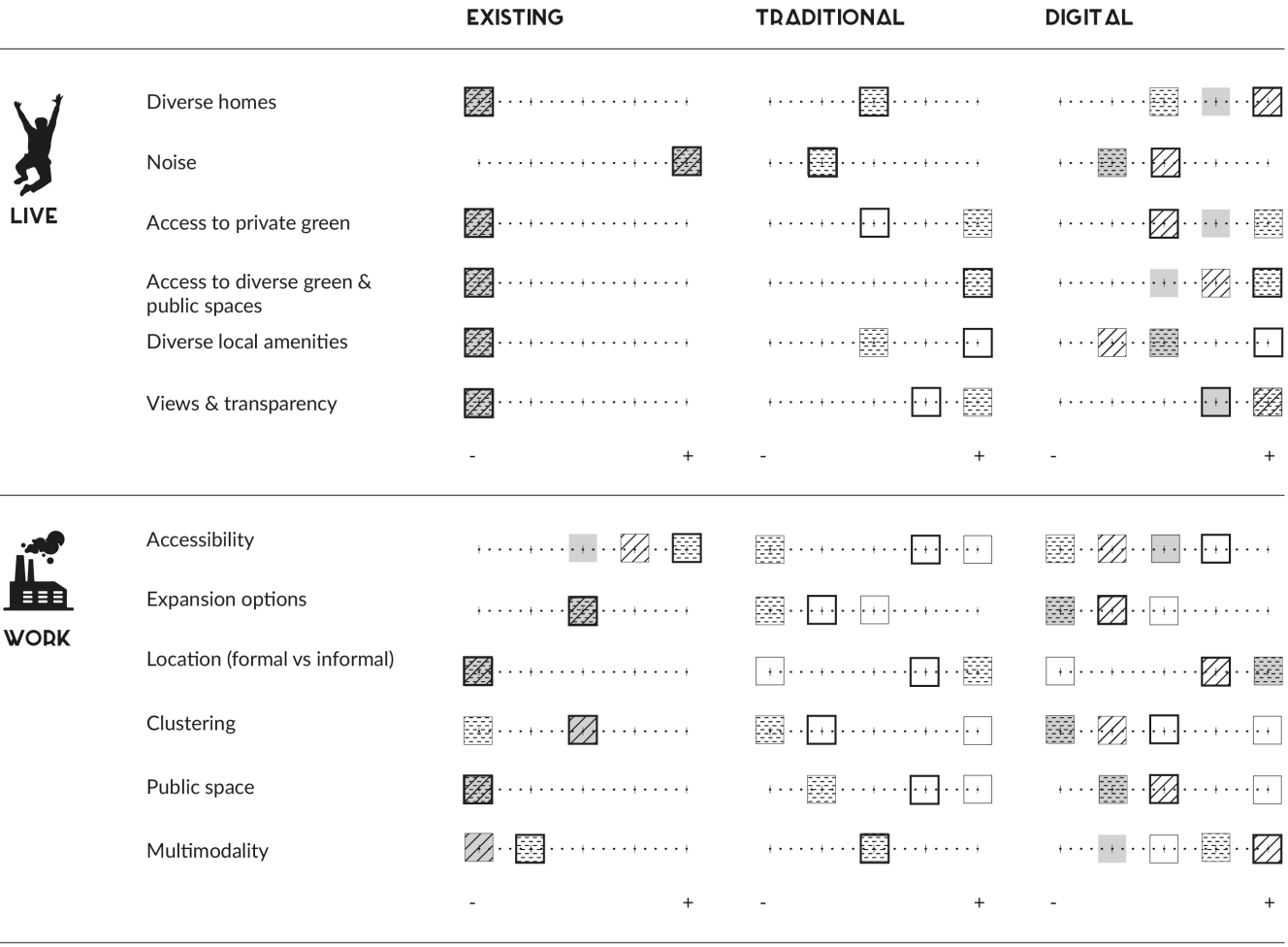


The qualitative assessment framework presents spatial qualities that residents find important and qualities of importance for current and future industries. These were determined by the previous chapters of analysis and interviews.
The different hatches represent the 4 different live-work neighbourhoods created in the two scenarios. The two scenarios are assessed in relation to the evaluation of each quality in the existing situation.

The aim of the design is for the different neighbourhoods together to cover the right half of the spectrum -/+ with the exception of noise for the live qualities. For the work environments it may cover the full spectrum. This means the area provides diverse work environments, with the characteristics of a more formal district or an informal one.



D.15 AH


EXISTING
TRADITIONAL
DIGITAL
LIVE
Diverse homes
Noise
Access to private green
Access to diverse green & public spaces
Diverse local amenities
Views & transparency
- +
WORK
Accessibility
Expansion options
Location (formal vs informal)
Clustering
Public space
Multimodality
Isaac Baarthaven
Zuiddijk
Vijfhoekpark
Noorder IJ
remaining areas

An elaborate description of the outcome summarised in the qualitative assessment framework D.15 for the location Koog aan de Zaan is shown here.

Traditional Scenario

LIVE

Diverse homes:

In total the neighbourhoods provide more diverse types of housing.

- Apartments are added near train stations, currently mainly exists of row housing.
- Some low rise towers are added with views over the water.
- Tiny houses location in combination with soil remediation.
- Addition of village blocks, low rise with private gardens.
- Housing options near natural reserves.
- Housing options near sports facilities.
- Housing options mixed with small to medium scale work activities.

Noise:

- Functions are not directly placed in between industry and busy streets anymore.
- Limited amount of housing directly next to the highway or train track.
- Transition volumes with functions are situated between heavy industries and residential development.
- Creation of closed blocks.

Accessibility to private green:

- In some areas it decreases as row housing is replaced by apartment buildings, only a balcony.
- In total a lot more housing with private gardens.

Accessibility to green public spaces:

- Collective green spaces are provided with the apartment buildings.
- Improved connections between public spaces and greenery.

Diverse amenities:

- Increase of spaces for amenities, services and commercial activities in all neighbourhoods.

Views:

- More homes and apartments are oriented towards the park or water.
- Large facades of industries are made green, particularly ones along the Zaan river.
- Parks along the river are linked to the river and not interrupted by streets.

WORK

Accessibility:

- In certain places it stays the same, as accessibility is already sufficient.
- In BJ-Kogerveld it is improved as it becomes a cluster for work activities.

Expansion options:

- For the existing larger food industries expansion options are limited.
- Some areas expansion options are decreased.
- Expansion options are created in the BJ-Kogerveld area where businesses may cluster.

Location:

- An increase of informal work environments, that act as transition functions between large industries and housing, complement the amenities and transit street.
- Existing large industries remain relatively formal.

Clustering:

- Clustering of food industries along the Zaan stays the same, however there are no expansion options or spaces for new related activities.
- Clustering of construction industries cluster mainly in BJ-Kogerveld

Public space:

- Interventions in street design improve loading and unloading spaces and safe cycling options
- Important streets for logistics are improved.

Multi-modality:

- Stays the same, is already very good for the BJ-Kogerveld cluster.
- The waterfront in BJ-Kogerveld can potentially be used for water transportation of goods.

Digital Scenario

LIVE

Diverse homes:
In total Koog aan de Zaan will provide a lot more diverse housing stock.

- Several towers are added with views over the water.
- Closed blocks with apartments as well as larger homes.
- Terraced housing.
- Compact low rise blocks, with single families homes mixed with small apartments blocks.
- Addition of village blocks, low rise with private gardens.
- Housing options with public transportation accessibility.
- Housing options near natural reserves.
- Housing options combined with sports facilities.
- Housing options mixed with small to medium scale work activities.

Noise:

- Functions are not directly placed in between industry and busy streets anymore.
- Limited amount of housing directly next to the highway or train track.
- Transition volumes with functions are situated between heavy industries and residential development.
- Creation of closed blocks.
- Parts of the closed block are built higher on the side of the noise source.

Accessibility to private green:

- Decreases in certain as more apartment buildings are placed in neighbourhoods current existing of predominantly row-houses.
- Increases in other places by adding single family homes with gardens in a denser configuration.

Accessibility to green public spaces:

- Collective green is provided with the apartment buildings.
- Improved connections between public spaces and greenery.

Diverse amenities:

- Increase of spaces for amenities, services and commercial activities in all neighbourhoods.
- Public transportation accessibility.

Views:

- More homes and apartments are oriented towards the park or water.
- Large facades of industries are made green, particularly ones along the Zaan river.
- Parks along the river are linked to the river and not interrupted by streets.
- Large volumes along the waterfront are divided into smaller ones to provide more view lines and access to the water.

WORK

Accessibility:

- In certain places it stays the same, as accessibility is already sufficient or only has limited improvement options.
- With the introduction of an extra driveway entrance to the highway in Kalf, industries can directly access the highway without driving past residential neighbourhoods. Moreover it can trigger further clustering of businesses on this location.

Expansion options:

- For the existing large food related industries in Oud Koog, some expansion space is made available. However, limited.
- The spaces within the contours of the industries near the Zaanse Schans remain possible expansion locations for these industries, but not for high risk or high nuisance activities.

Location:

- Existing large industries remain relatively formal.
- More informal work environments are added, that act as transition functions between large industries and housing, complement the amenities and transit street.

Clustering:

- Clustering of food industries along the Zaan stays the same, there are options to cluster new related activities in proximity.

Public space:

- Interventions in street design improve loading and unloading spaces and safe cycling options
- Important streets for logistics are improved.
- Shared public spaces between work environments and live work environments.

Multi-modality:

- Addition of a tram line improves the access to public transportation options for many neighbourhoods, as well as for business districts.
- More focus is put on goods transport along the water of industries.

14.2 ADAPTIVE CAPACITY

SQ What is the adaptive capacity of the proposed design?

The adaptivity of the inner city location OK is mainly determined by the choice to keep the existing large scale food industries along the Zaan river. This has been decisive factor for embedding the patterns and creating transitions in both scenarios. This choice was made based on the difficulty of relocating these industries, in terms of how much investment has been made in the machinery tied to its location and the great expense of buying out these companies. The selection of industries that should be kept occurred in a similar way in the transformation location AH. However, the difference was that certain manufacturers with inefficient layouts were chosen for relocation, ones that did not fit the focus industries of that scenario.

Similarities between scenarios:

- Public space interventions that aim to improve streets, for both industrial and residential use. Easy loading and unloading as well as enough space for safe cycling paths. In particular transit streets with separated cycling lanes and destinations streets.
- Densification in local centralities, preferably together with introducing improved public transportation options. It is also possible along streets connecting different local centralities. Densification of these areas can increase the amount of local amenities, services, and commercial activities accessible to the neighbourhood.
- Increasing the amount of available and accessible greenery in neighbourhoods, both private, collective and public ones. Moreover, connecting them with the recreational routes. These spaces can act as transition spaces between the more residential part and work part of the neighbourhood.
- The highway and railway can be wrapped with functions such as storage spaces, wholesale or (when well connected to the main road network) also logistic activities. Often these functions do not produce excessive nuisances and can be situated in proximity to housing. While these volumes form noise barriers along the railway, sheltering the residential neighbourhood.
- Clustering of small and medium sized activities around larger manufacturers.

These similarities are strongly related to the defined street types. In OK the allocation of the street types overlap in both scenarios because there is already a lot of existing infrastructure and the same decisive industries have been kept. In AH there is room for some flexibility. Yet, the preservation of certain industries that cannot relocate overlaps as well, because it is based on the existing industries. As a result, to a certain degree, allocating the street types has created a framework for development similar in both scenarios.

Differences:

- The cluster locations for work activities and as a result, depending on the scenario certain streets can be a highstreet or a functional street.

- Different housing stock options in relation to the amount of housing that can be realised.

Is there still a 50/50 balance in Koog aan de Zaan?

In the traditional scenario a lot of work spaces, amenities and commercial activity are added. As the area already houses a lot of large scale food industries, a new cluster for more small and medium sized construction activities was created. Shifting the balance to a more industrially focussed area. 40% of the added development is dedicated to housing, while 60% to other functions.
In the digital scenario 35% of the added development is dedicated to other functions and 65% to residential. While in the traditional scenario, a lot of the existing fabric is kept. In the digital scenario a lot of out-dated housing and work spaces are removed. At the same time, there is only a small difference between the total added gross area compared to the traditional scenario for work spaces. While the amount of housing that is able to be realised has almost tripled.

- Removal of certain work spaces and reconfiguration of residential and work volumes can achieve higher intensification of uses.
- Gradual transitions can be realised increasing the programme for housing as well as increasing the amount of programme for work activities. Better transitions do not depend on the ambitions for realising residential programme spatially.

* See Street types p.186

14.3 PLANNING STRATEGIES

SQ What criteria should guide compact and mixed-use spatial development and transformation in Zaanstad?

Existing spatial policies and strategies have been examined to assess existing ways of spatial planning and instruments that are preferable in dealing with reduction of industrial sprawl, mixed-use development and integrating industries. As more strategic planning approaches have become more popular, it supports the use of patterns to guide urban design and as planning instrument. This research starts from the idea that the use of patterns is more successful to achieve integration of industries in cities. As has been argued, the use of strict land use plans and regulations has prevented mixed-use developments from becoming successful, and restrains industries and their activities in a way that forces them to leave. Moreover, that these tools do not encourage use of spaces that are unplanned but still desirable.
Some argue that land use plans are able to protect from undesired developments. However, it may not sufficiently allow, perhaps even restrict desired development. The assumption was made that patterns will achieve more successful mixed-use developments than land use planning.

Patterns allow for flexibility. Ultimately, the success of live work environments depends on the choices made for the existing situation. If there are already large industries situated in an urban environment the transition spaces are limited. While in transformation areas transitions to housing can be developed more gradually. As a consequence, hard choices need to be made about where to keep industries. Especially about ones that have difficult confrontations between residences and the estate. This will ultimately determine where transitions between housing and industry are needed and how the patterns will be applied to the context.

The decision of which large industries to keep should be based on the level of difficulty for the manufacturing company to relocate in terms of:

- investments made in the location and its machinery;
- its current positioning in network, whether the industry has or can have appropriate access for its logistics activities that do not overlap (too much) with heavily used streets by people
- efficient organisation of the site, if the industry has an inefficient site layout or fragmented premises, it can be attractive for the firm to relocate

Patterns that have formed the backbone of the design:

- Guaranteed spaces for businesses (P.15) and the closely related Dispersed micro zoned industrial estates (ZP.3)

A potential planning tool is one that allows for a “transition belt” with certain regulations around larger estates allows for a transition of functions from large estates that are micro zoned in a certain area. Assured spaces for businesses are created by micro-zoning the larger industry, consequently the spaces surrounding it become assured spaces for smaller and medium businesses and activities.

- Appropriate accessibility (N.3).

The positioning of certain activities in the city, how they are connected to others says something about how the public spaces and streets are used. Depending on the activity the street or connection needs to facilitate certain interventions can be prioritised. With regard to certain street types, key patterns used in the design were: easy loading and unloading, separated cycling lanes and destinations streets in street with a lot of truck traffic, two way access route to the main road network for industrial estates with relatively large logistic need and representative street fronts and functional sides, or hard and soft edges. These facilitate certain activities along these types of edges and are linked with who will use the street.

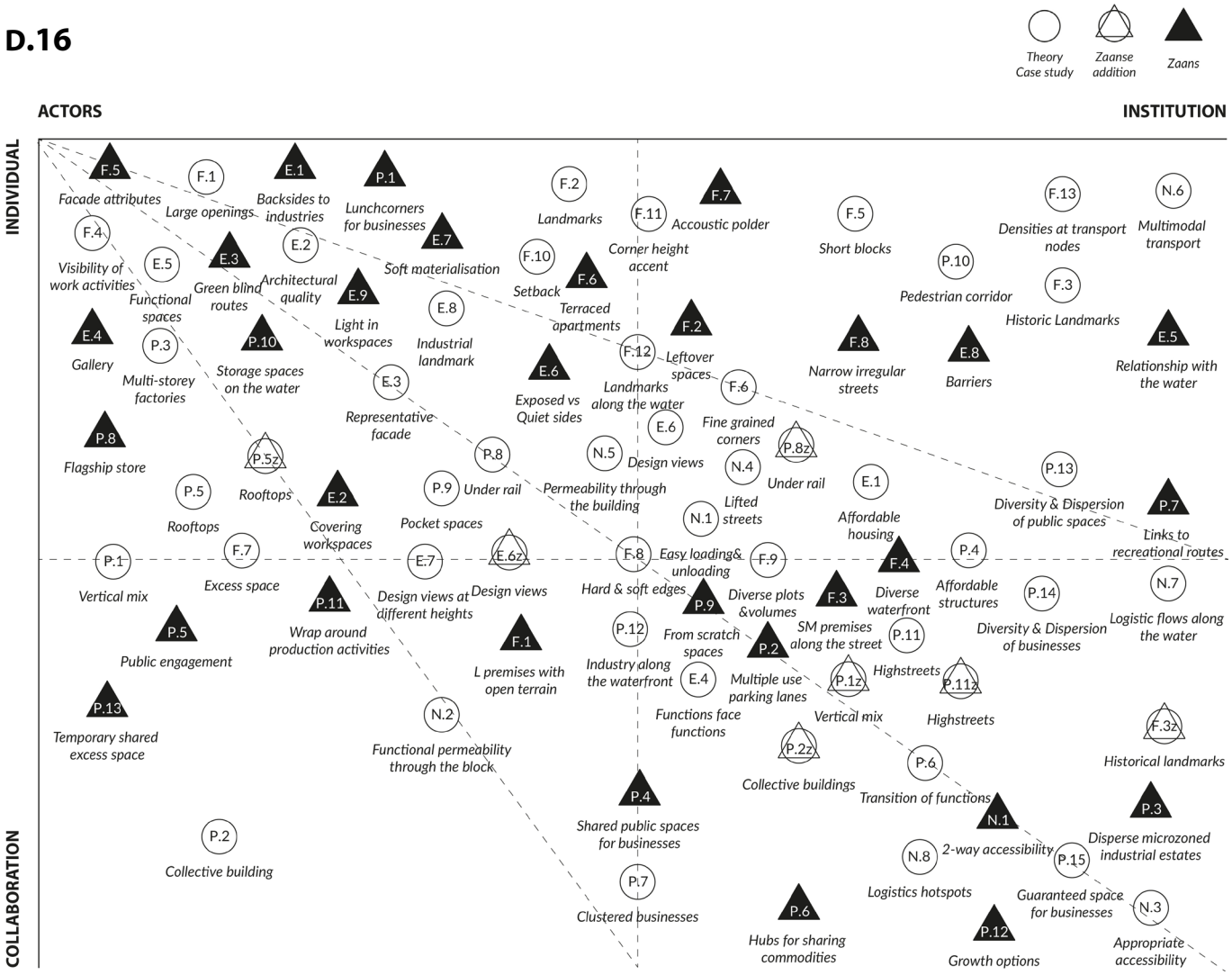
- Transition of functions (P.6)

The aim should be to achieve a gradual transition on district level based on ‘*Rust Reuring Ruis*’. Between residential and working environments a gradual transition results in a mixed live work environment. Public spaces can be developed for both workers and residents and can form a soft nuisance barrier between the more residential part of to the work part. Sometimes transitions cannot be made gradually. In these cases the orientation of residences in a way that limits the potential nuisance sources to one side of the building was key.

- Diversity of plots and volumes (F.9), Diversity and dispersion of businesses (P.14) and public spaces (P.13)

This way, diverse options for both business and residents are ensured.

D.16


Theory
Case study
Zaanse addition
Zaans
ACTORS
INSTITUTION
INDIVIDUAL
COLLABORATION
F.5 Facade attributes
F.1 Large openings
E.1 Backsides to industries
P.1 Lunchcorners for businesses
F.2 Landmarks
F.7 Accoustic polder
F.11 Corner height accent
F.5 Short blocks
F.13 Densities at transport nodes
N.6 Multimodal transport
F.4 Visibility of work activities
E.5 Functional spaces
E.3 Green blind routes
E.2 Architectural quality
E.7 Soft materialisation
F.10 Setback
F.6 Terraced apartments
P.10 Pedestrian corridor
F.3 Historic Landmarks
E.4 Gallery
P.3 Multi-storey factories
P.10 Storage spaces on the water
E.9 Light in workspaces
E.8 Industrial landmark
F.2 Leftover spaces
F.8 Narrow irregular streets
E.8 Barriers
E.5 Relationship with the water
E.6 Exposed vs Quiet sides
F.12 Landmarks along the water
F.6
E.3 Representative facade
P.8 Flagship store
P.5z Rooftops
E.2 Covering workspaces
P.8 Permeability through the building
N.5 Design views
E.6 Fine grained corners
P.8z
N.4 Under rail
E.1 Affordable housing
P.13 Diversity & Dispersion of public spaces
P.7 Links to recreational routes
P.5 Rooftops
P.9 Under rail
Pocket spaces
N.1 Lifted streets
P.1 Vertical mix
F.7 Excess space
E.7 Design views at different heights
E.6z Design views
F.8 Easy loading & unloading
F.9
F.4 Diverse waterfront
P.4 Affordable structures
P.14 Diversity & Dispersion of businesses
N.7 Logistic flows along the water
P.11 Wrap around production activities
Hard & soft edges
P.9 Diverse plots &volumes
F.3 SM premises along the street
P.5 Public engagement
P.12 From scratch spaces
P.2 Industry along the waterfront
P.11 Highstreets
F.1 L premises with open terrain
E.4 Multiple use parking lanes
P.12z Vertical mix
P.11z Highstreets
P.13 Temporary shared excess space
N.2 Functional permeability through the block
Functions face functions
F.3z Historical landmarks
P.2z Collective buildings
P.6 Transition of functions
P.4 Shared public spaces for businesses
N.1 2-way accessibility
P.3 Disperse microzoned industrial estates
P.2 Collective building
N.8 Logistics hotspots
P.15 Guaranteed space for businesses
P.7 Clustered businesses
P.6 Hubs for sharing commodities
P.12 Growth options
N.3 Appropriate accessibility

In this research, patterns were developed based on the (spatial) desires and concerns of inhabitants and businesses (Chapter 7. Perceptions). In this way, the interests of the stakeholders have been integrated to a certain degree into the design.

However, the stakeholders are not always in control of realising the spatial qualities related to their interests. Therefore D.16* gives insight to the patterns certain actors have control over. Which actors have the means to develop the related practical implications of patterns and eventually contribute to more qualitative live work environments. Moreover, which ones need collaboration with multiple actors or with the municipality, or can be developed by actors, but need to be framed by the municipality.

A certain cluster can be found in the middle of the diagram or theoretical patterns. As the patterns are acquired from urban design and planning this is not surprising. Guiding and framing of development remains an important role for the municipality. The patterns that have formed the backbone can play a key role in developing this framework.

* The patternfield of D.16 can be developed more accurately by doing workshops with inhabitants, businesses and the municipality. As they know best which patterns lay within their reach.

15.1 CONCLUSION

Possibilities to generalise the results of the research

The main question asked in this research is "How can urban industrial integration in cities be combined with other functions to achieve densification and create qualitative live - work environments?"

Spatial qualities or patterns of live work environments have been explored and collected from theory, a case study, an analysis of live work environments in Zaanstad and interviews with inhabitants and businesses. These patterns have been refined and supplemented by iterations of design testing.
The patterns from the spatial analysis of Zaanstad are concretisations of themes from theory. In this way, represent practical solutions to generalised prescriptions from urban design and planning theory. The patterns acquired from interviews with inhabitants and businesses represent the integration of stakeholders into the design. Eventually, these are the people who will make use of the spaces and determine whether the live work environment is successful or not. These patterns represent valuable knowledge and solutions from the stakeholders, from which urban planners and designers can learn as well as other stakeholders that experience similar situations.
With these patterns, the potential of live work environments is explored in the framework of the scenarios developed for Zaanstad. Providing insights in to the decisions and desirable interventions that can be made that still allow for a flexible future outcome.

From this design testing on location, the relationships between the patterns have been determined. While the patterns themselves are already valuable outcome of this thesis. The patternfield shows how the solutions are linked and that not every solution is possible everywhere. As activities are connected to their positioning in the city and positioning to others in terms of network connectivity, so are many patterns. It was found that various patterns are connected to certain street types. In this way, the allocation of the street types provided a framework for urban design. As municipalities are mostly responsible for streets and public spaces, potentially a lot of the qualities can be steered and safeguarded this way. Defining interrelations and making groups of patterns that are linked it to street types can be a valuable method for creating a framework for development.

The concluded prioritised patterns are abstract enough to be applicable in multiple contexts. As these patterns were collected from theory, they have already been generalised to a certain extent. These patterns can be used to explore certain positioning of large scale industries (P.15) and the resulting potential transitions (P.6) and appropriate network needed (N.3). This is something the patterns cannot determine, only show the potential transitions that can be realised with or without them. Based on these explorations, it can be determined where (new) large scale industries have the most potential to locate. Hard decisions need to be made about which large scale industries to keep in existing situations. In order of importance, based on how fixed they are to their location (in terms of investments made in the premises), whether its current positioning in the network is appropriate and how efficient the spatial organisation of the premises is. Hence, decisions of whether to keep or relocate should be made based on the potential transitions and the type of qualities it will create. Based on these decisions, a frameworks for qualitative live work environments can be made. As the other patterns follow these decisions.
This was also reflected in similarities and differences between the two scenarios. Where the two scenarios represented different choices of where to keep and cluster industrial activities.

The method of pattern based steering can be generalised in this way, but the application needs to be customised to address specific contexts. Even though patterns can be universal to a certain extent. Diversity in levels of prosperity, economic development, cultural and societal values, such key differences impact the transferability of patterns (Lehnerer, 2009). Especially of more concrete patterns, some aspects will be more transferable than others. The interrelations of the patterns in regard to the street types can be generalised. Groups of patterns can be found that are related to the positioning in the city and network. While practical implications of patterns and concrete environmental qualities need to be fitted into the new context. Spatial forms such as building typologies can be applied more conceptually as the current ones are based on the urban fabric of Zaanstad.

15.

Most of the guiding patterns are derived from theory are already generalised to a certain extent. However, one must remain critical of the transferability or suitability of the particular patterns to the context. The patterns from the Brussels and London case have appeared to be transferable at least to another context in the Netherlands. Patterns from the Shenzhen case less so. The dimensions of the form and spaces are foreign to the context of the Netherlands. The patterns from the case-study and the context of Zaanstad have mostly had implications on smaller scale interventions (building, block, street level) in the design. These can serve as references for future development of live work environments or reassessed conceptually in other contexts. Further research is needed to determine the transferability of these patterns before these can be generalised.

Lastly, there is a lot potential of live work environments in Zaanstad as well as achieving densification. The municipality of Zaanstad should reflect on whether relocation of larger industries should only be to outer laying businesses districts, as this research has presented there are also potential locations in the existing urban environment. Moreover, the accessibility of the network by businesses should be evaluated on whether it is appropriate enough and where improved or new connections are needed to the main road network. The amount of 30 ton trucks moving through the historical highstreet and ribbon developments should and can be limited with better connections. Though it is difficult to integrate the extremely large logistics or storage centres, it is possible for some of the large or medium sized industrial estates. Moreover, relocation also provides the opportunity to organise the premises more efficiently. With the right transitions, urban industrial integration can be promoted.

15.2 REFLECTION

Societal relevance

Currently, industries with a certain nuisance, whether it is noise, risk, smell or traffic, are subjected to the peripheries. This has a significant impact on the environmental quality of the landscape, its cultural heritage and the migration of workers. As space becomes increasingly scarce, displacement of industries creates quality of life for a certain group of people, while affecting others negatively. While large business and industrial districts arise in the landscape, the nuisances are actually only moved to another location where it is less populated. At the same time, giving even more space to these industries. By doing this, the spatial conflicts it creates are not being addressed and is become increasingly unsustainable in light of climate change, loss of natural environments and biodiversity loss. It raises the question whether quality of life for the few, outweighs quality of life for the many. Calling into questions how socially inclusive and sustainable current planning policies are that allow this development. Fundamentally, this research is about for whom quality of life should be improved. In this thesis the standpoint is taken that the benefits as well as the disadvantages resulting from the production and facilitation of our lifestyles should be shared collectively. Moreover, by bringing the benefits as well as the disadvantages closer to home, it will trigger innovative ways to reduce disadvantages.

Why is it important that spatial planners and urban designers consider integrating urban manufacturing? When factories moved outside the city into windowless boxes, the anonymity was mutual. Manufacturers were as content to exclude the public as the public was to dismiss industries to separated zones or the rural periphery. This attitude must change before the industry can regain its role as a good, productive urban member of cities. Technology can enable the reintroduction of industries. But ultimately it is the role of spatial planners and urban designers to manage and protect spatial qualities and facilitate good transitions between work and living activities.

The potential benefits for cities along with their residents are numerous. As mentioned before, it can mitigate the harmful effects of industrial sprawl. Moreover, new mixed developments may revitalise urban neighbourhoods. Most importantly, it can create more transparency and awareness about the production processes of the products we use. Transparency in industrial spaces and its activities has proven to be successful in improving the marketability of cities and factories. Manufacturers who take pride in their work inspire and share this pride with the public. Potentially, it can reconnect the means of production and the city's creative and constructive spirit. It may strengthen economic clusters with the benefits of knowledge spill-overs, while the city provides a robust labour market. Integrating industries in cities can therefore address the spatial mismatch between class and income, the integration of a variety of people into the job market, the accessibility to services, facilities and work. Furthermore, benefits can include reduced car reliance by shortening distances for commutes but also delivery distances. Proximity and transparency are gradually becoming more important. As a result of trends such digitisation and automation, production processes are becoming more complex and incomprehensible, by increasing transparency in production, people develop a better understanding of these processes and their impact. Furthermore, with the increasing environmental pressures of climate change, no sector should be left unscrutinized and transparency becomes a necessity. Thus, the urban integration of industries not only addresses the social inclusion of a diversity workers in cities but also liveability and environmental issues generated by essential players in the production and facilitation of our lifestyles. It calls for the responsibility of cities and the people in it, in addressing the competition of space and environmental challenges.

However, from the perspective of making industries more sustainable and addressing the spatial conflicts and nuisances involved, they do not necessarily need to be integrated in cities. There is research devoted to developing eco-industries and making production processes and supply chains more sustainable. These are all good developments, that this research does not dispute. However, given that there are many potential benefit, it is worth investigating integration of industries in cities as well. In the end, it remains to be proven whether the integration of industries will actually evenly distribute the quality of life for all, or whether difficult local confrontations between work and living will still create disproportionate quality of life for certain inhabitants on the local scale, instead of regional. Furthermore, the focus of

this thesis is on urban integration of industries, this does not automatically mean that there will no longer be industrial sprawl. Careful consideration of existing rural industrial areas in proximity to small villages or city edges is still required.



Source: own photo

Ethical issues

As I am not a local inhabitant from Zaanstad, there are potential limitations to really understanding the relationship of living in proximity of industries in the context of the Zaanstreek. To come closer to this understanding, many interviews with local inhabitants and businesses were conducted talking about living in proximity to industries or vice versa. Several site explorations such as walking and cycling through the neighbourhoods and emerging into the touristic experience of the Zaanse Schans. What has become clear is that there is ambiguity about Zaanstad. What is called the Zaanstreek consists of several smaller villages that have expanded along about 10km of ribbon developments and the Zaan river, of which Zaandam is the largest. The administrative concept Zaanstad exists only since 1974, that groups together a range of very different villages. What is Zaanstad really and it be defined as one Zaanstad?

Its historical relationship with Amsterdam is seemingly complex. As the Zaanstreek started out as an industrial expansion of activities of Amsterdam, it has grown to become very different from Amsterdam. With a very different demographic and economic profile. Resistance to densification is present (photo) as well as becoming more urban. Some sentiment exists that resists to the idea of being in service to Amsterdam for residents that find the big city too expensive. This is something to take into consideration in densification plans, for whom will the housing be built? Will it be in service of providing homes for the demand of Zaanse inhabitants or is it developed to facilitate the expansion of Amsterdam, this becomes evident in the price range of the newly developed homes. As the centre of Amsterdam is only 15-20 minutes away by train from many places in Zaanstad, the relationship between the region and Amsterdam seems inevitable.

In Zaanstad there appear to be roughly two camps, ones that claim the industry (particularly the cacao food industry, are part of the identity of the region and ones that prefer that these industries are slowly relocated and become more residentially oriented. Critics from the last group claim that keeping the industry in the city prevents it from reaching its full potential. Ultimately, combining industry with other functions including housing might be a questionable goal. Many of these industries have certain nuisances and cover large areas, that may compromise liveability severely. Large industries are functional buildings and are not designed for people to stay in or around. Generally, people would rather not live next to one. But that is also not the goal of this research, the aim is to improve and allow transitions from these industrial estates within the urban environment. This research focusses on a strong design proposal that incorporates human scale and liveability to live work environments. There remains a challenge to overcome these preconceived and often justified perceptions. Assurances for both residents and businesses are needed for it to become successful. The acceptance of live work environments is largely dependent on the cultural, political and societal context of communities. However these are not fixed, as different generations can develop new preferences.

The advantages and limitations of the chosen methodology

Three main methods were used to guide the research to an integrated design proposal. First a theoretical analysis of principles used in mixed-use development, integration of industries and compact city strategies. Second, a case study that supported these principles with empirical research. Third, research by design and scenario design used to apply the patterns and develop qualitative live work environments.

Initially, the ambition was to develop patterns, that were "universal" to a certain extent that could provide as guidelines for future live work environments in different contexts, not only in the Netherlands but also internationally, somewhat limited to the Western contexts. Early in the project, it became clear that this was not possible. By looking at three different cases and assessing which patterns appeared in multiple cases, certain patterns could be considered transferable to multiple contexts. However, the search for a "universal" formulation of a concrete pattern was unrealistic. The abstract patterns can provide guidelines for the relative spatial organisation of functions. But the more concrete patterns provide only potential interventions which are more or less important depending on the context. The applicability and use of the pattern is in the end linked to its spatial, cultural and political context. It is the context that decides which ones and how the patterns are applied. This was experienced in the design of the two-locations as well, as the initial contexts are very different the resulting issues and transitions needed may be similar but the small scale interventions are locally defined. Eventually, the focus shifted to developing more concrete patterns that enable and improve environmental qualities. The transferability of these patterns remains to be determined by future research/

At first, the case-study was intended to provide more concrete dimensions or scopes for abstract qualities, such as diversity. Due to time frame of the project and lack of certain data it was chosen to shift the focus more towards the environmental qualities related to the spatial organisation of form and function. As a result, the case study acted more as interesting references project that confirmed existing patterns, rather than supply dimensions for abstract patterns. Consequently, the case-study could not be used to provide indicators for a successfully mixed environment. The relevant data for each case would be needed, and more extensive quantitative data analysis would be needed to determine these indicators.
It was chosen to assess the design proposal by means of the evaluating the before and after situation of the design location based on the spatial and environmental qualities that inhabitants and businesses desire for their environments. These qualities were based on the literature study of spatial qualities related to perceived liveability and spatial requirements for different types of industries and complemented with the conclusions from the survey and interviews. To a certain extent these aspects have also informed the patterns. However, the application of the multiple patterns does not necessarily result in improvement of all these qualities.

By means of research by design two hypothetical scenarios were explored that represented "extremes" of choices that can be made for spatial planning of densification or facilitation of certain economic activities. The explorations on the chosen test sites in Zaanstad made use of the patterns to investigate the spatial possibilities and the adaptive capacity of the design to different circumstances. However, the design outcomes are not realistic, but are developed to understand the choices that need to be made in terms of spatial planning. Decisions that allow for multiple future developments and other that fix and exclude other possibilities. The differentiation of the two scenarios into Digital and Traditional were used to create extremes in the choices that can be made, however focus industries or sectors cannot be clearly separated into two scenarios. The ecosystem of industries is complex and intricate. It is more likely that at certain places the focus will be on clustering of industries related to one scenario, and at another place clustering of industries related to the other. Complementing each other in the economic profile of the region.
Cities need development and research of options and potentials like this thesis to support better decision making. Nevertheless, this research has focussed primarily on the spatial organisation and qualities of live work environments. Other themes such as social safety, cultural diversity and social inclusion have not been treated explicitly. Though diversity of spaces and activities do allow for various types of users. Separate design strategies and policies are needed safeguard other aspects that have been left out the scope of this thesis.

Data collection

The collection of geo-spatial and socio-economic data is richly available in the Netherlands. This has not been an issue. Some more sensitive information, such as the land ownership status is not publicly available. Land ownership has an impact on the possibilities of the municipality to develop and the time frame of transformation processes, as a lot of the land is privately owned. Eventually, the specific data was not necessary for the design research, focus is put on how the municipality can facilitate the spatial organisation of functions rather than its active involvement in the transformation of the area.

Due to the corona virus, for some time it was not possible to conduct interviews on the streets of Zaandam. Eventually, the interviews with inhabitants were replaced with an online questionnaire. Even with some technical difficulties, it was possible to gather some desired results. Unfortunately, the participation of survey too low to make generalised conclusions, particularly about the experienced nuisances in relation to positioning to industries.
Pictures taken in Zaanstad during that time show little activity as many people no longer visited cafés or shops and companies were closed, its workers at home. For a while it was difficult to understand the conflicts created by the direct confrontation of large industrial estates with residences. But as the lock-down passed and activities started up again, and the interviews with businesses could continue. Luckily the businesses were open to interviews online or at safe distances from each other. The only obstacle was some delay of the process.

Thesis in relation to Urbanism and Design Studio Urban Fabrics

In my thesis of researching the implications for the city of incorporating industries into the urban environment the city-industry dynamic is explored. As large industries are functional buildings and are not designed for people to stay in or around, it is interesting to look at it from the eye-level perspective, the human-scale and how conflicts arise. The Urban Fabrics studio studies the relationship between physical elements of the urban environment and other intangible elements in cities. It has a strong focus on design and uses design as a research method and to explore. At the same time the Urban Fabrics studio designs through the scales, which is important as these industries play a big role in the regional, national economy even global economy and have an impact on the regional infrastructures. As it is design oriented from the start, incorporates the concept of liveability and vital urbanism, designs through the scales, the methods and themes of the studio and the purpose of this master thesis are therefore very compatible.

Researching the limits of how to combine industries with housing in cities contributes to the research on compact city strategies, such as urban (industrial) revitalisation and mixed-use development. Liveability is an essential concept in this research. This research further explores the spatial limits of compact qualitative live work environments. By looking at the theories and common practices of mixed-use development and integration of manufacturing in cities, testing these on site, and evaluating whether the spatial outcomes conflict with the selected aspects of liveability, this research contributes to concepts of industrial integration together with the densification and intensification of uses. In relation to this, the spatial impact of different possible scenarios of how future trends may influence the spatial manifestation of industries in the context of Zaanstad.

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17. APPENDICES

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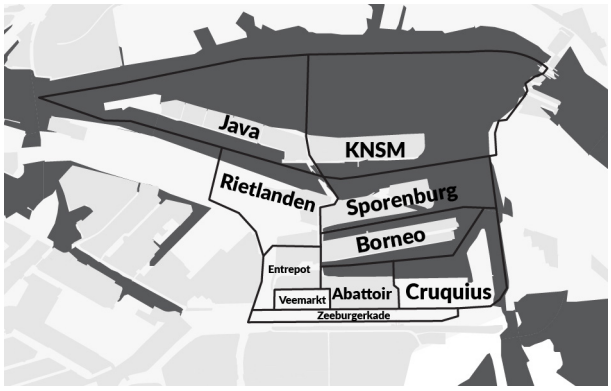
F.31 The city of Amsterdam (municipal borders in black)
1. Northern IJ river bank area 2. Eastern Docklands (own illustration)



F.32 Eastern Docklands neighbourhoods



F.33 Northern IJ river bank neighbourhoods

1. EVALUATION OF SPATIAL STRATEGIES AND POLICIES OF MIXED USE DEVELOPMENT IN THE NETHERLANDS - CASE STUDY

Both the Eastern Docklands and Buiksloterham are transformation locations of industrial areas into mixed-use environments in Amsterdam but in different time periods. After a short introduction of the location, the type of planning used during that time has been reviewed, whether it was more strategic or project based focusing on the local level. Moreover, what the ambitions were for mixed-use development. Lastly, whether the mixed-use development was successful and whether it encouraged integration or displacement of businesses and industries.

The Eastern Docklands

The Eastern Docklands have been transformed between 1980-2003. It consists of 11 neighbourhoods of which Cruquius, Zeeburgerkade and Veemarkt remained business districts. Others were transformed into residential districts, starting with Abattoir in 1897 and ending with Rietlanden in 2003 (Abrahamse, Buurman & Hulsman, 2003). The area lost its harbour function in the 1970s, as there was a surplus of harbour areas available and its positioning was no longer advantageous. The remaining port industries were given the

Source: own illustration

opportunity to relocate (DRO, 1997). The Eastern Docklands were sold to the municipality and decided to transform it into a residential area (Abrahamse, et. al., 2003). The structural plans during that time focussed on the city and mainly addressed the housing demand.

The structural plan in 1984 introduced the compact city strategy and mixed-use policies (Gemeente Amsterdam, 1984). Its aims were to find space for housing development within the existing city boundaries and achieve building densities of 100 residences per hectare (Jolles, Klusman & Teunissen, 2003). The new development needed to support the city centre, a mix of uses was always part of the objectives. At the time, the urbanism department of the municipality of Amsterdam worked with urban plans, urban planning programme of requirements (Stedenbouwkundig programma van eisen, SPvE) and note of principles (Nota van Uitgangspunten). SPvE's were prepared by the municipality per subarea, enabling a phased approach for the whole area. This project planning style is used in all the following neighbourhoods. Each area reflects certain thinking of the period it was developed. During the development of Abattoir the municipality built a lot of affordable social housing. Veemarkt was redeveloped as a business district, while Abattoir became a residential neighbourhood. A mix of functions was realised on whole area level. This can also be seen as the separation of functions still common at that time. After the Note of principles of the Eastern Docklands in 1990s (DRO, 1997), the municipality adjusted its mixed-use approach to small-scale business spaces for offices, workshops and studios in the plinth of building blocks and working at home residences. Resulting in a vertical mix of functions in KSNM, expecting to increase the vitality and attractiveness of the area (Hoppenbrouwer & Louw, 2005). Apart from social housing some houses were developed for the private sector (Abrahamse, et. al., 2003). Java was developed to resemble the historic canals of Amsterdam. A lot of vertical mix and shared premises was realised here. A lot of differentiation in housing types was introduced, including working at home residences. In Borneo and Sporenburg many low-rise family housing were built. Housing development clearly shifted away from social to predominately private sector housing (Abrahamse, et. al., 2003). A mix of uses was achieved vertically in the building or block level or shared premises. Lastly, uses were mixed horizontally and on a district level in the Rietlanden. The northern part of the neighbourhood has a lot of offices, businesses and commercial activities. Uses are mixed in buildings and blocks vertically and on the shared premises level.

From these different developments a shift can be seen in mixed-use policy, from district to block and to the building level. According to Hoppenbrouwer & Louw (2005), the transformation of the Eastern Docklands into a mixed-use environment has been successful. The initial estimate in 1987 was to realise 800 jobs. In 2005 more than 1600 jobs were counted in their research. More than half consisted of small-businesses and most of the employment in the service sector, located in the residential areas. While traditional sectors such as manufacturing and trade were found on the business districts, providing for more than 20% of the employment opportunities in the entire area. Notably, their research revealed that while creating mixed-use environments was the objective, many people and businesses view the Eastern Docklands as a residential area. Currently, Cruquius (initiated in 2011) and Zeeburgerkade (no starting date yet) are planned to be transformed into mixed-use environments (Gemeente Amsterdam a, b, n.d.). These transformations possibly mean a loss of jobs in the manufacturing, distribution services and logistics sector. As these have remained mainly on the industrial districts that were not mixed with residences.

Buiksloterham

In 2003, a new structural plan was introduced, the first including a regional vision. Collaboration between the surrounding municipalities emerged. Negotiations were made concerning housing developments and localisation of business and industrial districts. Businesses and services were allocated in proximity to public transportation and infrastructural nodes. Large scale businesses and harbour activities were allocated to the Noordzeekanaal area to concentrate environmental hazards (Jolles, et. al., 2003). Again, the structural plan emphasised densification.
Buiksloterham was one of the selected complex transformation locations where densification would take place (BVR & DRO, 2003). To date it is still undergoing transformation. The former industrial and harbour activities in this area made way for small-scale businesses and creative industries and now also housing. An investment agreement set up in 2007 (Gemeente Amsterdam, 2007) formulated rules and a framework. It set the groundwork for a land use plan that was finalised in 2009.

Due to the economic crisis, the original office programme and phasing of the housing development were cancelled. DIY building projects were introduced and became very successful. Later, the General Environmental Law Act (Wet algemene bepalingen omgevingsrecht, Wabo) was introduced in 2010 together with the Chw that allowed certain deviations from the Wabo and enable mixed-use environments. After the crisis ended, the housing demand boosted and densification and mixed-use ambitions were increased.
A diverse programme is one of the main principles of development in Buiksloterham. In the original investment agreement of 2007, living and working were evenly programmed, the type of mix remained to be determined per location. Mixed-use would be realised on area level, some parts reserved for businesses and industries. Depending on the site, living and working are mixed on block and building level. One of the main conditions is that no party is forced to leave the to be transformed area by the municipality and the existing industries determine whether a site can transform into a residential one (Gemeente Amsterdam, 2007). Half of the business sites are reserved for city-based businesses and a quarter of all new business spaces reserved for the lower priced rent sector (Gemeente Amsterdam, 2019). The density of the former industrial district was relatively low, the initial ambition was to double it for the whole area.
The document was revised in 2019 (Gemeente Amsterdam, 2019). The most notable changes are the increase of the maximum developable programme together with the density. There is a theoretical potential of 8575 homes, including the homes already realised. This is a dramatic increase compared to former ambitions (9000 homes in total in the Northern IJ river bank area of which 2000 in Buiksloterham realised in ten years). Moreover, all the remaining developable plots are assigned the new balance of 70% living and 30% working (of which 10% amenities).

The municipality owns a third of the land in Buiksloterham and develops these actively. The rest is developed by businesses or other private developers. With the municipality as the main driver of development, it will gradually develop half of the total programme. Two third is residential and one third working and amenities (Gemeente Amsterdam, 2007). The municipality decided to change the planning process, no detailed masterplan. Instead a set of starting conditions are laid out that allow various developments. The municipality restricts itself to providing the necessary spatial conditions, supply of the land and the legal planning framework. Structural aspects are determined in a framework and several new streets. Per site or lot, a range of rules apply for development of the programme and some about form. Simple process rules and lack of rules are supposed to make it attractive for developers. Parties can also choose to develop conform the existing land use plan of 2009. In that case the rules of the new investment agreement do not apply. When developing parties want to deviate from conditions set by the land use plan, all the new investment agreement rules are required to be integrated. The municipality anticipates the use of the new investment agreement as notable increase in necessity to deviate from the land use plan is seen in Buiksloterham (Gemeente Amsterdam, 2019). Some disadvantages are that when development deviates from the land use plan, stakeholders can object and delay the development process. Other issues are that private developers cannot oblige the municipality to develop the surrounding public space of their plot. Moreover, private parties have to organise the phasing of their own development. Hence, construction activity nuisances are almost unavoidable.
In 2009, 300.000 m2 of businesses were found in Buiksloterham and almost no residences. 10 years and an addition of 200.000 m2 housing later, this has shifted to 200.000 m2 (Gemeente Amsterdam, 2019).

According to the municipality, displacement of extensive businesses is unavoidable. Even though part of the developable area of Buiksloterham is reserved as business district and follows the existing land use plan. Remarkably, while in 2007 different locations were assigned a certain working living balance, including areas where the balance shifted towards working. In the 2019 version, all remaining plots are assigned a programme where living dominates. This means that in the remaining developable plots it will be even harder to realise a mix with businesses that are known to need more space. Mostly residential areas allow non-residential uses mixed vertically, with small-scale offices and businesses that can be stacked into multi-level buildings. Especially together with the housing and densification pressure, weaker economic functions come under pressure and might assist further displacement of industries. Still, the ambition remains to create productive neighbourhoods that integrate business spaces used for production, repair, storage and transfer of goods (Gemeente Amsterdam, 2019). The municipality of Amsterdam might have set mixed-use and densification ambitions too high for the remaining plots.

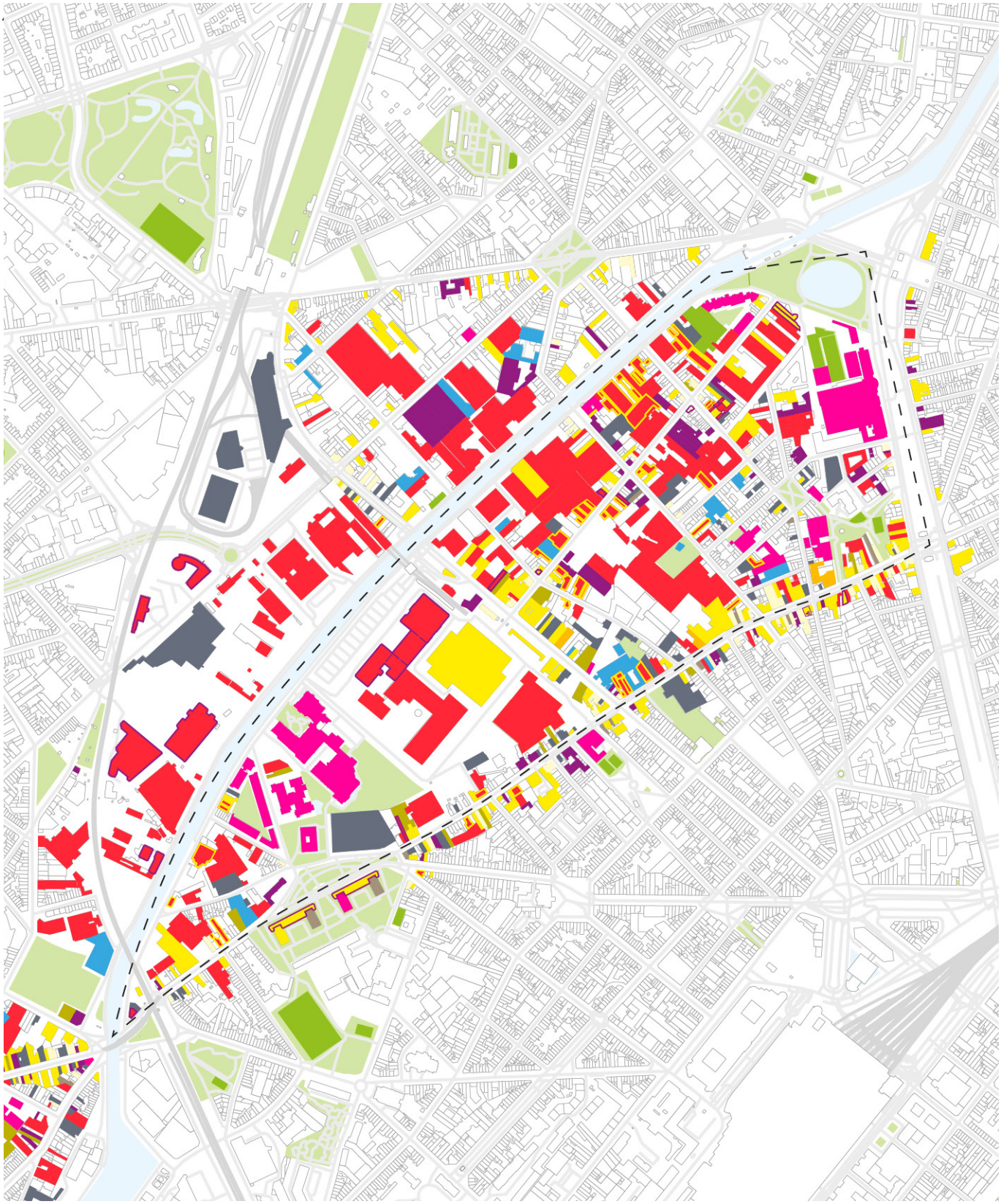
2. CASE STUDY



1:500.000

Source: own illustration

* Only functions directly adjacent to the neighbourhood border are shown in this map



Source: map: Openstreetmap. 1&4: Abattoir. (n.d.). Projecten. [image]. Retrieved from: https://www.abattoir.be/nl/projecten;

C.1 BRUSSELS - KUREGEM



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Source: 2: Gemeente Anderlecht. (2018). Zoveel meer dan een slachthuis. [image]. Retrieved from: https://www.anderlecht.be/fr/node/2310; 3&5: google maps street view; 6: Sadée, T. (2015). Brusselaars zijn de dictatuur van Koning Auto zat – NRC. [image] Retrieved from: https://www.nrc.nl/nieuws



Source: map: Openstreetmap. 1-3: google maps street view; 4: Dhondt. P. (2019). Gosseliesbrug kampt vijf dagen na ingebruikname al met defect. [image]. Retrieved from: https://www.bruzz.be/mobiliteit/gosseliesbrug; Sadée, T. (2015).

C.1 BRUSSELS - KUREGEM



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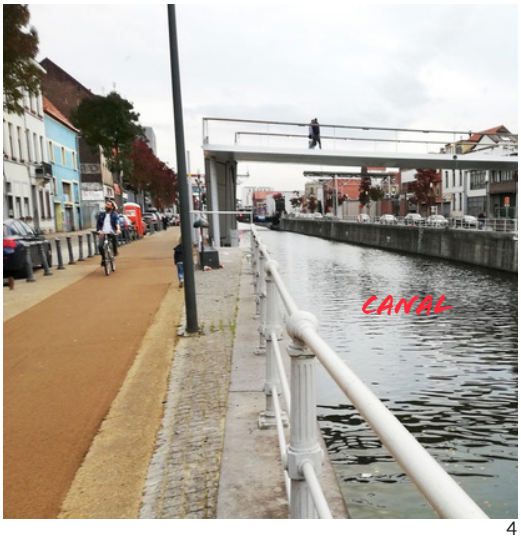

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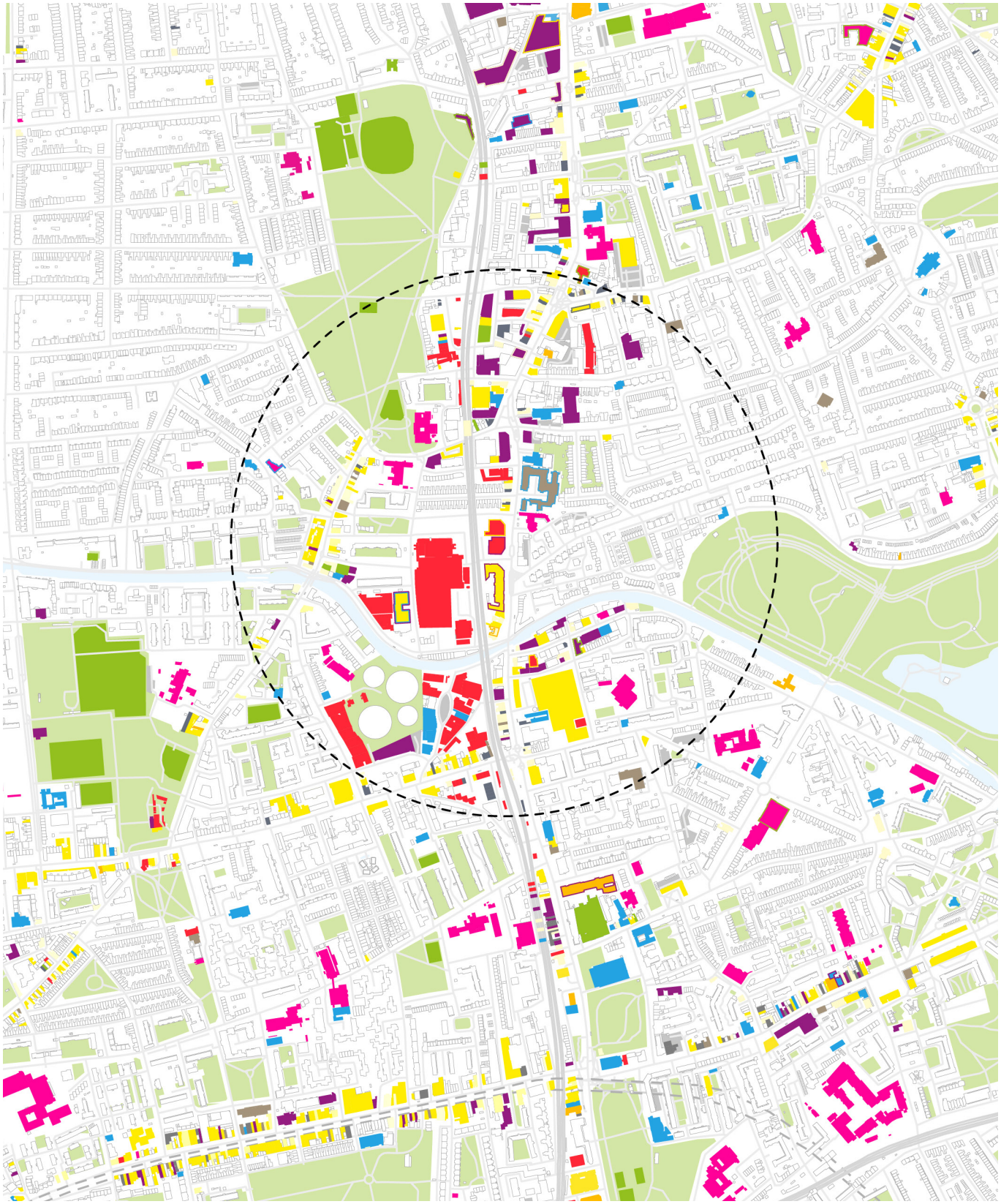
Source: 5: Screen.Brussels. (n.d.). Dauwpark. [image]. Retrieved from: https://screen.brussels/nl/film-commission/filmset/dauwpark; 6: Brussels Hoofdstedelijk gewest. (2014). Liverpoolplein. [image]. Retrieved from: https://overheidsdienst.brussels/activiteitenverslag-gewestelijke-overheidsdienst-brussel-2014-2/



Source: map: Openstreetmap; 1: Hawkes. J. (n.d.) Aerial view over Hackney London. [image]. Retrieved from: http://stock.jasonhawkes.com/media/9b5693e8-3335-11e1-9a45-fb7f4995ce45-aerial-view-over-hackney-london;

C.2 LONDON - HACKNEY



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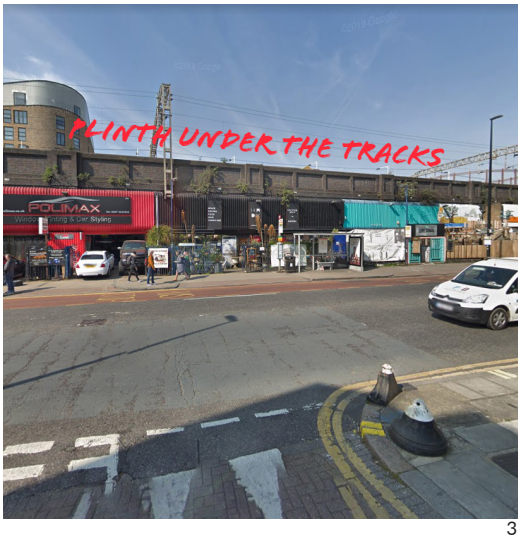

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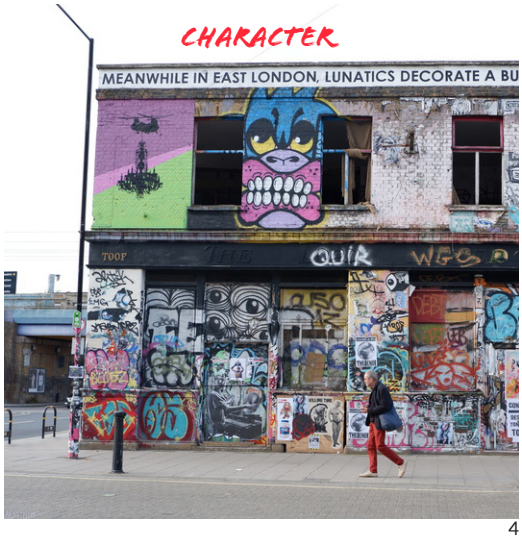

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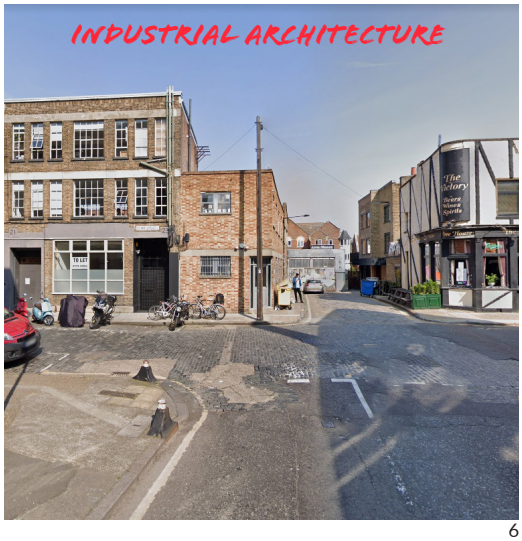

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Source: 2-3,5-6: google maps street view; 4: Smith. V. (2019). Hackney Wick's famous graffiti building is about to change. [image]. Retrieved from: https://londonist.com/london/the-lord-napier-a-derelict-pub-used-as-canvas-by-street-artists



Source: map: Openstreetmap. 1-3, 6: google maps street view; 4: Anton page. (n.d.). 25B Vyner Street regents canal Hackney London. [image]. Retrieved from: https://antonpage.com/commercial-properties/25b-vyner-street-regents-canal-hackney-london-e2-9dg/

C.2 LONDON - HACKNEY



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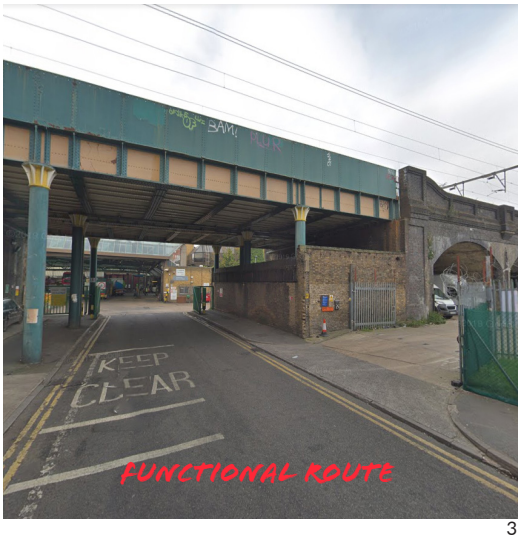

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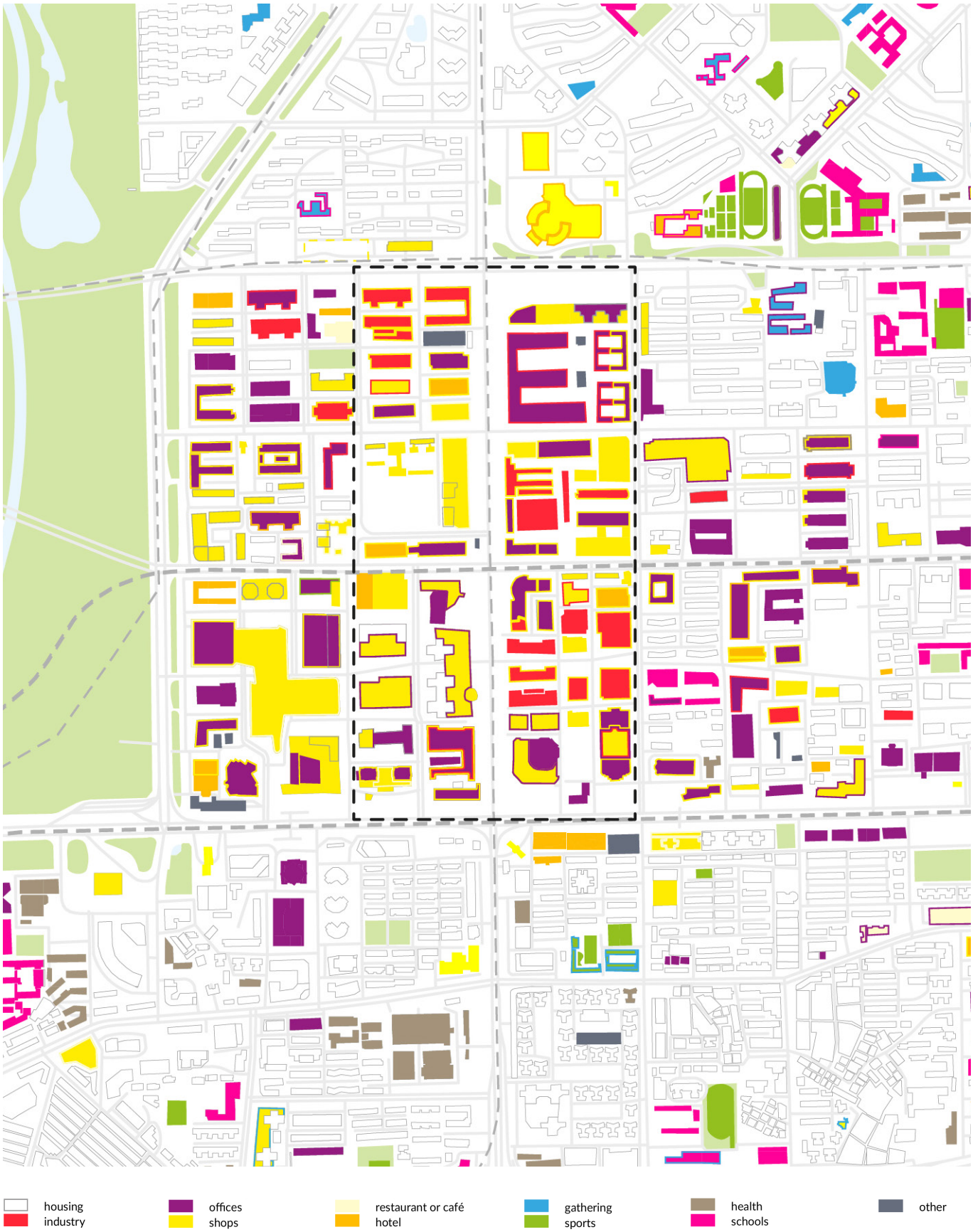
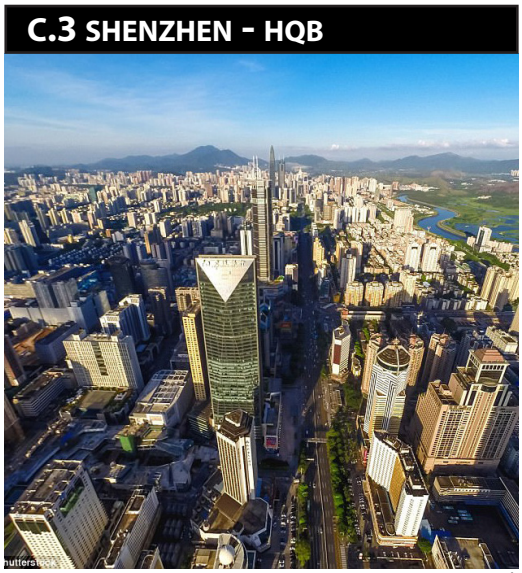
Source: 5: Burrows, T. (2020). Woman in her 40s stabbed in arm and back by stranger in 'unprovoked' attack in London park. [image]. Retrieved from: https://www.thesun.co.uk/news/11339169/woman-stabbed-stranger-unprovoked-attack-london-park/



Source: map: Openstreetmap. 1,4: Williams, S. (2017). Welcome to China's Silicon Valley: Spectacular pictures show the dazzling neon lights at Huaqiangbei - the world's largest electronics market. [image]. Retrieved from: https://www.dailymail.co.uk/news/article-4861360/Pictures-world-s-largest-electronics-market.html;



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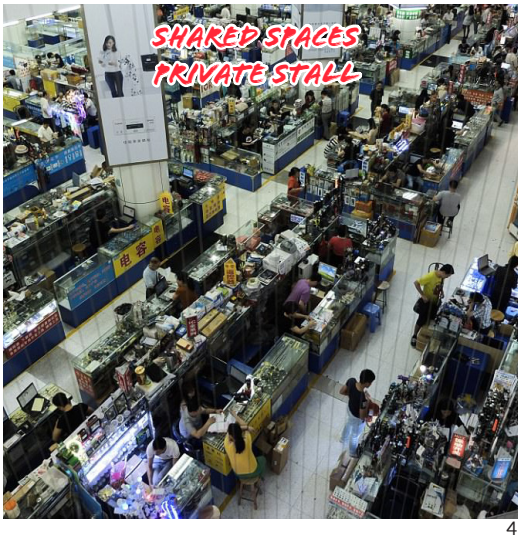

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Source: 2: Wang, H. (2013). Huaqiangbei street view. [image]. Retrieved from: https://en.wikipedia.org/wiki/Huaqiangbei#/media; 3: Granger, M. (n.d.). Huaqiang Electronics World. [image]. Retrieved from: https://en.wikipedia.org/wiki/Huaqiangbei#/media/; 5-6: Baidu maps



Source: map: Openstreetmap, Baidu maps

C.2 SHENZHEN - HQB



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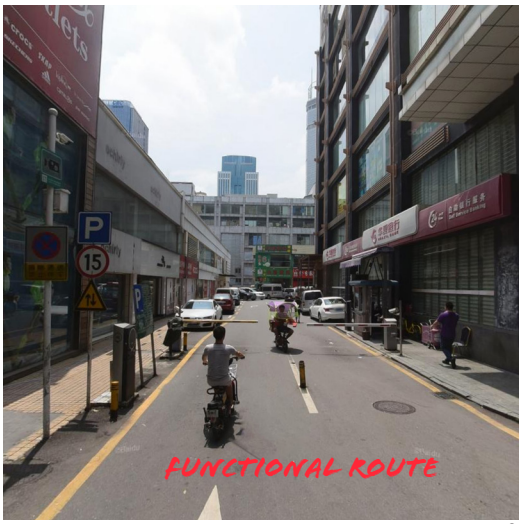

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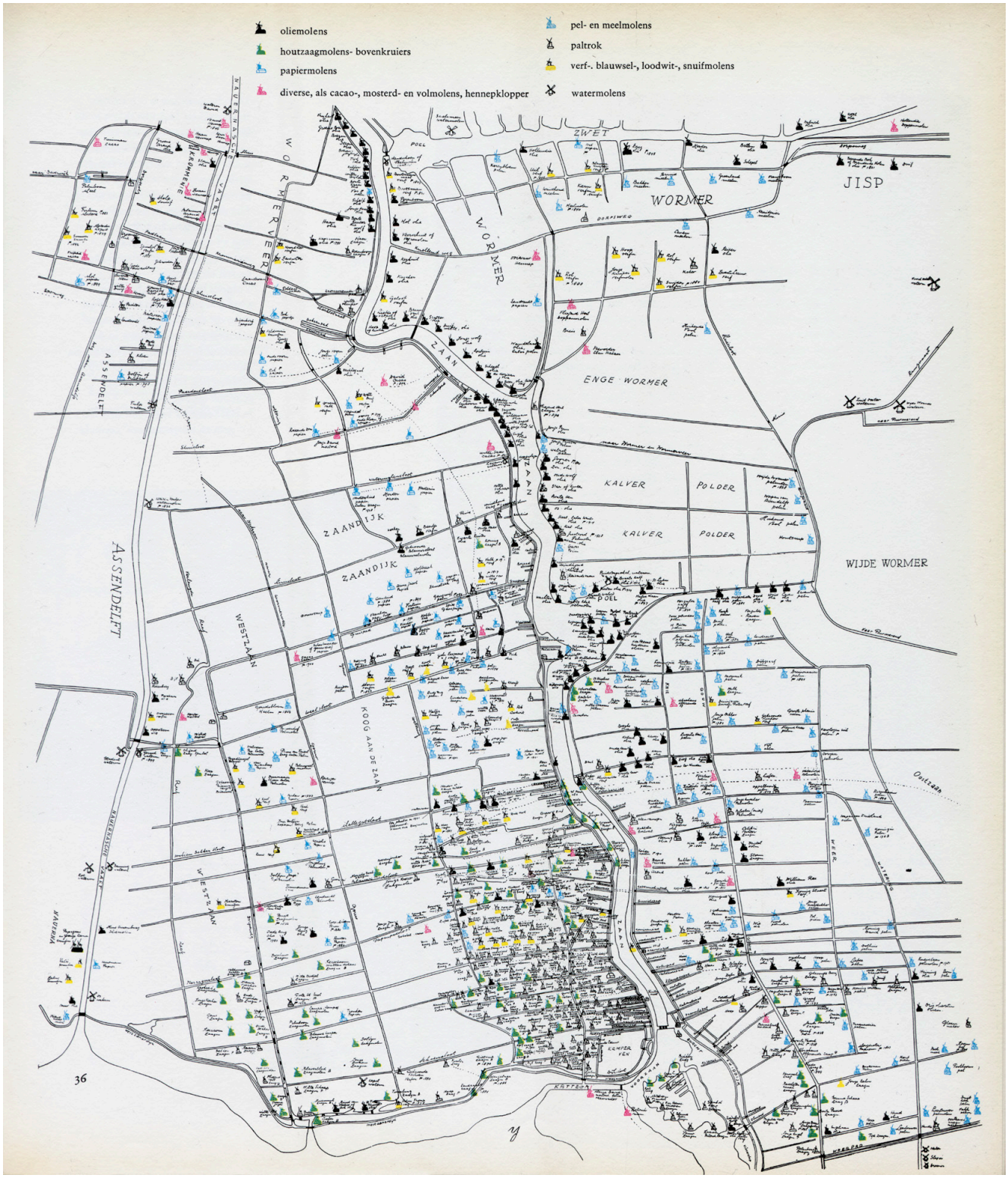
Source: 1-4: Baidu maps; 5: Granger, M. (n.d.). Huaqiang pedestrian street. [image]. Retrieved from: https://en.wikipedia.org/wiki/Huaqiangbei#/media/; 6: Rivens. E. (2005). Shenzhen Lychee Park. [image]. Retrieved from: https://en.wikipedia.org/wiki/Huaqiangbei#/media

3. OVERVIEW OF HISTORIC DEVELOPMENT



F.34 Map of industrial mills in the 18th century

Source: De Orkaan Zaans nieuws. (2016). De Zaanstreek: de eerste industriestad van Nederland [image]. Retrieved from: https://www.deorkaan.nl/de-zaan-streek-de-eerste-industriestad-van-nederland/

Region
sea dike
reclaimed land

Zaanstad
wind mills
factories/ business district

~10th century
Mining of peat, building dikes and dams were necessary to control the water level.

~1400
The first lock in the dam between east and west Zaandam was placed.

~1500
In the Zaanstreek mainly small villages existed. Of which Assendelft, Westzaan, Wormer, Jisp and Oostzaan were bigger than Zaandam.

<1600
main activities were farming, fishing and catching birds. Due to the wet peat landscape, after a while agriculture was less profitable and farmers also started keeping livestock, fishing and ship trade.

end 16th century
invention of the industrial sawing mill

17th century
emergence of inland shipping, wood from all over the country would was brought to the Zaanstreek to be manufactured there

many sawing mills were established

as a result many shipbuilding related companies were set up, that acted as suppliers for the shipyards. Such as rope yards, anchor forges etc. Ship builders also started to concern themselves with the shipping of goods, many other products were shipped to Zaanstreek as well. For the manufacturing of whale oil, grain and spices, mills were needed. Also for paint, chalk and paper.
Soon thousands of mills were built in the region

end 18h century
about 600 mills existed in the Zaanstreek

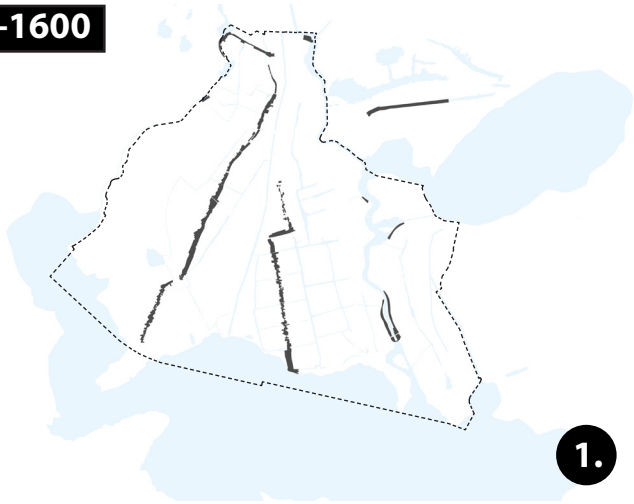
1750-1850
many industrial mills disappeared and ship building stagnated

1806-1813
During the French occupation, trade with foreign countries stopped. The whole region experienced unemployment and poverty.

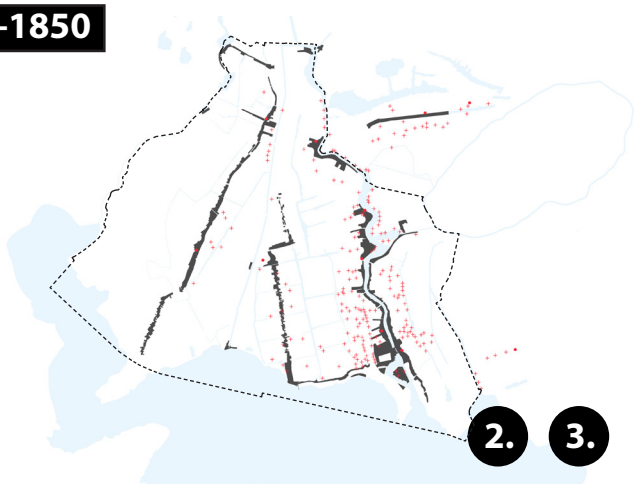
<1300



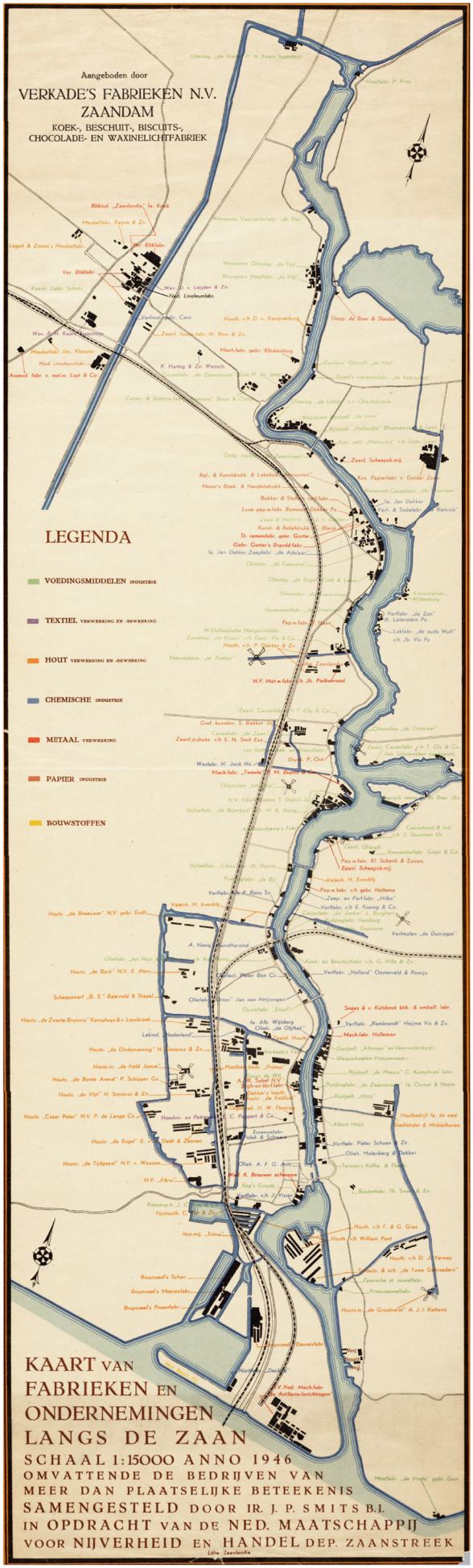
1500 -1600



1600 -1850







F.35 Map of industries along the Zaan river in the 20th century

Source: Gemeente Zaanstad. (2017). Dijken, linten en paden in Zaanstad Cultuurhistorische Verkenning [image]. Retrieved from: https://lintendijkenpaden.zaanstad.nl/system/attachments/files/000/001/968/original/CHV_historische_dijken_linten_en_paden_concept_voor_participatie.pdf

1850 -1950

1869-78
Development of railway line between Amsterdam, Zaandam and Alkmaar. It had not any significant effect on the industrial development as that was mainly water-based. It did have an effect on the building of residential areas.

1876
opening of the Noordzeekanaal and Zijkanaal G

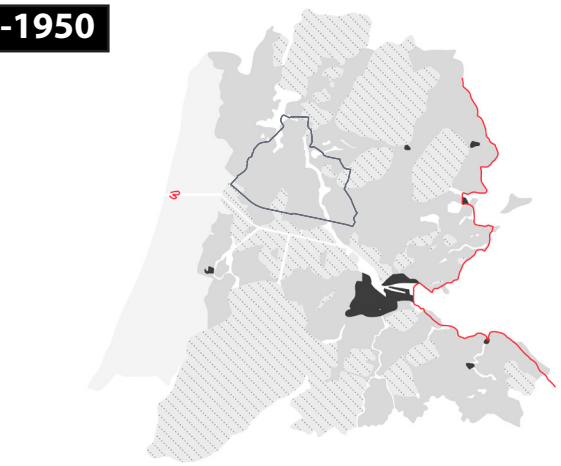
end 19th century
many brands were established in the Zaanstreek, such as Duyvis, Honig, Wessanen, Lassie and AH.

Industires were concentrated more on seperated business districts. For a part outside of the dike on the Hemlanden.

end 19th century
The industrialisation resulted in many factories along the Zaan river right next to housing, creating a high facade along the water. The second flourishing period focussed on the Food industry and related services such as retail. Wood manufacturing also revived. Steam powered machines manufactured many raw materials into foods and stimulants such as rice, cookies, sigars, coffee, tea and chocolate. But also paint, lacquer and varnish. Mills were gradually replaced by steam powered machines and later diesel, gas and electric motors. This also lead to the upscaling of the industry.

1901
Implementation of the Housing Law. Requiring municipalities develop expansion plan to proviede qualitative housing. Between Zaandam and Wormerveer working-class neighbourhoods were developed. Before housing was mainly built from wood, now brick housing was introduced

1903
new lock replaced old one to allow entry of larger inland ships





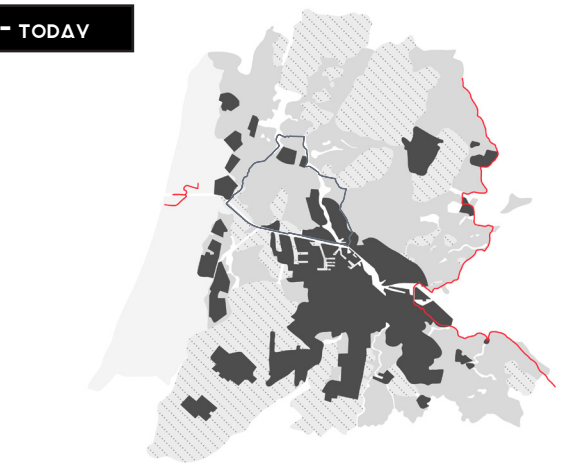
4.

1950 - TODAY

1950s
The government stimulated development of an industrial area in Achtersluispolder. After this development it would take a while before the government woud develop new industrial areas.

1960s-80s
After WWII many industries disappeared along the Zaan river. Transport over land gained importance especially after the development of the A8 and A7. Manual labour was replaced by machines.

1974
Municipalities west of the Zaan river were combined to become Zaanstad. East of the Zaan river became part of Wormerland in 1991.



1980s
Office and trade district Westerspoor was developed and for smaller business the district Start.

The industrial district Zuiderhout was developed after the closing the waterway

When this district was finished the Island was left by remaining industries and replaced with housing

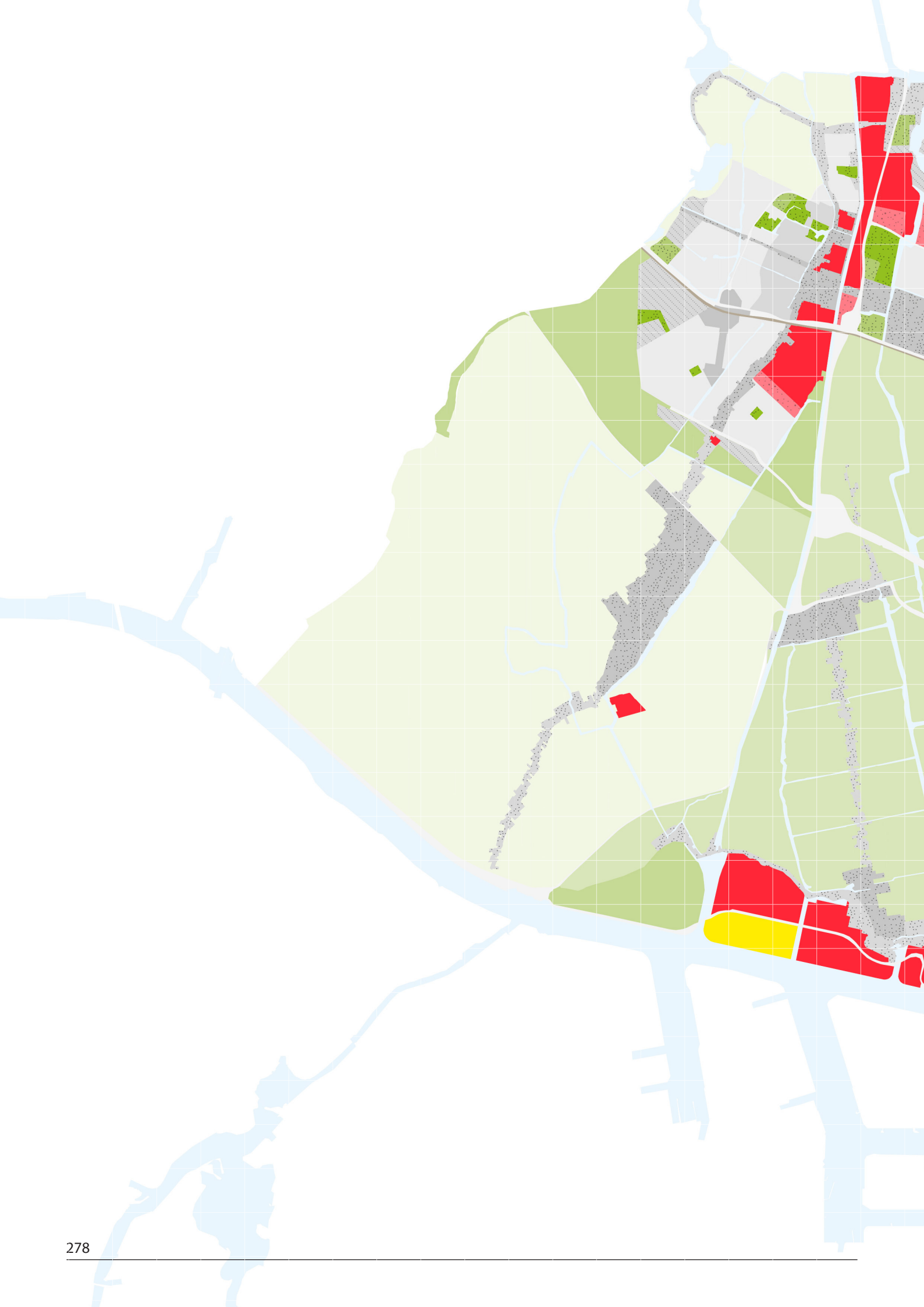
1985
The committee Verzijl decided that the Zaanstreek could no longer be considered an industrial region (only).

end of 20th century
Many industrial areas along the Zaan river were restructured and new industrial districts were devloped along the Noordzeekanaal.



5.

Source: Rutte, R. (2015). Over Holland 16/17 Ontwikkelen zonder plannen en regels: De ruimtelijke inrichting van de Zaanstreek van de vijftiende tot de eenentwintigste eeuw. Delft, The Netherlands: Vantilt uitgevers & Faculty of Architecture and Built environment TU Delft.
Davis, H. (2020). Working Cities, Architecture Place and Production. London, England: Routledge Taylor & Francis Group.



4. SPATIAL PROFILES OF ZAANSTAD

This map shows the different spatial profiles and housing types of Zaanstad based on the Structural vision of Zaanstad in 2012 and a cluster analysis of density differentiating various block types. By defining different areas with similar qualities a choice can be made which locations are interesting for a site visit.

The 6 different squares frame 8 different spatial profiles selected from the spatial profiles shown in this map. These locations are analysed more in depth in this chapter. A site visit reveals spatial qualities and challenges of the particular profile.



SP.1 CITY CENTRE COMPACT



City Centre Compact

p.130

SP.2 URBAN RIBBON DEV



Urban Ribbon Development

p.131

SP.5 INNER CITY INDUSTRY



Inner City Industry

p.134

SP.6 MIXEDWORKINGDISTRICT



Mixed Working District

p.135

SP.3 VILLAGE



Village

p.132

SP.4 RIBBON DEVELOPMENT



Ribbon Development

p.133

SP.7 INDUSTRY & HARBOUR



Industry & Harbour

p.136

SP.8 HEMBRUG



Hembrug

p.137



Green urban development

Mainly low rise development with some apartment slabs or towers in situated in a large green space.



Garden city

Slabs sometimes in combination with row housing are organised in a configuration that enclose a collective or public green space.



New Garden City

Low rise development, mostly row housing, is organised around winding streets. The main streets are green. While the destinations streets are often dead end and have a lot of parking spaces.



Parks

Within the built environment several larger and some smaller green structures are integrated. Ideally connected to the larger green network. Some also have other functions, such as a cemetery or allotments.



Agriculture

In the rural areas there are some agricultural activities. However, over the years these activities have been decreasing.



Nature Reserve

The characteristic polder structure is part of the ecological network and a special protection zone based on the European Habitat regulations. These are also important recreation areas.



Recreation

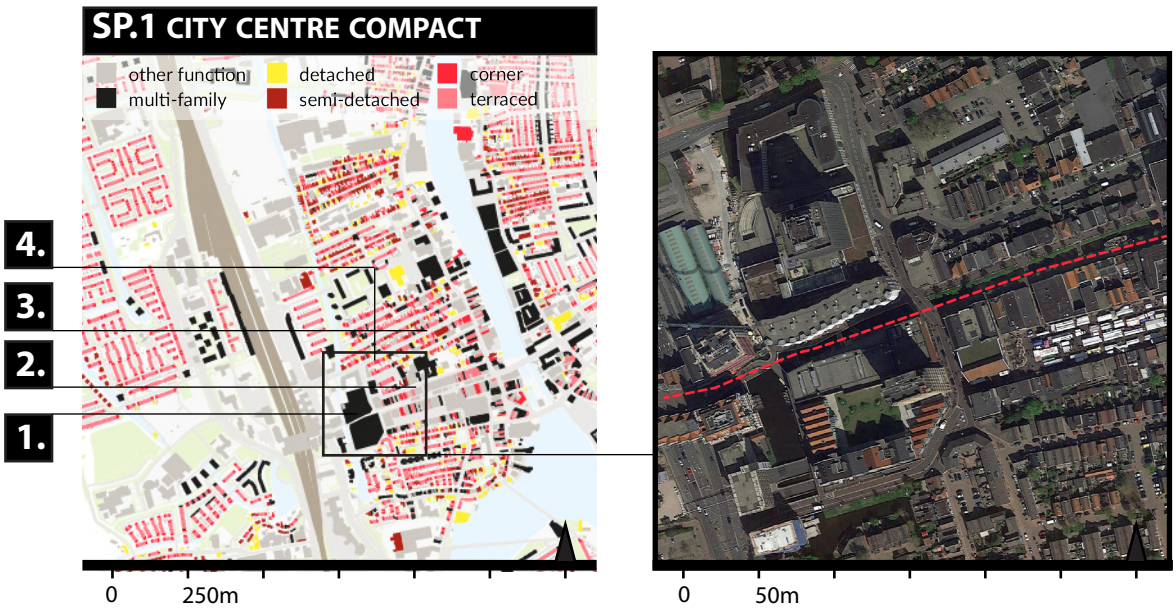
These natural landscapes have a special focus on facilitating recreational activities. Small beaches, lakes for water sports and recreational boats.



Sports

Larger sports parks are integrated within the built environment and facilitate different kinds of sports and recreation.

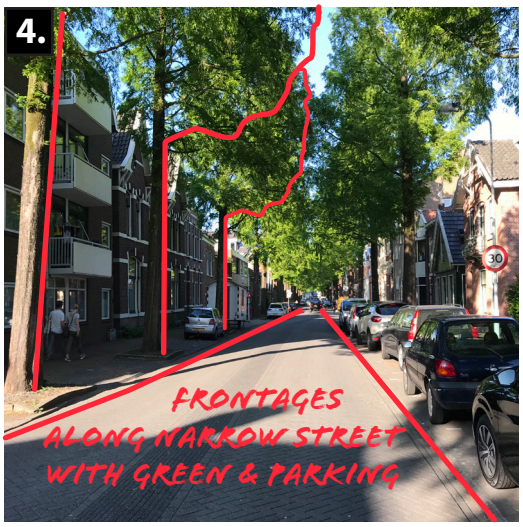
SP.1 CITY CENTRE COMPACT





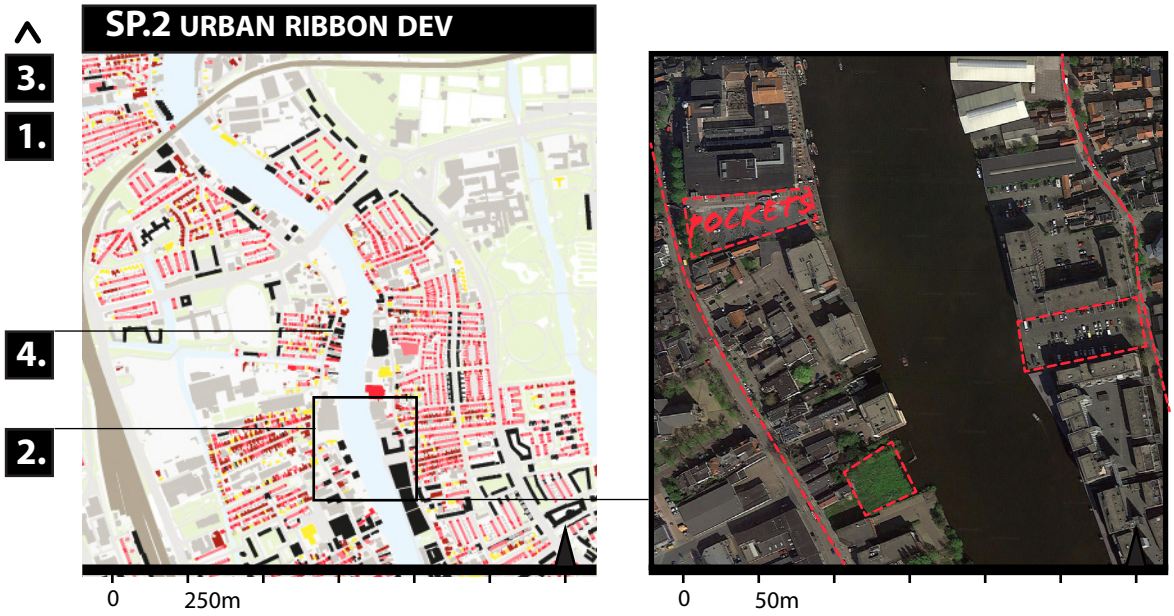






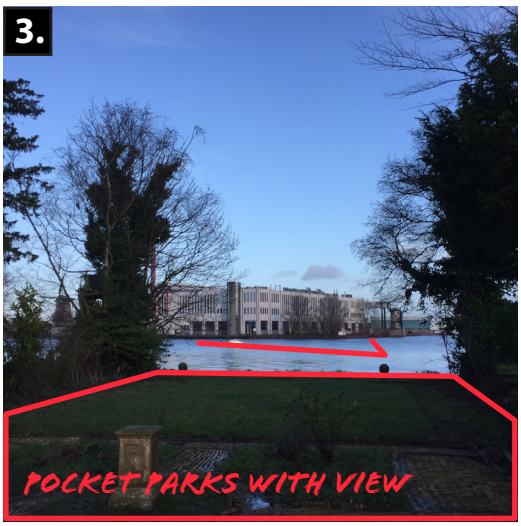
This area is relatively dense and there is high ground coverage as well. There diverse and large mix of functions present, mostly concentrated around the main station of Zaandam. With the exception of some new towers in general there is a lot of low rise. This means the public space is very compact and street profiles are also relatively narrow, there is little space for the car. However, in close proximity there are sufficient public transport options. Compared to most of Zaandam the city centre is the least green. There is some blue, after the restructuring and renovation of the city centre, the historic waterway has been reintroduced that was reclaimed for more space for the car. The main street is where all the representative fronts and entrances are for the shops, offices and other services and facilities. There is also a clear backside for loading and parking and access to storages.

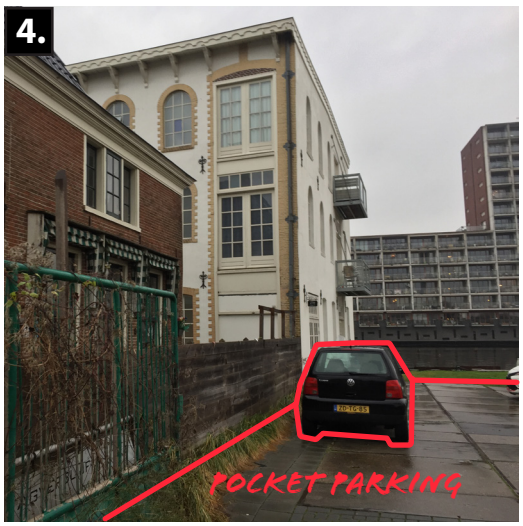
SP.2 URBAN RIBBON DEV







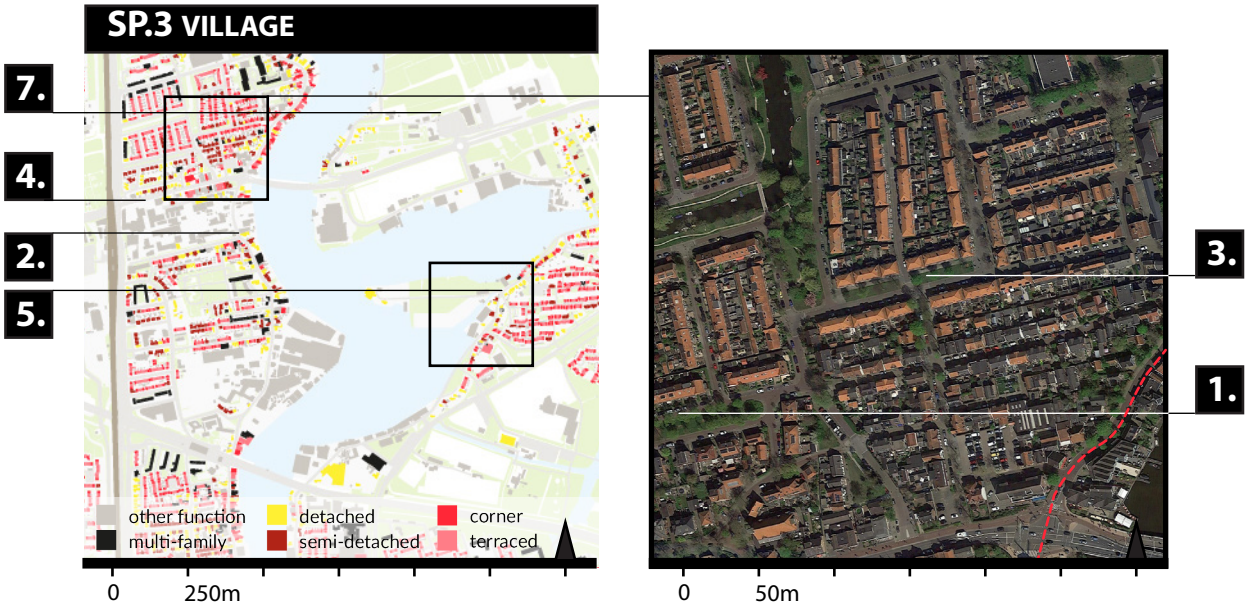




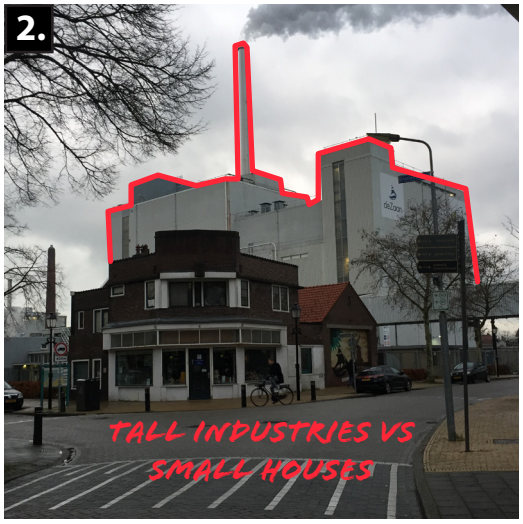
The urban ribbon development is situated along both sides of the Zaan river and is similar to the village profile. What distinguishes it, is its close relation to the city centre and its urbanity. Overall, the urban ribbons are more dense with diverse building ages. In some parts housing with an FSI of 2-5 has been developed (background 4.). Functions are mostly situated along the street of the urban ribbon. The street forms the main connection and route to the city centre. In general both sides of the streets have buildings. Some sites along the Zaan are vacant or left as open space for a pocket park or for parking. These create spaces create a visual connection with the river (photo 3.&4.).

Source: map: google maps satellite view - street views: own photos

SP.3 VILLAGE





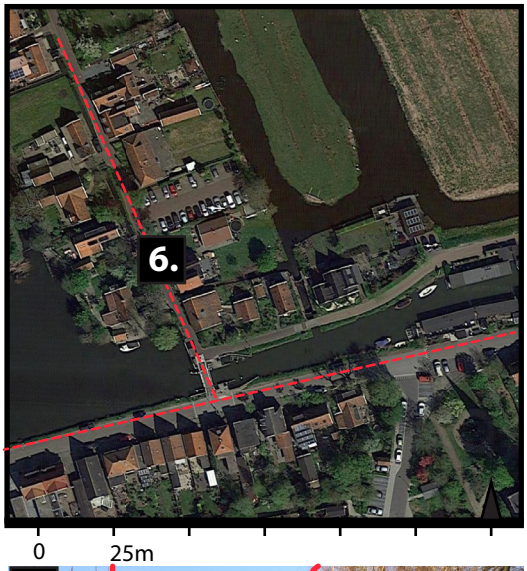


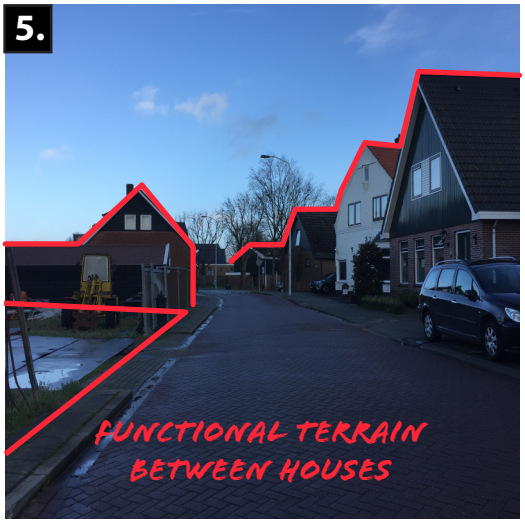


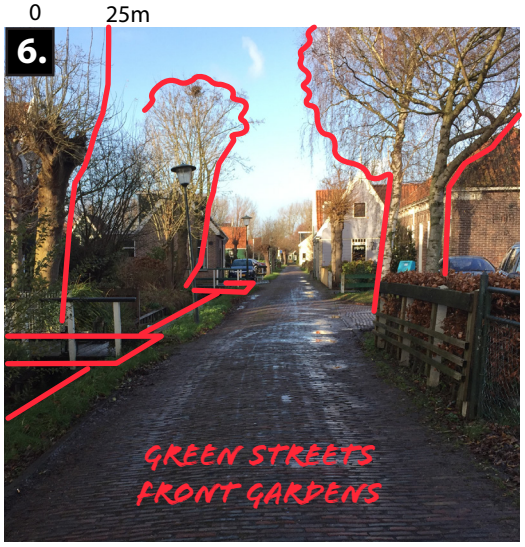


The villages are usually connected with the ribbon developments along the road network which have expanded into villages especially along the river Zaan. The villages of Zaanstad are characteristic for their mix, have relatively high overall density due to high ground coverage and have a diversity of building ages. The ribbon along the Zaan forms the main connection between the different neighbourhoods. Housing consists of low-rise mainly, industries literally stand out. Industrial buildings and housing are situated directly next to each other, with limited transition spaces. Accessibility by car is reasonable. There are good public transportation options. The more residential neighbourhoods are mostly workers homes or row houses. Some street have a more green character with small patches of green along them. Others are narrow and grey.







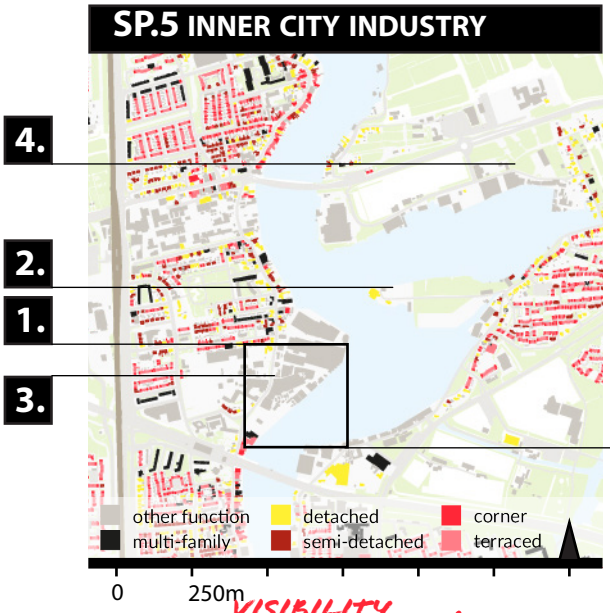


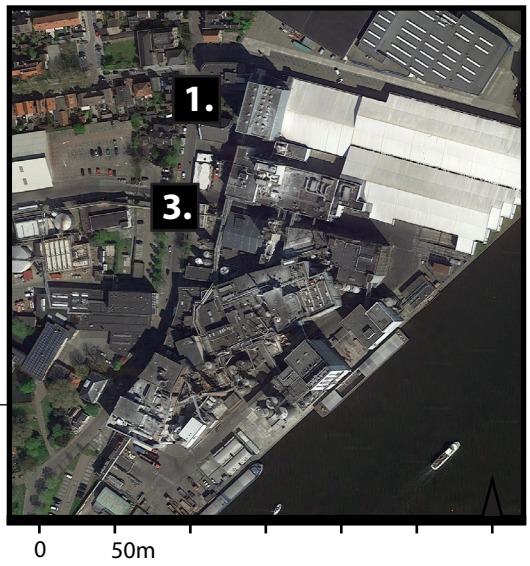


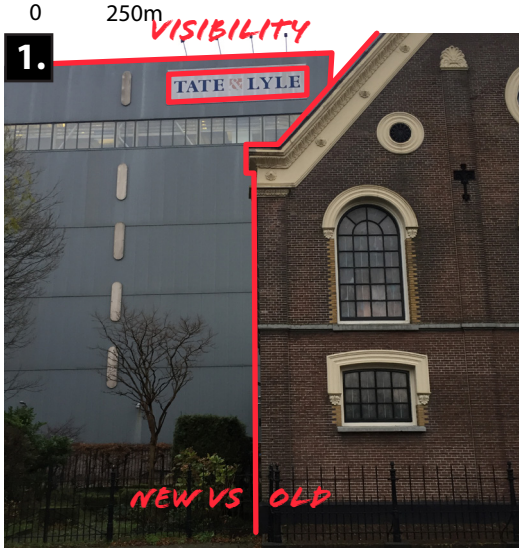


On the east side of the Zaan some parts of the ribbon developments have also have expanded with some residential areas along it. The public space and surroundings are very green and blue, as they are situated along natural reserves and the river. At the same time, the ribbon developments are mainly residential while also directly situated next to inner-city industrial areas. Trucks of the logistical flows of the industries drive, turn and park in the narrow streets. Other parts are mixed horizontally with other functions, that include some terrain around their building between the houses.

SP.5 INNER CITY INDUSTRY

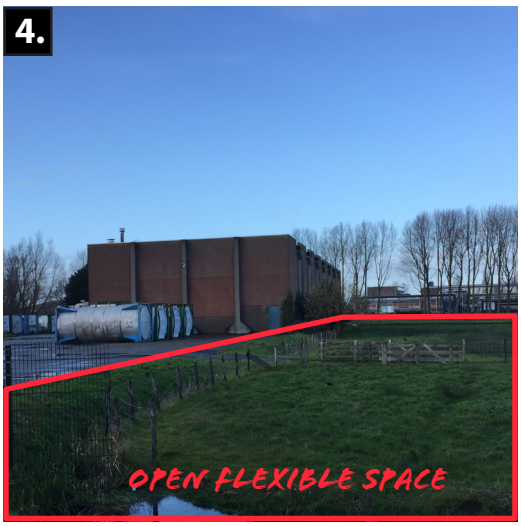






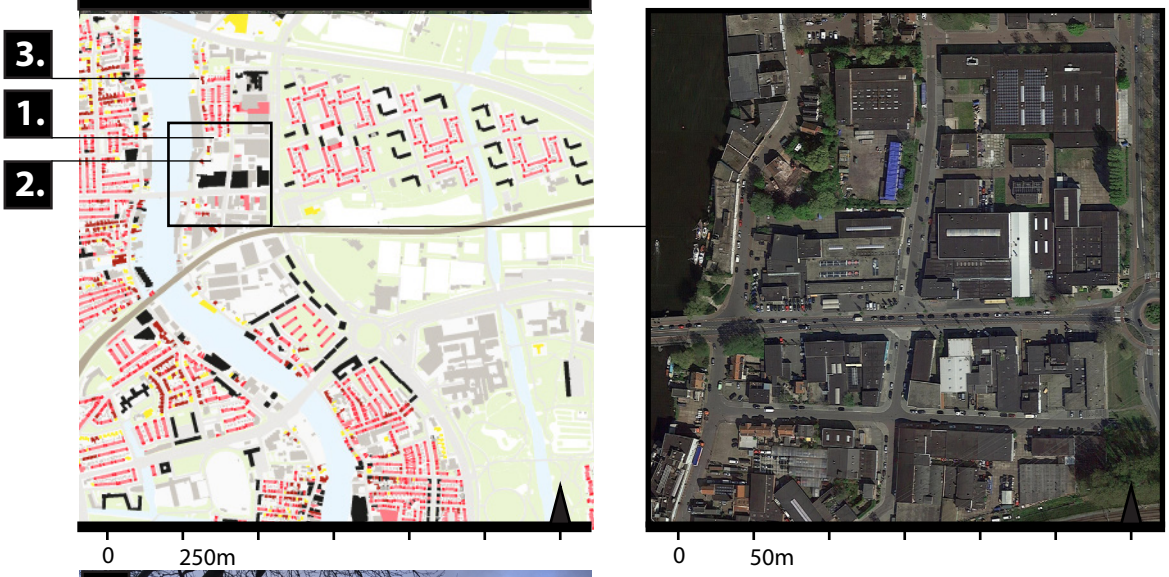




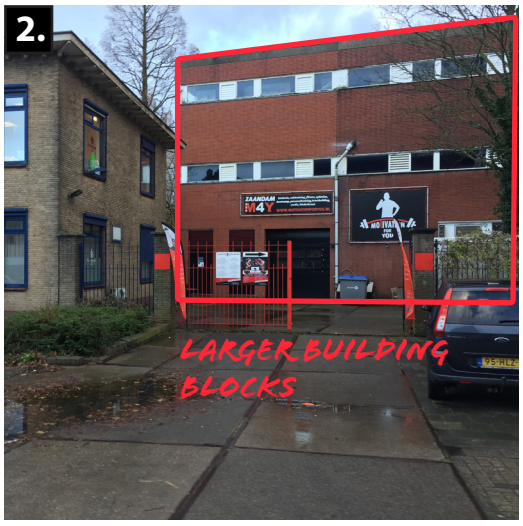


The inner-city industrial areas are an important historic component of the city and form the characteristic skyline and image of the city (photo 1. & 2.). They are situated along the (urban) ribbon developments and are part of the village profile. In contrast to the low-rise residential areas, the industries stand out in form and architecture. Accessibility by car is reasonable, while accessibility by public transportation and bicycle is good. Here also, a difference can be seen on the East and West side of the Zaan river. While the West side has compact industrial areas where trucks can be seen parking or turning in narrow streets. The East side has quite some space left, adjacent to the industries there are green pastures (photo 4.).

SP.6 MIXEDWORKINGDISTRICT





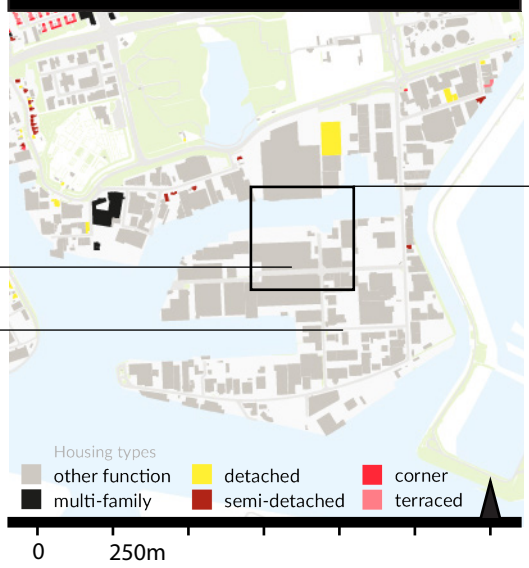


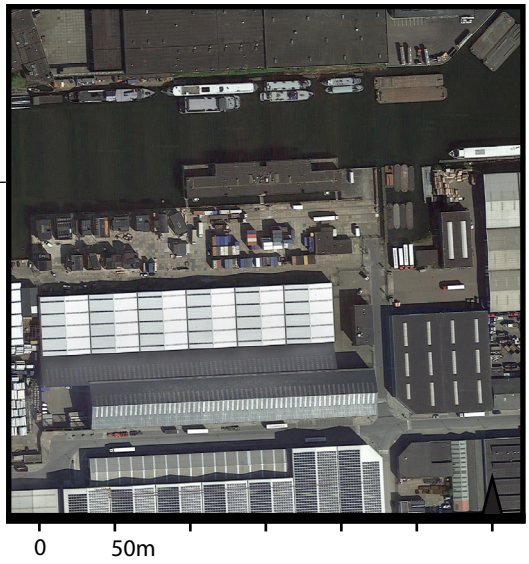


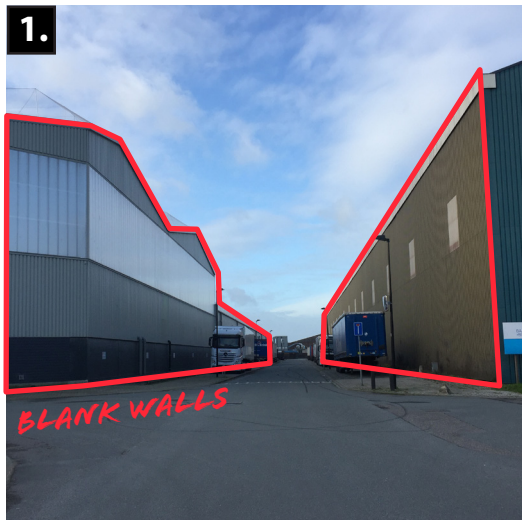


In the mixed working district industries and businesses with environmental category 1-3 are accepted. In the city plan it is also planned as a business and mixed areas. Housing and businesses are situated directly next to each other. Accessibility by public transportation and bicycle is good for the ones situated along the Zaan river. The mixed-working districts near the Noordzeekanaal are less accessible by public transport, but are in proximity of the highway. In general there are a lot of parking spaces that form the transition between housing and industries. While industrial buildings have large facades that block views to the river.

SP.7 INDUSTRY & HARBOUR





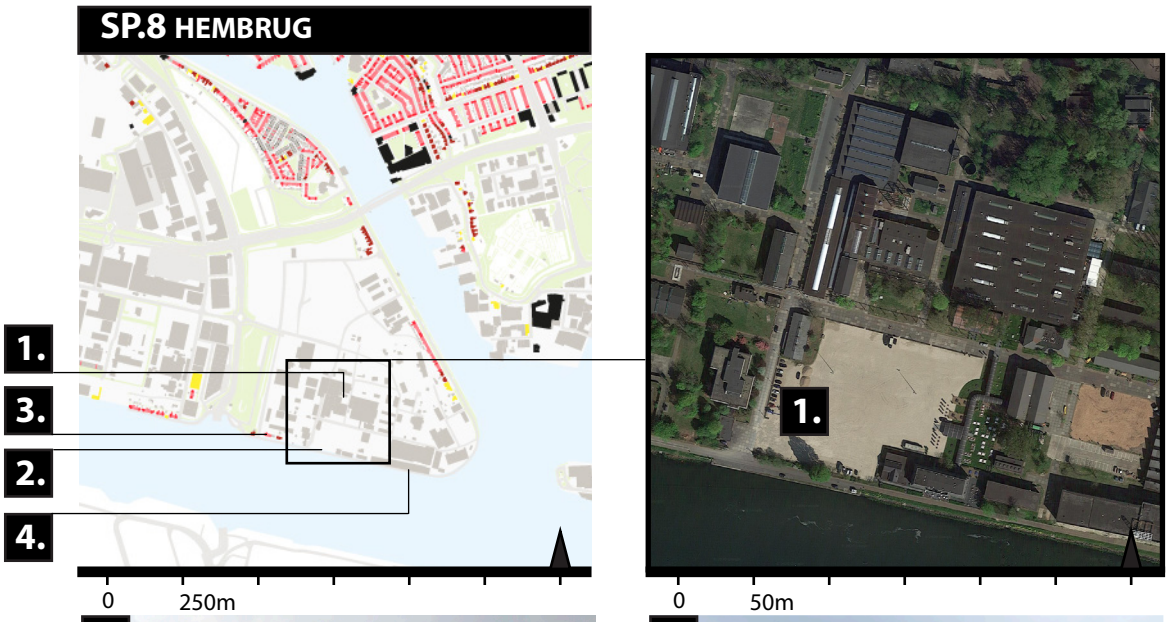






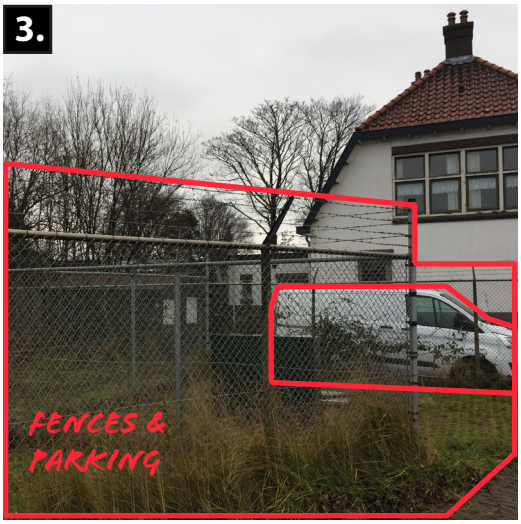


The industrial and harbour areas are situated along the Noordzeekanaal. As this area is set up as a classic industrial district, the public space is functional and there are a lot of large building footprints present separated from each other with fences. The main streets are spacious, clear with hardened surfaces. The representative front sides of industries are situated along these streets. When you turn into a side street it reveals messy backsides, parking lots for trucks etc. Some companies, use water transport for logistics. However, not all businesses there are harbour related, there are industries situated in the area with an environmental category ranging from 3-5. There is a large park, sports park, dyke and infrastructure separating the area from residential neighbourhoods. In general these areas are not easily accessible by public transport. But very accessible by car from the high way.





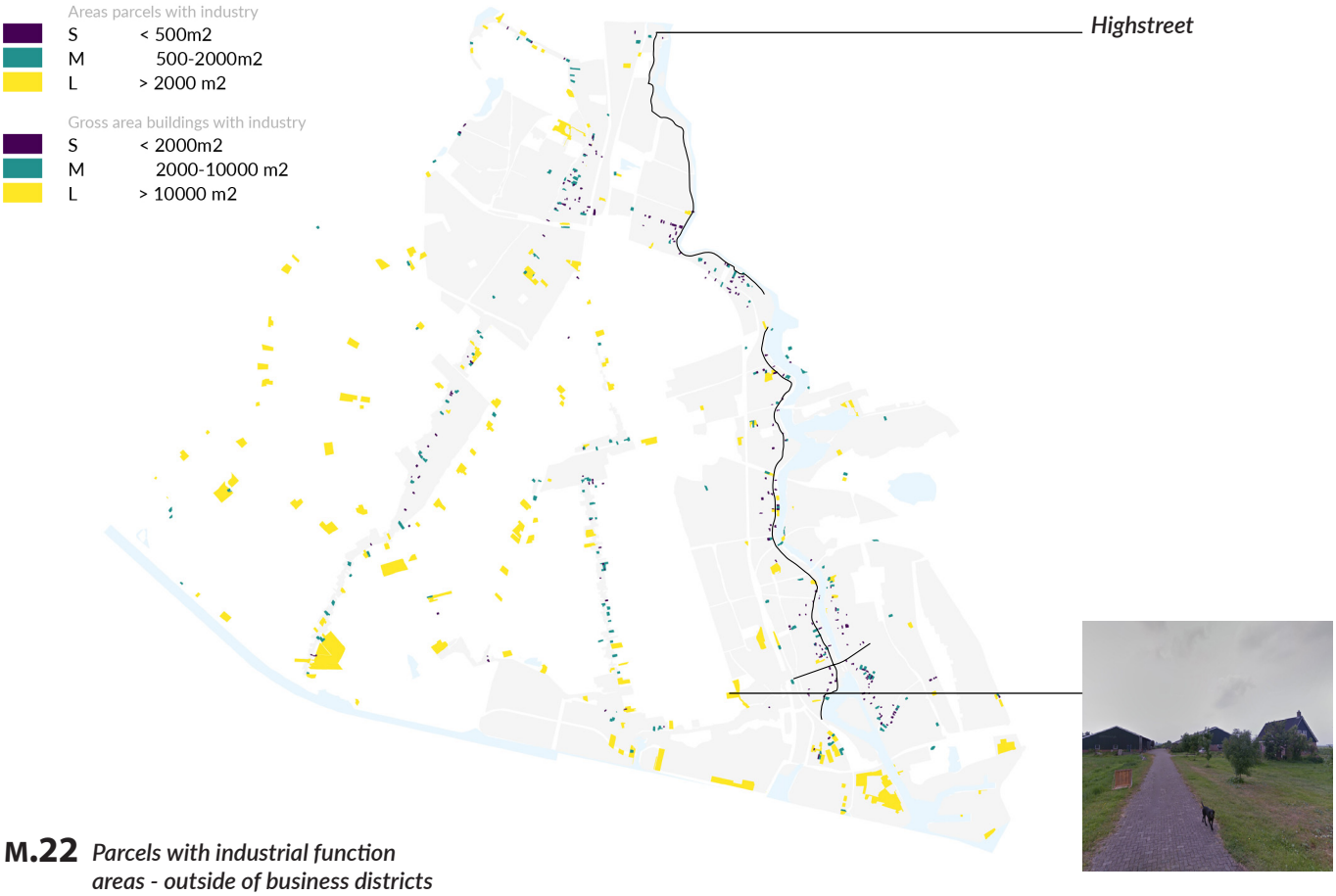




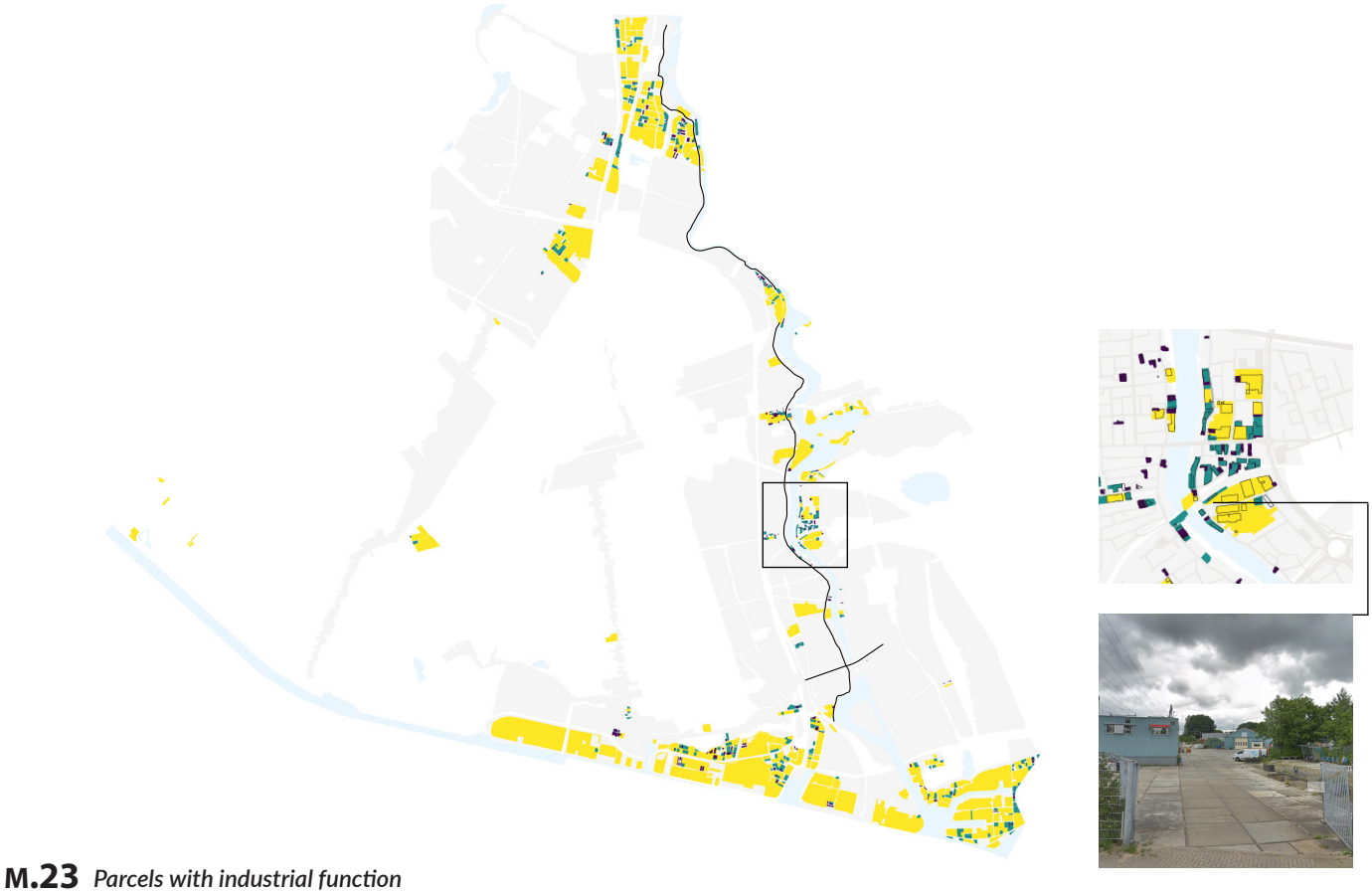


The Hembrug district is more particular, as it has a lot of historical (industrial) buildings and monuments. The functions in the area are mixed and but the footprints are generally smaller compared to the other industrial business districts. Housing and the industrial buildings are separated from each other by fences, parking lots, sheds, unmaintained grass fields or gardens with thick hedges and trees around them. Creative businesses have settled in the former industrial building that are clustered together. A large open space remains available as public space or for planned events. The edges along the water are relatively green and give panoramic views over the water. More inward, the terrain is somewhat functional. Accessibility by car is reasonable, but the ferry to Amsterdam is what gives this area potential for development.

5. SPATIAL MANIFESTATION OF INDUSTRIES - MAPS

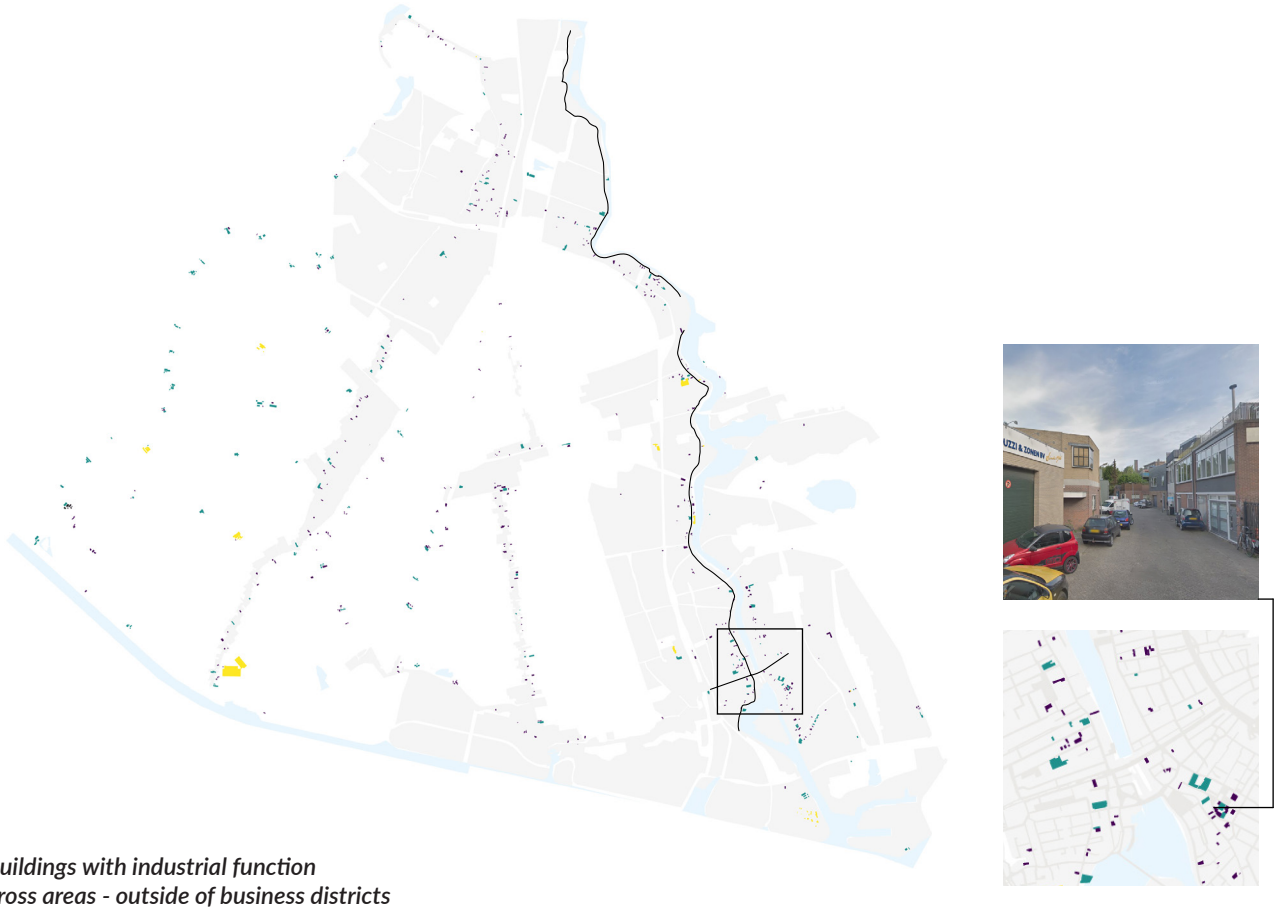


M.22 *Parcels with industrial function areas - outside of business districts*



M.23 *Parcels with industrial function areas - on business districts*

0 1km 10km



M.24 *Buildings with industrial function*
gross areas - outside of business districts

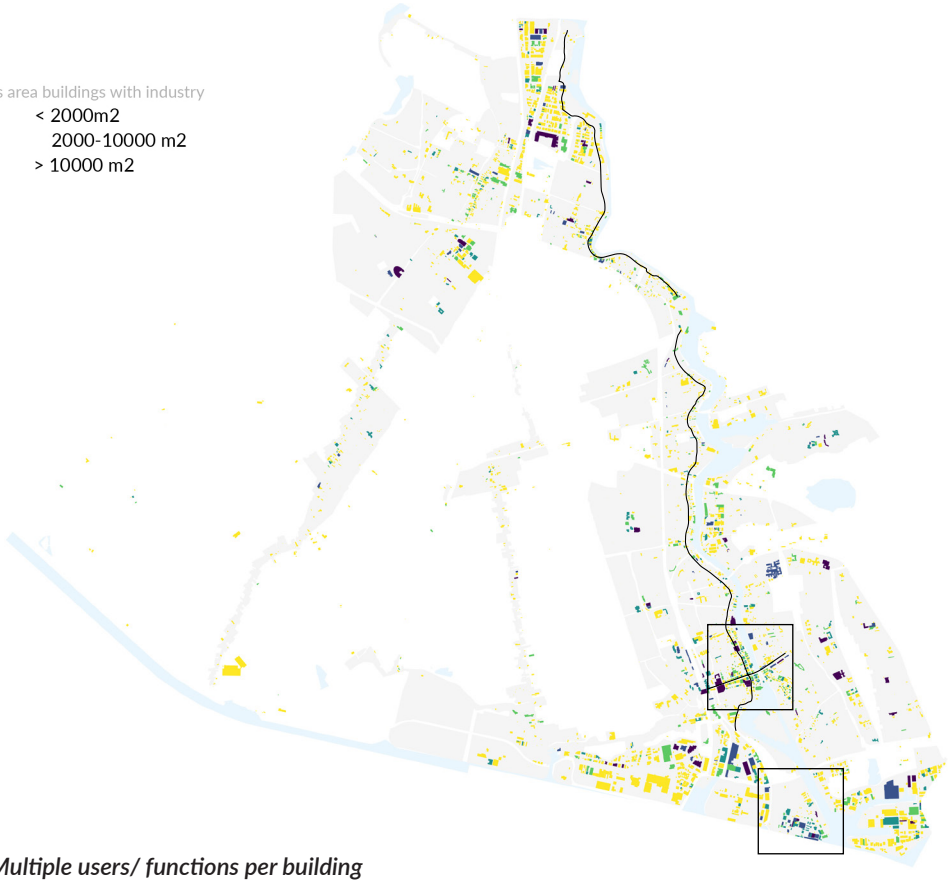


M.25 *Buildings with industrial function*
gross areas - on business districts

Source maps: QGIS adaptation of BAG3D and BAGverblijfsobjecten geodata; photos: Google streetview

Amount of functions per building
- >10
- 6-10
- 3-5
- 2
- 1

Gross area buildings with industry
- S < 2000m2
- M 2000-10000 m2
- L > 10000 m2



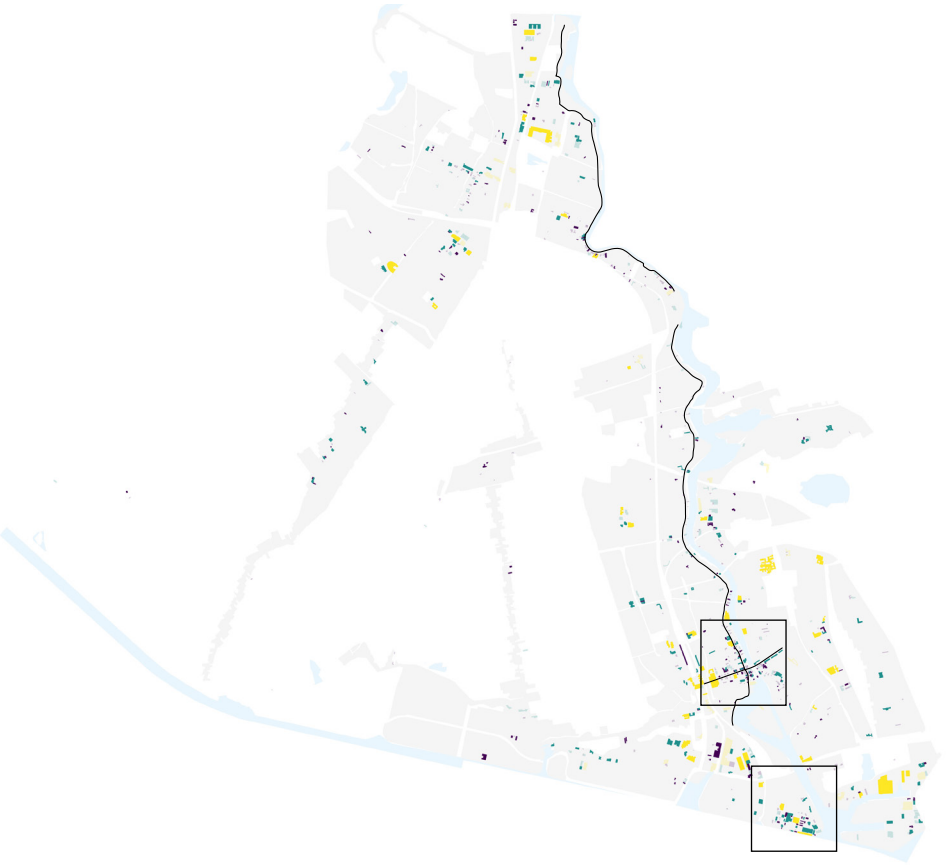




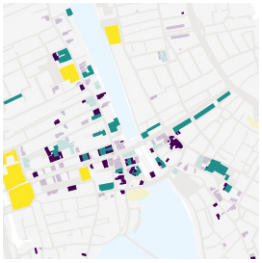


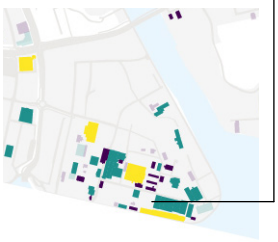
M.26 *Multiple users/ functions per building*

* Housing is not included in the calculation of multiple functions









M.27 *Buildings with 2 or more users/ functions*
sizes based on gross floor area of buildings

0 1km 10km



M.28 *Housing mixed with other functions and industry building sizes SML footprint area*



M.29 *Functions other than industry building sizes SML of gross floor area*

* Area of buildings is used for housing that is mixed with other functions
Gross floor area of buildings that only contain other functions

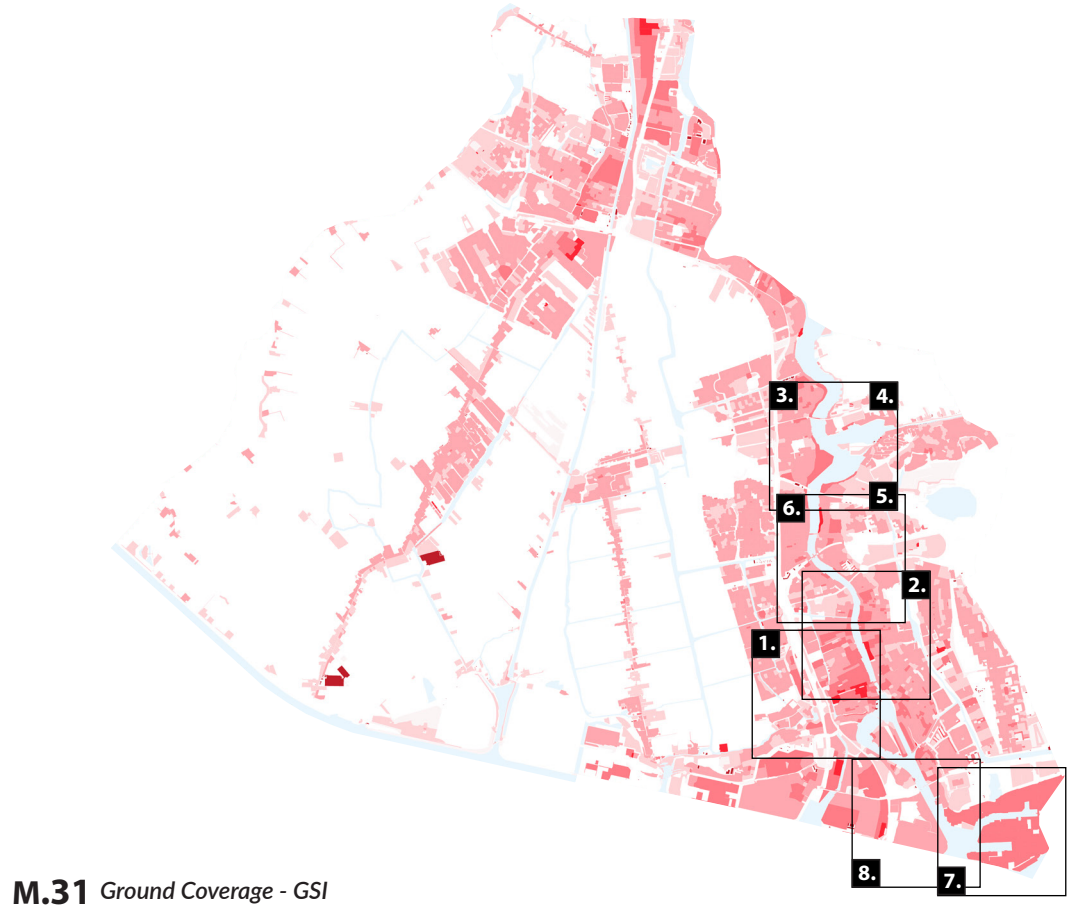
Source maps: QGIS adaptation of BAG3D and BAGverblijfsobjecten geodata; photos: Google street view

The 6 different squares frame 8 different spatial profiles referred to later in the chapter where these locations are analysed more in depth.

6. PRELIMINARY ANALYSIS - MAPS

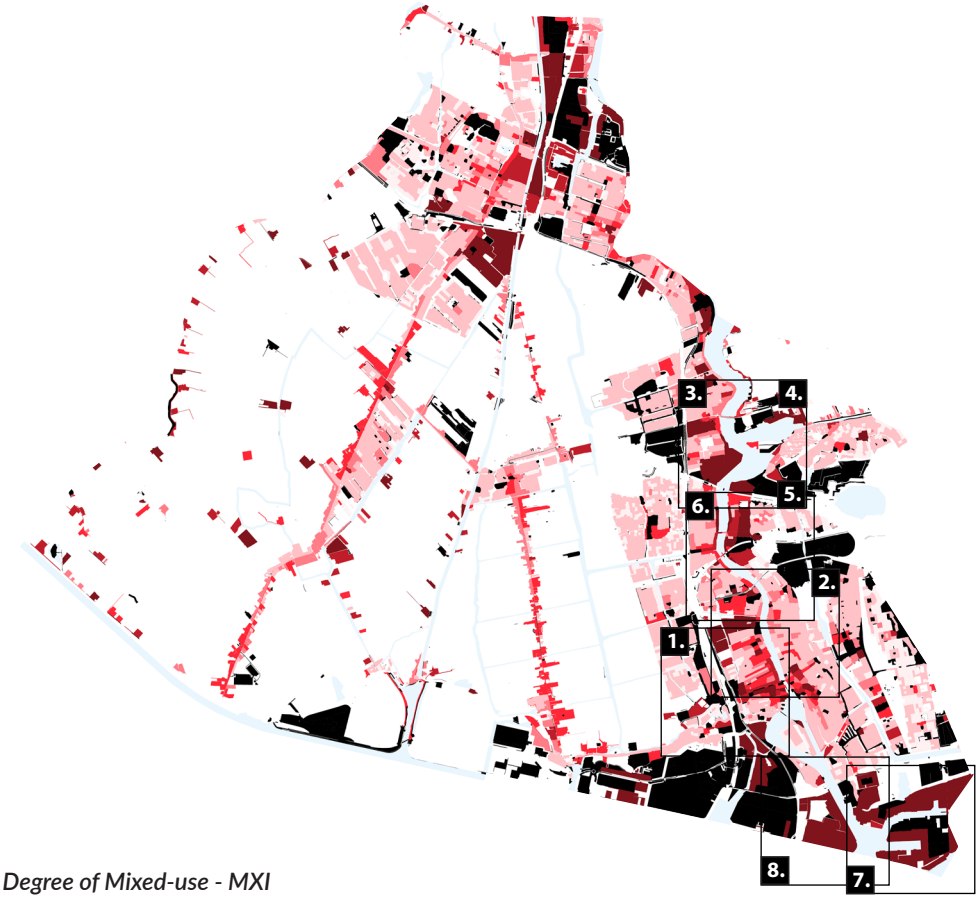


M.30 *Density - FSI*



M.31 *Ground Coverage - GSI*

0 1km 10km



M.32 *Degree of Mixed-use - MXI*

Density and Diversity

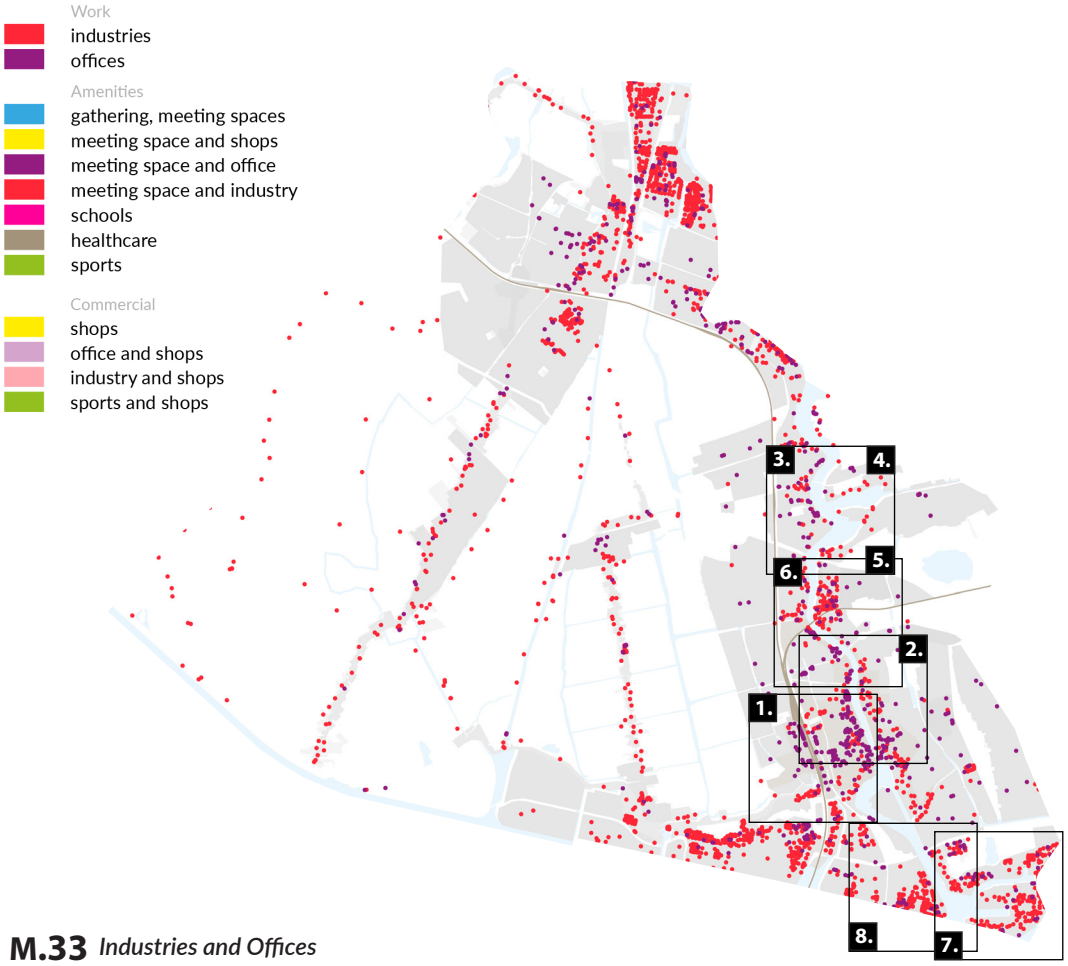
The density of Zaanstad is not really high. Due to the its green and open character in the residential neighbourhoods.

The MXI analysis shows to what degree the blocks are mixed. With a MXI of 1 meaning predominantly residential uses and of 0 meaning predominantly other functions than housing. Approximately a 50-50 balance of residential uses and other functions is seen in the blocks marked bright red (MXI 0,4-0,6). Notably, especially along the Zaan river already a lot of balanced mixed-use environments exist. Together with the rural ribbon developments. Historically Zaanstad developed and expanded along these ribbon developments, and now also function as highstreets.

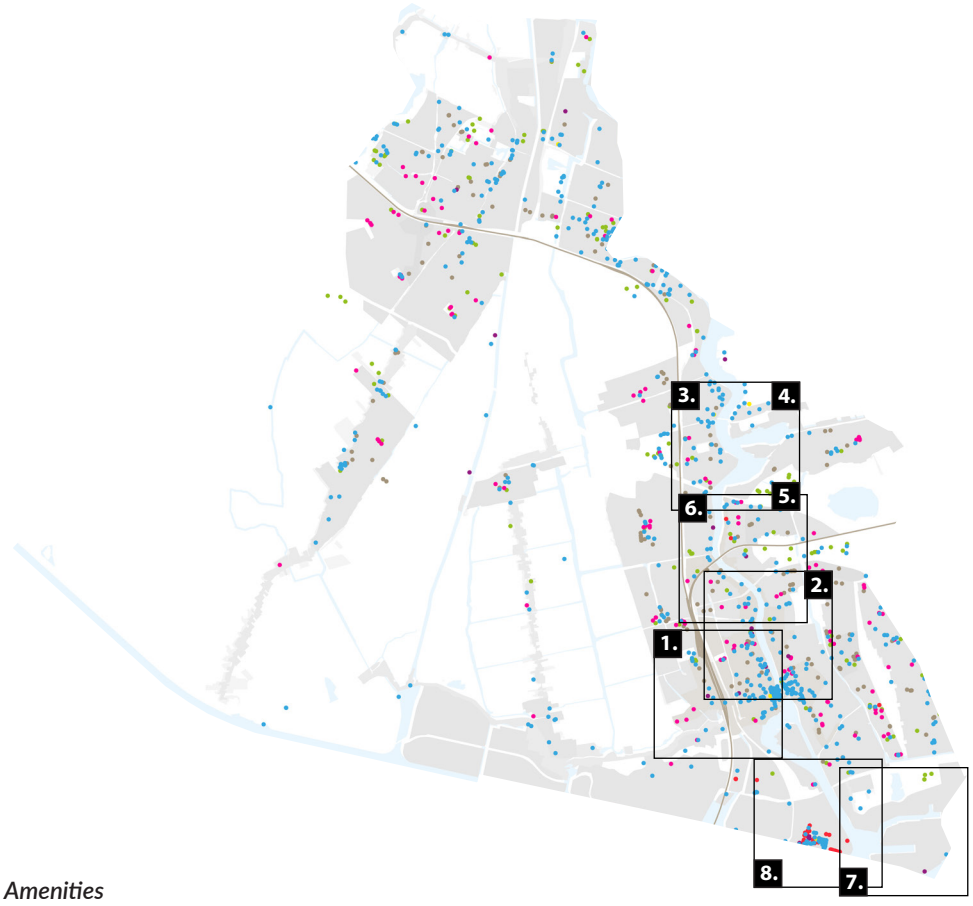
In the area Oud Koog and Zaanse Schans, on the west side of the Zaan river there is a higher FSI as well as GSI. In general the strips along the Zaan river have higher ground coverage and densities. The parks are not surprisingly mono-functional. Apart from those places, the whole area shows a very mixed environment. There are some smaller plots where more functions are mixed together. Larger areas are mixed to a certain degree. Either the balance shifts to housing while other larger plots have more functions with little housing.

The Achtersluispolder and Hembrug are both not very dense environments, however the GSI is relatively high. As these are industrial or business districts, there are a lot of large buildings with large footprints (SP.7, SP.8). In general there is not a diverse mix of function in these areas. Even the mixed zone appointed by the City plan (SP.7) in the top left corner of the Achtersluispolder neighbourhood is actually not very mixed. There is just small strip of housing along the dyke, that goes through the industrial area.

Source: PDOK datasets

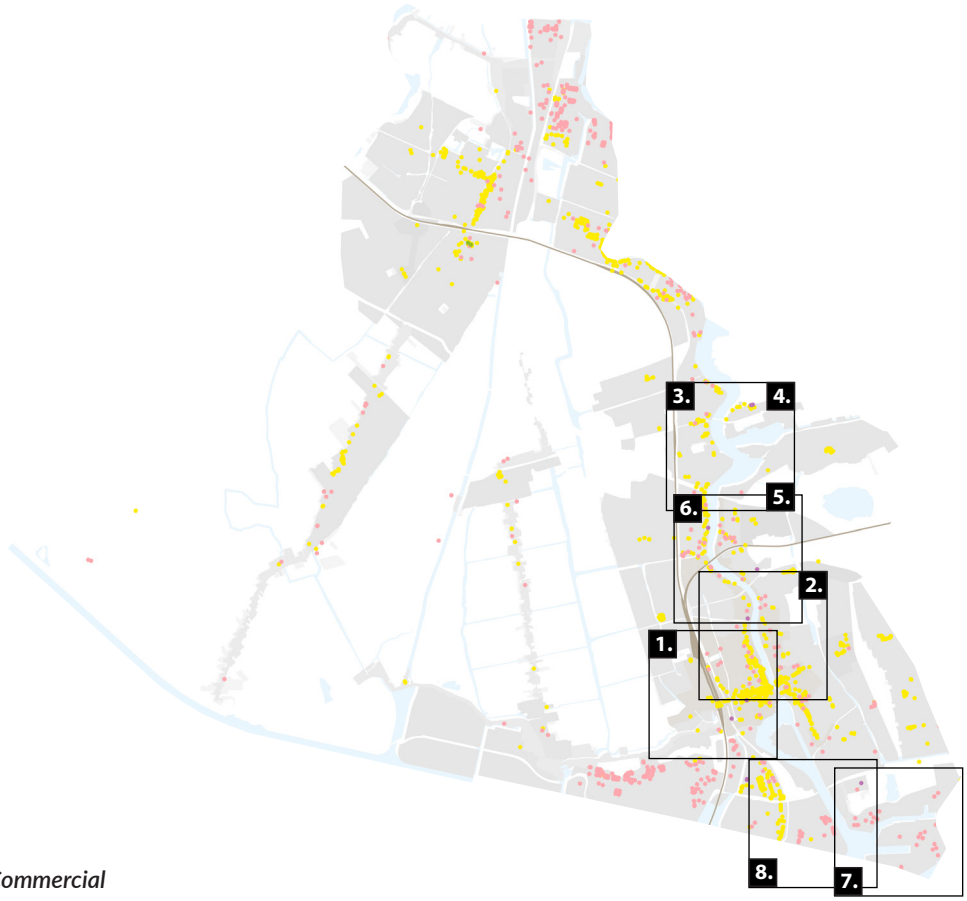


M.33 *Industries and Offices*



M.34 *Amenities*

0 1km 10km



M.35 *Commercial*

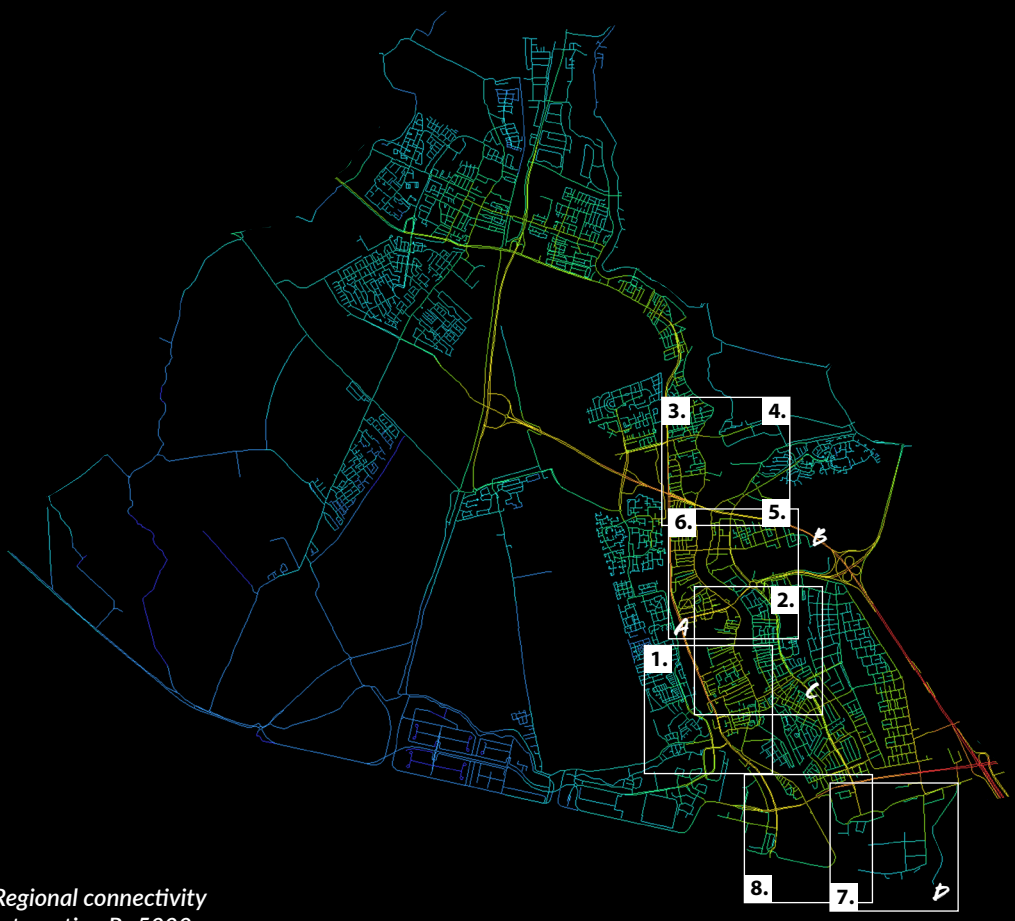
Dispersion of functions

Work clusters of offices appear in the city centre. Most of the industrial activities mainly take place on industrial districts. Some are clustered along the Zaan river.

Commercial attractors are predominantly along the highstreet and in the city centre. There are not many commercial activities present in Oud Koog and Kalf (3./4.). Neither in the expansion neighbourhoods, particularly on the other side of the railway. Notably, some large wholesale and outlet stores are clustered together in Zuiderhout (left top corner of 8.) along the main road leading to the Noord zee kanaal. Some industry related stores are present on business districts.

Amenities are relatively dispersed. Most of the amenities cluster along the highstreet and in the city centre. In the expansion neighbourhoods amenities are organised centrally in the neighbourhoods. Amenities are lacking in Southern business districts.

Source: PDOK datasets

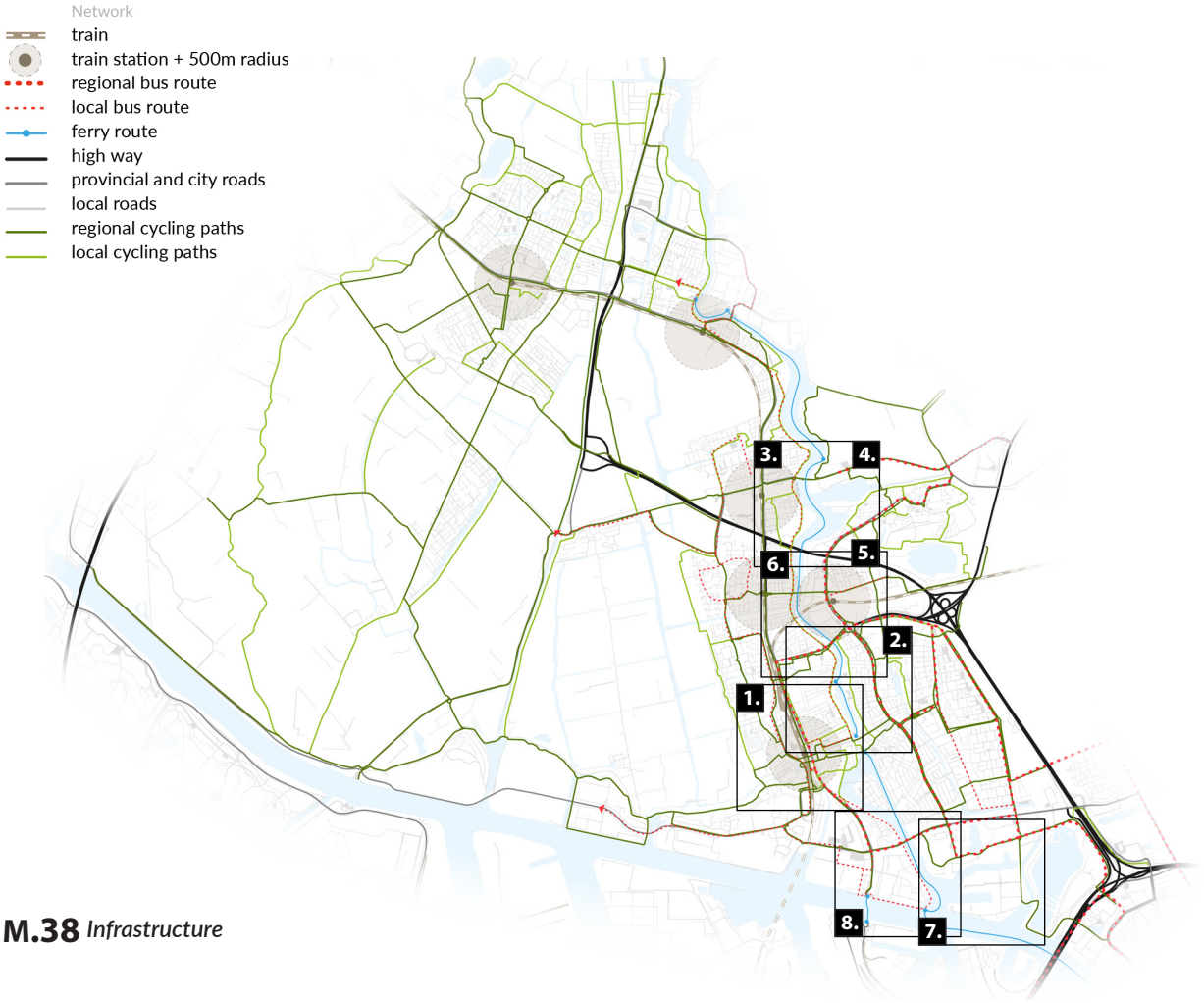


M.36 *Regional connectivity*
Integration R=5000m



M.37 *Local centralities*
Integration R= 400m

0 1km 10km



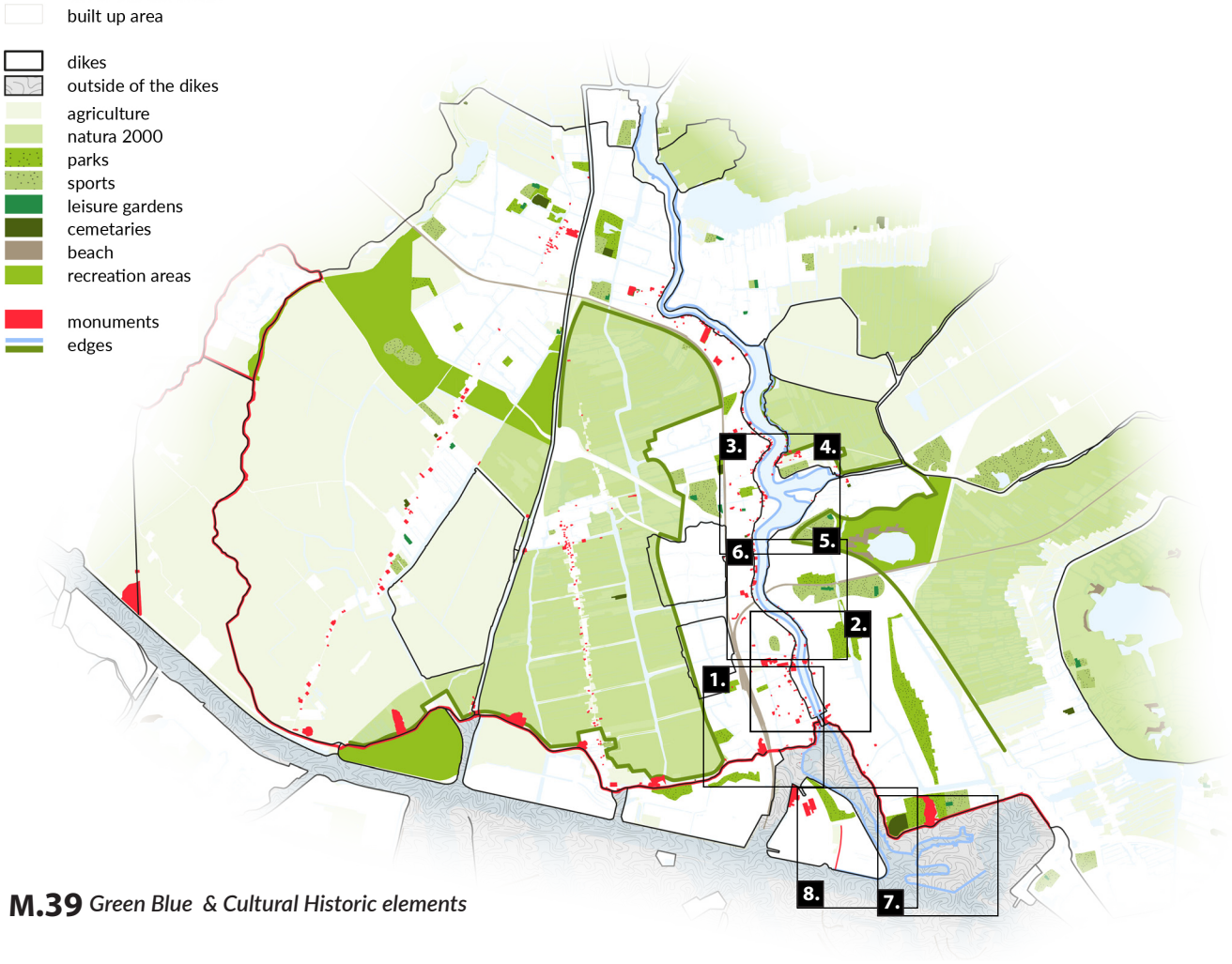
M.38 *Infrastructure*

Networks

The regional connectivity map shows the amount of transitions needed from one street segment to reach all the other street segments using the shortest route. All streets are considered to analyse movements of motorised vehicles. Segments further than 5000m are not considered. The most integrated streets are the ones that need the fewest turns to reach all other streets. This reveals which roads connect best to the rest of the city and region. Not surprisingly, the Provincialeweg (M.24 A.) and Coentunnelweg (A8 highway) (M.24 B.) are most integrated in Zaandam. Connections between the North and South of Zaandam are clear. The s155 (M.24 C.) is also relatively integrated in the North-South direction. The horizontal connections in the especially in the Northern part of Zaanstad are missing, Connections between East and West may need improvements, this is particularly evident in Achtersluispolder (M.24 D.).

The local centralities map shows the amount of transitions needed within 400m. Here the highways are not considered in the analysis and walking paths are added. This map shows the integration of streets and paths for non-motorised vehicles. From it the integration of particularly walking activity and can be determined. But also to some degree short cycling distances. Especially near the Zaanse Schans (M.25 B.), the analysis shows that the streets are not really integrated for walking activity. As a touristic attraction it is not really connected to the rest of the city. Again the Provincialeweg (M.25 A.) and the s155 (M.25 C.) appear to be important North-South connections and the bridges important cross overs of the Zaan river. While the streets parallel to the Zaan (M.25 D.) are more integrated near the city centre, they become less integrated further away from the city centre.

Source: PDOK datasets, Atlas Leefomgeving



M.39 *Green Blue & Cultural Historic elements*



M.40 *Noise and smell*

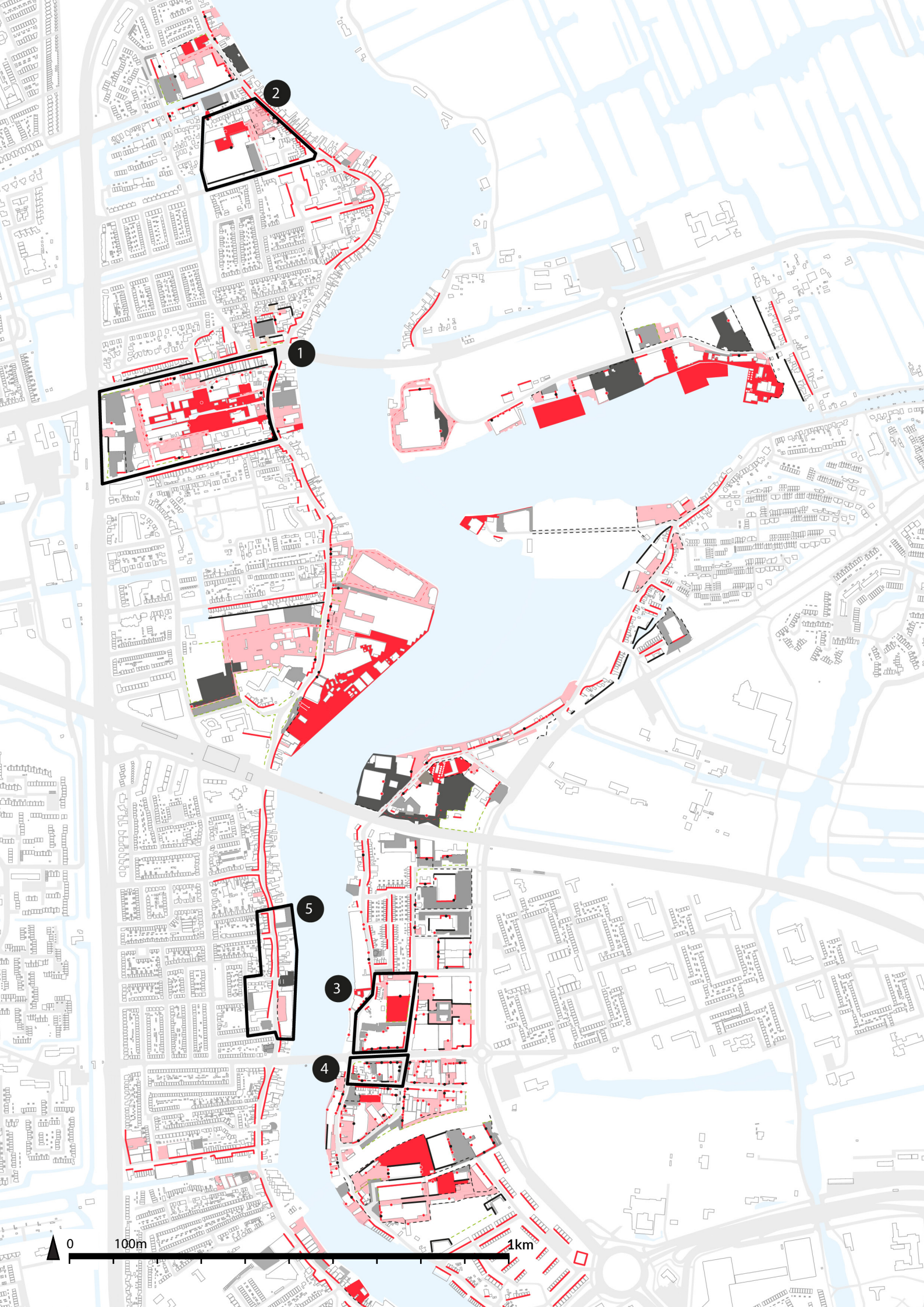


Environmental Quality

Historic monuments appear mainly along the dike and the old ribbon developments. Due to the natural reserves there are distinct water and landscape edges.

Achtersluispolder and the other business districts along the Noordzeekanaal with the exception of Hembrug are on the outer side of the dike, vulnerable to flooding.

Complaints of smell and noises arise mostly in the Zaandijk, Oud Koog, Kogerveld and Hembrug area. Hembrug is in the nuisance contour of the Harbour. The others are in close proximity of the highway, train track and inner city industries.

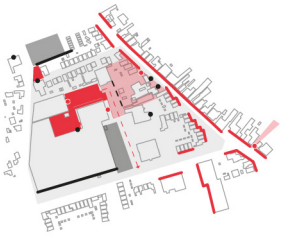

1
2
3
4
5
0
100m
1km

7. FRONTS AND BACKS

1 *Olam Cacao - Oud Koog - Oud Zaandijk*



2 *Pielkenrood Vaten - Zaandijk*



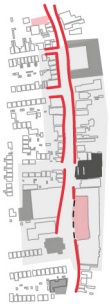
3 *Boerenjonkerbuurt*



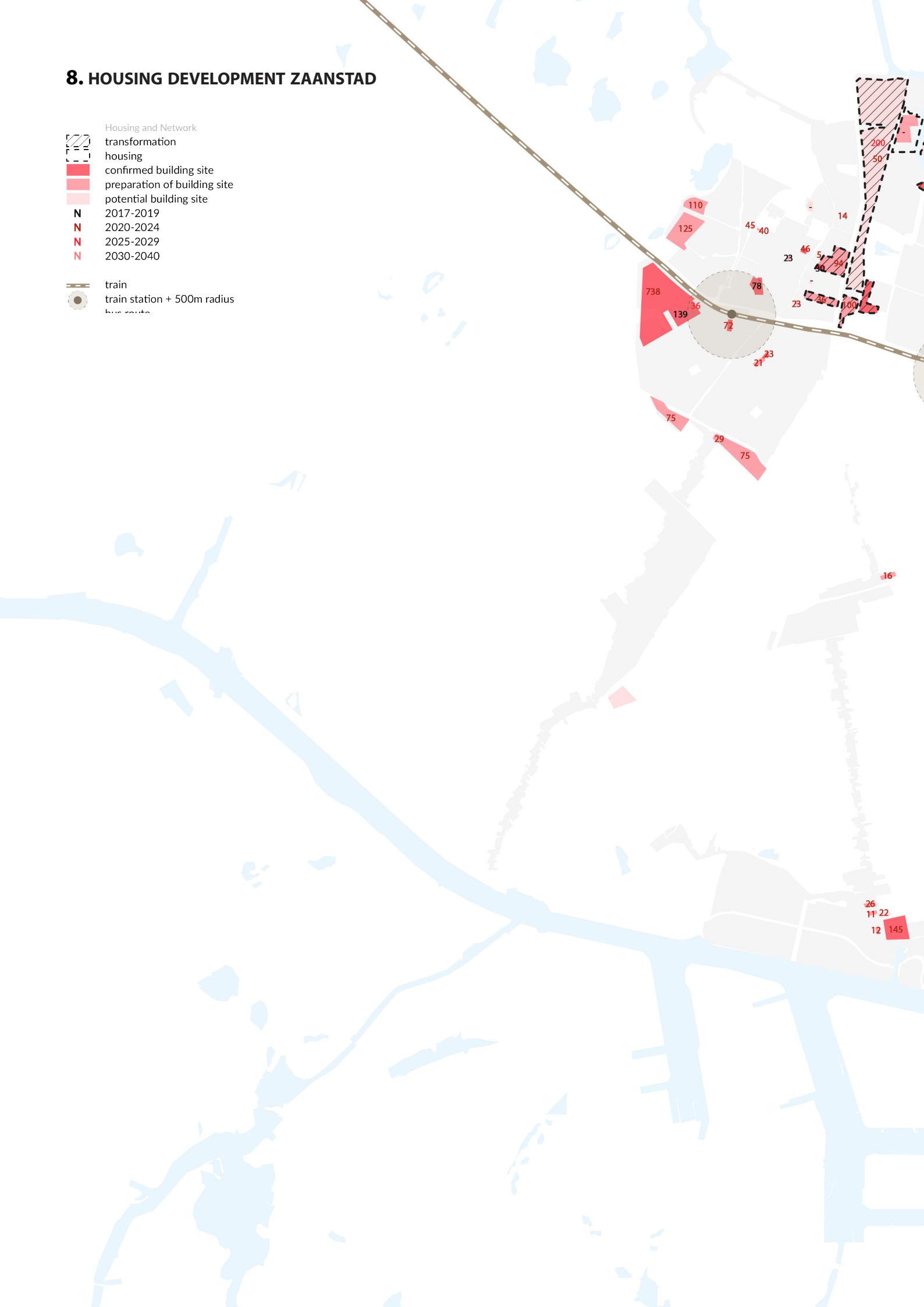
4 *Boerenjonkerbuurt*

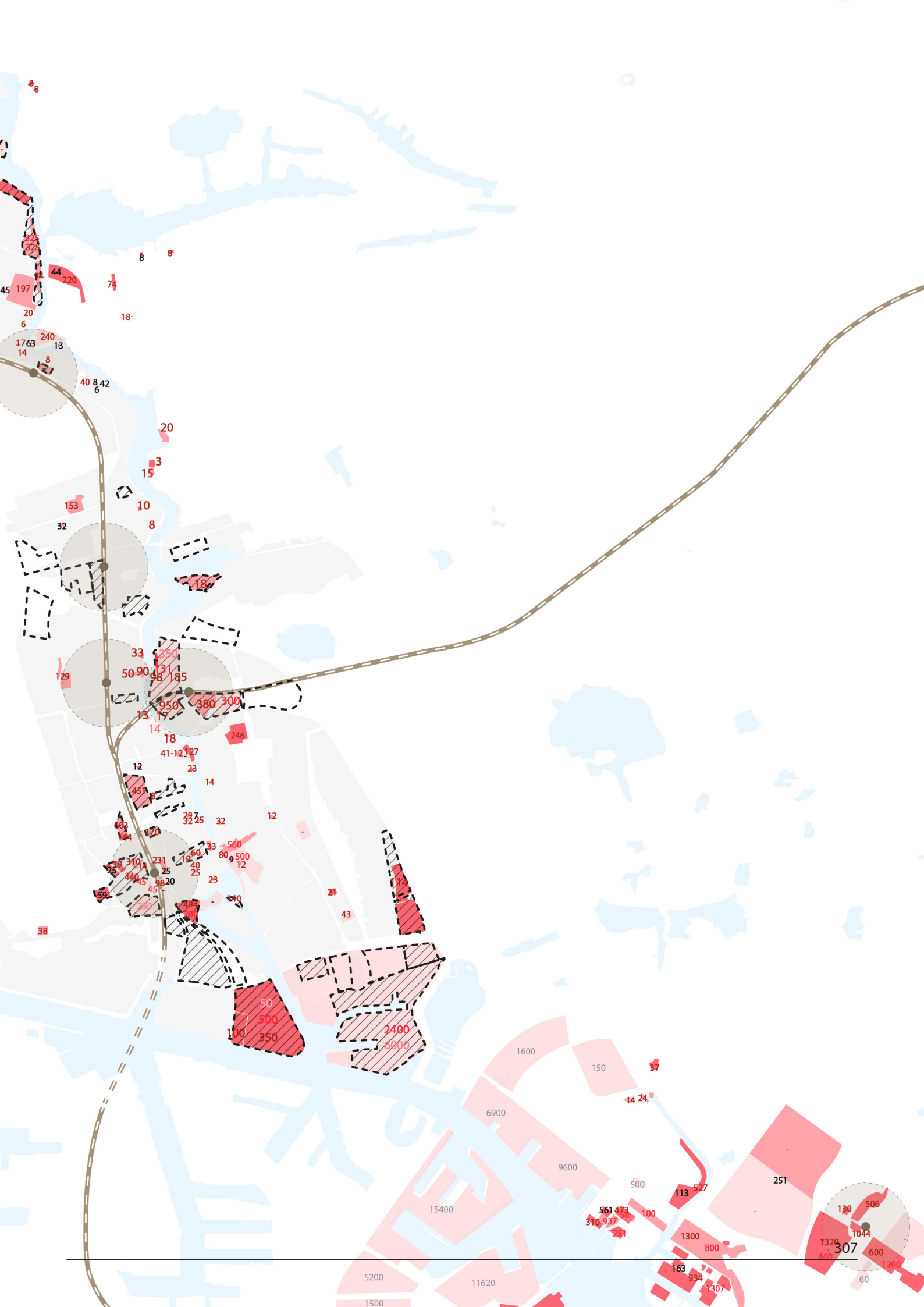


5 *Westzijde - Oud Koog*

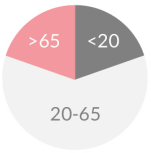


8. HOUSING DEVELOPMENT ZAANSTAD



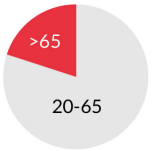


Average ages in Oud Koog/ Oud Zaandijk

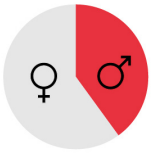


*survey outcomes**

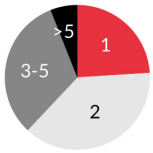
Age of survey participants



Men vs Women



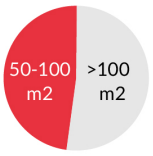
Amount of people in a home



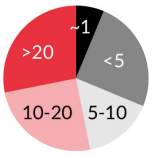
Dwelling size of participants

* Average satisfaction
50-100 m2 : 7,7
>100 m2 : 8,4

9



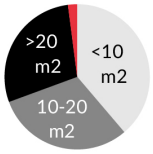
Years in current residence



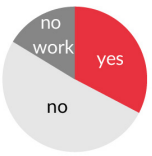
Garden, balcony or roof terrace size of participants

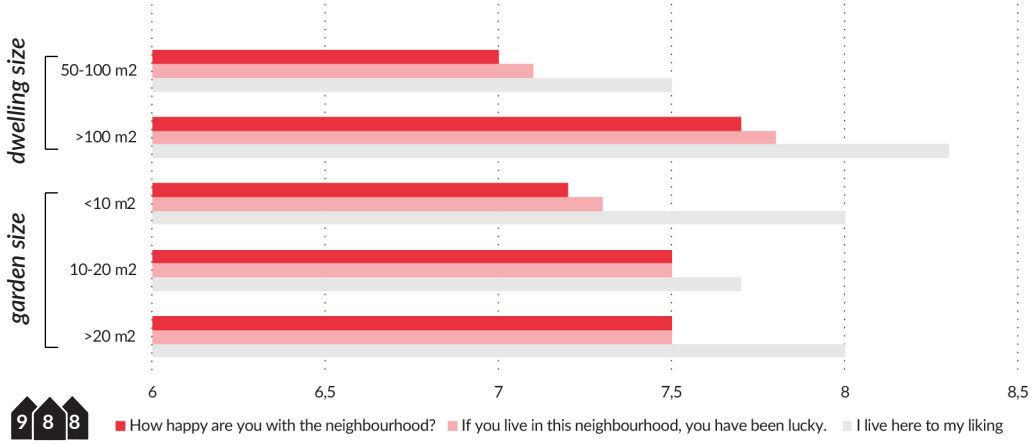
* Average satisfaction
<10 m2 : 7,4
10-20 m2 : 7,6
>20 m2 : 8,5

8



Works in the neighbourhood





9 8 8

* background information on participants

9. SURVEY INHABITANTS OF OUD KOOG - OUD ZAANDIJK

Introduction

An online survey was prepared with approximately 25 questions. The survey started with more general questions about demographics to provide background information for the other questions. The street of the resident of the participant was asked to compare the results of the survey with its proximity to certain industries.

Three statements were presented about the liveability of the area. The participants had to rate how much they agreed with the statement. Afterwards, questions were asked about the dimensions of their home, storage space and garden, and how satisfied the participant was with each. Other characteristics were asked such as, with how many people the participants lives and for how long they have lived there, and how far they have to travel for work. Which kinds or nuisances are experienced by the participant, when and from what.
More open questions were asked about what kinds of activities the participant wants to do in their own living environment and which aspects of the neighbourhood they are satisfied about. What kinds of spaces or amenities they are willing to with others. Finally, their perception to live-work environments and the businesses in their neighbourhood.

Who?

Most of the participants of the survey come from the Oud Koog and Oud Zaandijk neighbourhoods.
Compared to the averages of ages in both neighbourhoods, the age group under 20 is underrepresented in the results of this survey, and the group 20-65 a little over represented. Also women are overrepresented. According to the Municipality of Zaanstad, 40% of the households consists of 1 person. Meaning 1 person households are underrepresented in this survey. The amount of participants in 2 people households is similar to the average of Zaanstad for these two neighbourhoods. Leaving the 3-5 person and more households over represented in this survey.

All of the participants have a garden, of which 3 a balcony or roof terrace.

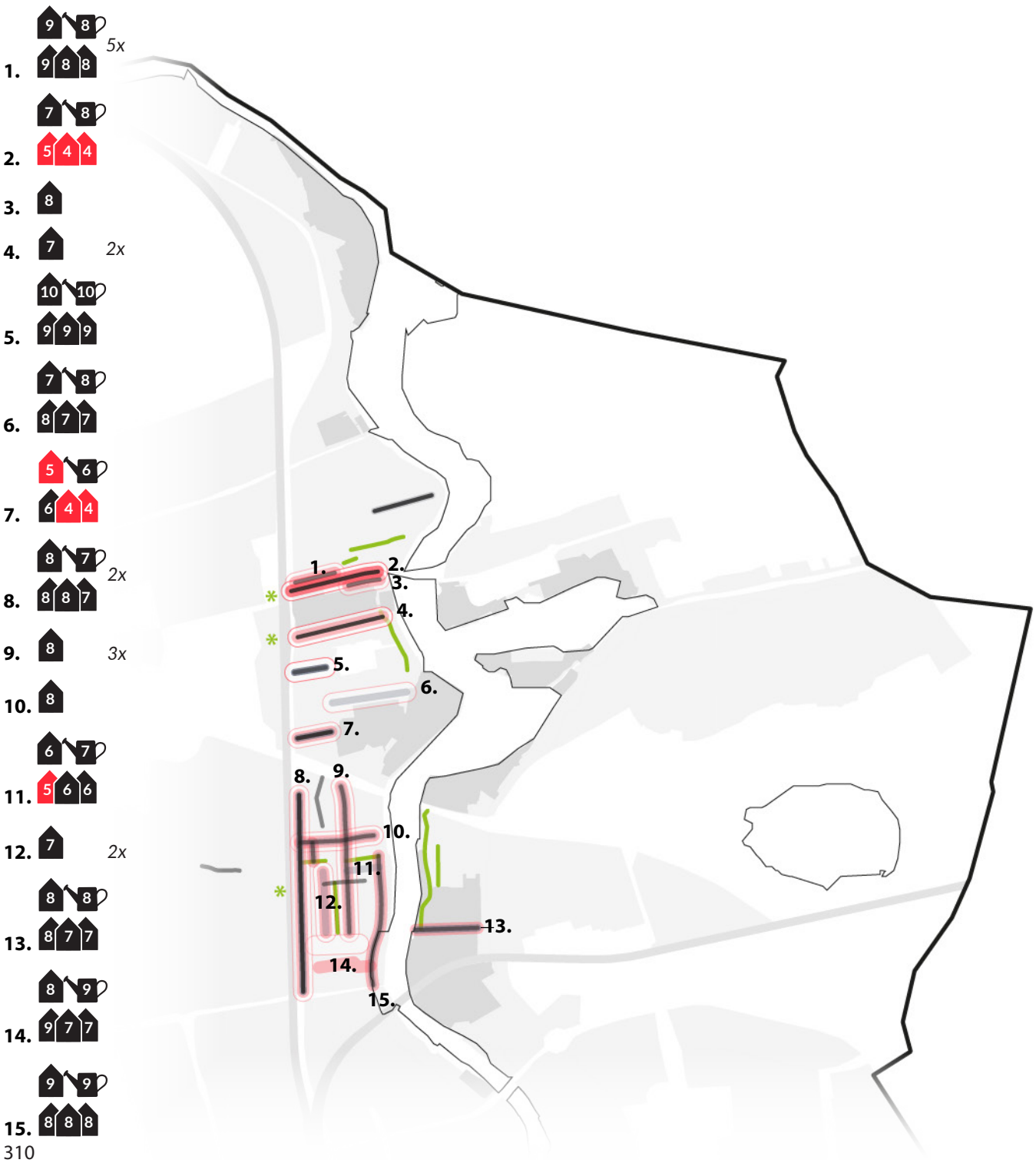
Most of the people who do not work are from the age group >65. Of the people who do work, about half does not work in the neighbourhood.

Neighbourhood and Dwelling satisfaction

When averaging the marks the participants have given based on their dwelling size or garden size, it can be analysed whether there is a relation between the size of people's homes or garden size and their satisfaction with their neighbourhood.

Not surprisingly the when the size of the home or garden increases the satisfaction of these two increase as well. Notably, people grade "I live here to my liking" higher than the statements mentioning the neighbourhood.

Unfortunately there were not any participants without a garden. Therefore it cannot be compared if the satisfaction of the neighbourhood is lower, if the participant does not have a garden.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2. 7 8 5 4 4
3. 8
4. 7 2x
5. 10 10 9 9 9
6. 7 8 8 7 7
7. 5 6 6 4 4
8. 8 7 2x 8 8 7
9. 8 3x
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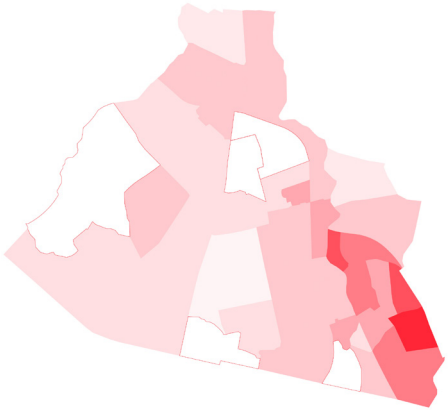
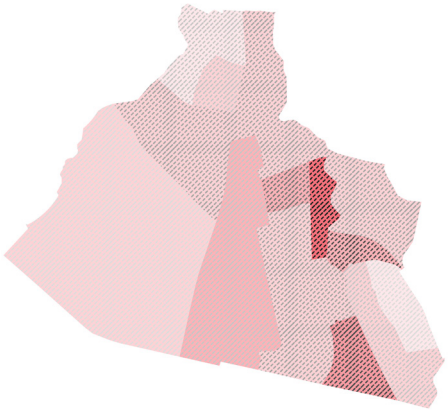


F.36 Liveability assessment by Leefbarometer



F.37 Smell and noise nuisance experienced

What and where are the nuisances?

Most of the participants of the survey come from the Oud Koog and Oud Zaandijk neighbourhoods. This is the most interesting area to investigate as according to F.36 and F.37, though it experiences the most smell and noise nuisance, people are in general assess the liveability as sufficient or largely sufficient. In the survey, only 3 of the 50 participants graded their living environment lower than 5.

Most participants experience nuisances from traffic and smell, and some of noise. Smell nuisances are through the whole neighbourhood. While noise nuisances mostly appear along the Guislaan.
The outcomes of the survey are similar to the liveability assessment and the noise and smell nuisance data. Though nuisances are experienced in this neighbourhood. Many participants are happy with their neighbourhood, home and garden.

People live there from **all age groups**.

Maybe lower housing prices?

A lot of shops in the neighbourhood.

Work close to home, so reduced travel time.

Diversity.

Less travel time and **less environmental impact.**

You can **walk or cycle to work**.

Everything is nearby!

Employment opportunities in the neighbourhood.

There are no benefits except reduced travel time.

Diverse inhabitants.



BENEFITS

Close to public transportation, highway and city with all the amenities, but still has a **small and inviting village atmosphere** with a school and some amenities in the neighbourhood.

No idea.

Interesting.

You can **experience** that something is happening.

There is **always something to do**.

Income.

I don't know.

Dynamic environment.

Changing commotion.

Less boring during the day.

Opportunity to distribute **residual heat** from industries to homes as a sustainable option.

It is **the nature of this city** where I live, its origin is immutable. Industry is where income arises from.

Always **lively**.

Constant movement of people, it is not a dormant village.

There is always noise.

I don't mind.

CONCERNS



Messy.

Trucks and smell nuisances from factories are accepted. Tourism is increasing!

Less privacy.

Dust, smells, noises.

Large traffic, sometimes smell nuisances.

Relatively high density.

Less social control.

Sometimes noise, smell nuisances and it is not a nice view! I don't call it a nuisance, I knew where I was going to live.

Parking problems.

Traffic nuisances, driving too fast, rush hour, no safe cycling routes for children from home to school.

Really depends on type of work activity.

Trucks, potentially dangerous.

Work and private life need to be separated

Not enough peace and quiet.

Pollutions from industries, highway going through the village and air quality.

Busy.

Undesirable living environment, Ugly buildings. The factories and businesses do not contribute to the esthetic values of the environment.

PERCEPTIONS

Left: of live - work environments in Koog aan de Zaan

Of companies in the neighbourhood

“Some companies are too big, but I cannot complain because they have been here longer than me.”

“I have lived here my whole life so I am used to it. “

“They have been here for so long, it is part of the Zaanstreek.”

“I think the companies are fine, I like the combination of different architectural styles in this neighbourhood: industrial, workerhomes, villa’s, all within a 100 m radius.”

“Fine, cacao belongs in the Zaanstreek”

“Great! They provide a lot of employment opportunities!”

”Good and nice! I like to buy from the companies from the neighbourhood.”

”They are part of this neighbourhood, I knew that when I came here.”

“If they are not too prominant due to nuisances, I do not have a problem. I am a proponent of small scale businesses.”

“If they have been here already it is fine, but no expansions.”

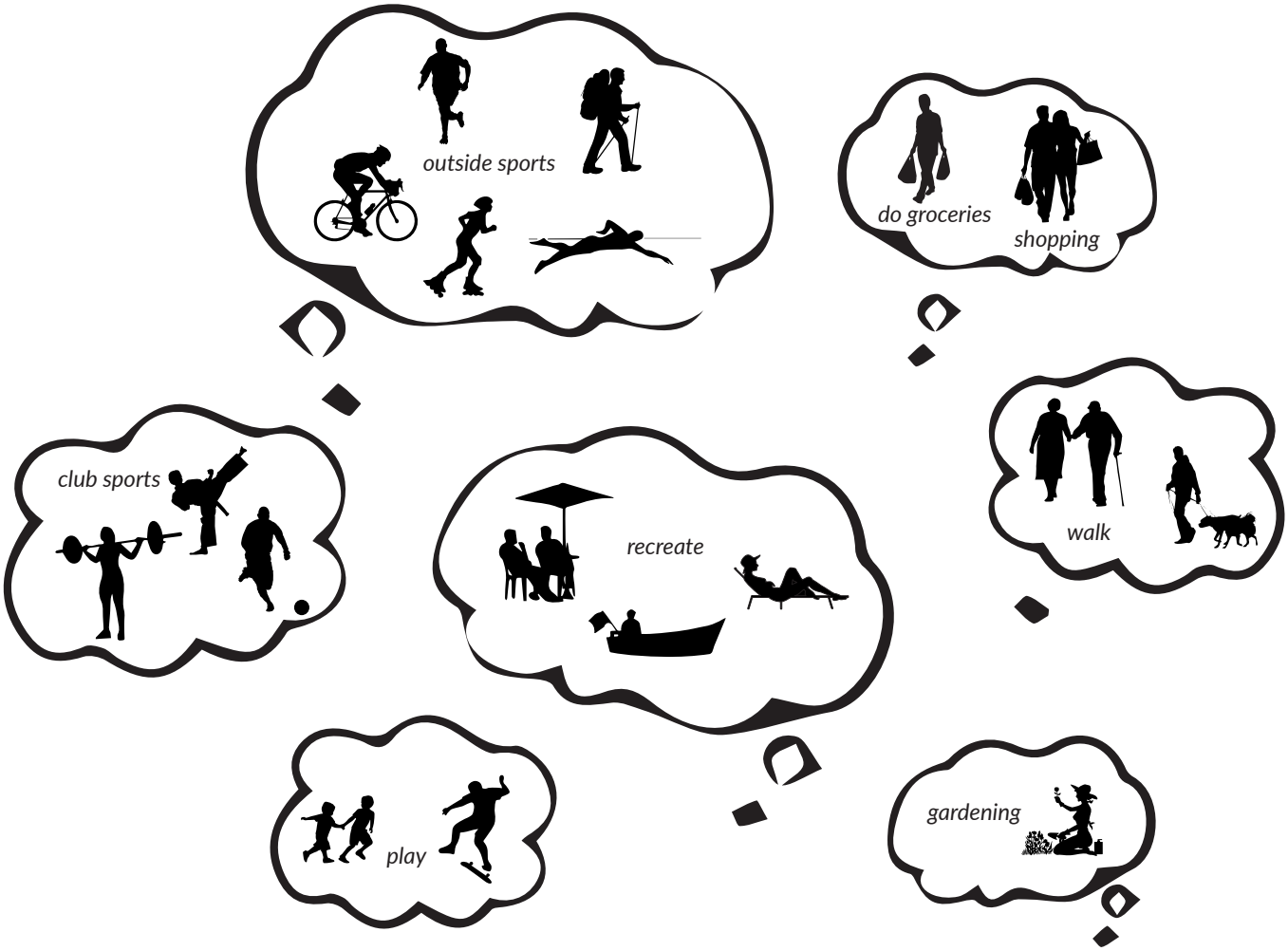
The old companies have become too large for the neighbourhood.
“The companies are too big, it does not fit in souch a densely populated area: ammonia emissions, discharges in the Zaan river or sewage, pollution, smell, even dangerous?”

“It is good for the amount of employment opportunities, but it does not fit in a living neighbourhood.”

“Sometimes there are smell nuisances, I would rather not have them in the neighbourhood.”

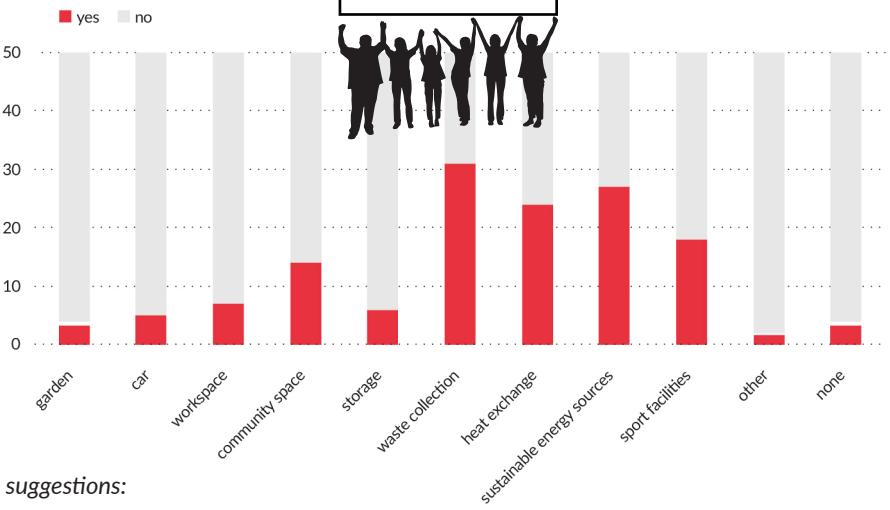
“ Especially the smell nuisance of yeast is very bothersome.”

“It smells”


outside sports
do groceries
shopping
club sports
recreate
walk
play
gardening

ACTIVITIES

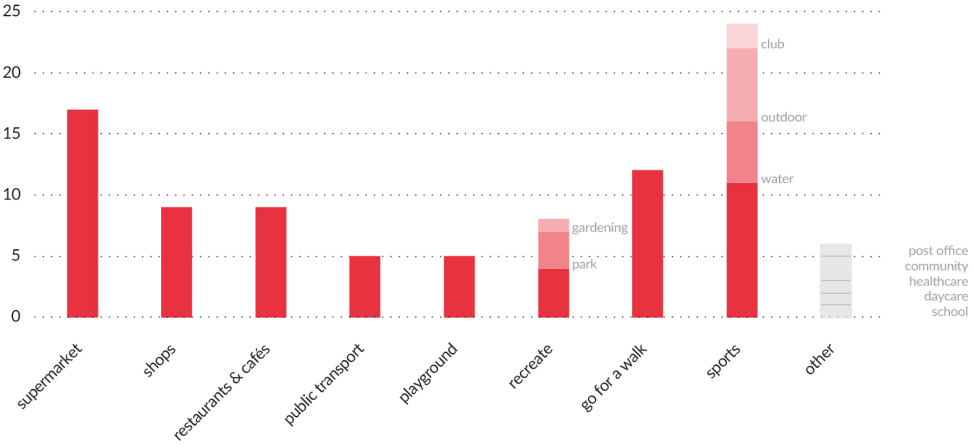
SHARING



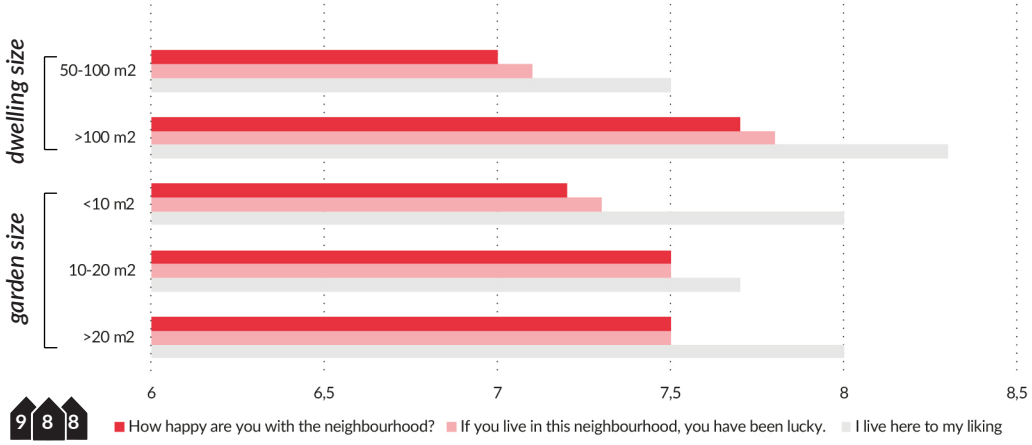
suggestions:

Food forrest
(Gardening) Tools and Machines

AMENITIES



SATISFACTION



10. SURVEY QUESTIONS - INHABITANTS

Kwalitatieve aspecten voor ontwerpen van woon en werk buurten

Deze vragenlijst is onderdeel van een afstudeeronderzoek naar leefbaarheid in woon-werk omgevingen. Dit onderzoek wordt uitgevoerd door master student stedenbouw Mae-Ling Stuyt van de TU Delft. Het bestaat uit 26 vragen en duurt ongeveer 10 minuten.

Zaandam heeft een rijke historie aan wonen vlak naast het werken. Eerst waren het honderden molens in het landschap, later fabrieken langs de Zaan. In de afgelopen 50 jaar zijn er veel bedrijventerreinen bij gekomen. Veel industrieën zijn veranderd en grootschaliger geworden. Stedenbouw gaat over het ruimtelijk ontwerp en planning van steden. Mijn onderzoek gaat over hoe het werken, oud en nieuw, deel kan blijven van de Zaanse leefomgeving zonder dat het ten koste gaat van de woonkwaliteit van haar inwoners.

Hiervoor is het belangrijk om in kaart te brengen welke leefomgeving kwaliteiten bewoners belangrijk vinden. Uw deelname wordt erg gewaardeerd.

1. Uw deelname aan dit onderzoek is geheel vrijblijvend. U kunt elk moment stoppen en u bent vrij om vragen niet in te vullen. In deze vragenlijst worden enkele basis vragen gesteld over uw achtergrond, individuele informatie wordt niet gepubliceerd in het onderzoek, u blijft geheel anoniem. Gaat u akkoord met het invullen van deze vragenlijst en het delen van de gevraagde informatie? *

   ◯ Ja

   ◯ Nee

Algemene vragen

De vragen in deze sectie geven achtergrondinformatie over de uitkomst van deze vragenlijst

2. In welke straat woont u?

3. Leeftijd

- ◯ <20 jaar oud
- ◯ 20-65
- ◯ >65

4. Geslacht

- ◯ Vrouw
- ◯ Man
- ◯ anders

Leefbaarheid algemeen

5. Ik woon hier naar mijn zin *

0	1	2	3	4	5	6	7	8	9	10

mee oneens mee eens

6. Als je in deze buurt woont heb je het goed getroffen *

0	1	2	3	4	5	6	7	8	9	10

mee oneens mee eens

7. Hoe tevreden bent u met uw buurt? *

0	1	2	3	4	5	6	7	8	9	10

erg ontevreden erg tevreden

Woonkenmerken

8. Met hoeveel personen deelt u uw woning? *

- ◯ 1
- ◯ 2
- ◯ 3-5
- ◯ meer dan 5

9. Hoe groot is uw woning? *

- ◯ <50m2
- ◯ 50-100m2
- ◯ >100m2

10. Hoe tevreden bent u met uw woning? *

0	1	2	3	4	5	6	7	8	9	10

erg ontevreden — erg tevreden

11. Heeft u een tuin of balkon? *

- ◯ Tuin
- ◯ Balkon of dakterras
- ◯ Nee

12. Hoe tevreden bent u met uw eigen buitenruimte? (sla over indien nee bij vraag 10.)

0	1	2	3	4	5	6	7	8	9	10

erg ontevreden — erg tevreden

13. Hoe groot is uw opslagruimte in totaal in of rondom uw woning? (bijvoorbeeld garage, schuur, berging)

- ◯ geen
- ◯ < 10 m2
- ◯ 10 - 20 m2
- ◯ > 20 m2

14. Hoe lang woont u al op uw huidige adres?

- ◯ minder dan een jaar
- ◯ minder dan 5 jaar
- ◯ tussen de 5 en 10 jaar
- ◯ tussen de 10 en 20 jaar
- ◯ meer dan 20 jaar

15. Werkt u in de buurt? *

- ◯ Ja, ik werk vanuit huis
- ◯ Ja, ik woon naast of boven mijn werk
- ◯ Ja, op loop afstand
- ◯ Ja, op fiets afstand of klein stukje rijden met de auto
- ◯ Nee, maar wel in de stad
- ◯ Nee, buiten de stad
- ◯ Nee, ik werk niet
- ◯ [ ]

Woonomgeving

kwaliteiten

16. Over welke aspecten van uw buurt bent u tevreden? *

[ ]

17. Wat voor activiteiten wilt u kunnen doen in uw eigen buurt? (op loop afstand van uw huis) *

[ ]

Woonomgeving

18. In welke mate ervaart u overlast van een van de onderstaande vormen? *

	geen	weinig	neutraal	redelijk	veel
Geluid	○	○	○	○	○
Geur	○	○	○	○	○
Verkeer	○	○	○	○	○
Stof	○	○	○	○	○

19. Door wie/wat ervaart u overlast? *

- ☐ Medebewoners
- ☐ Bedrijven in de buurt
- ☐ Openbare inrichtingen zoals scholen
- ☐ Bouwplaats
- ☐ Horeca
- ☐ Verkeer algemeen
- ☐ Vrachtverkeer
- ☐ Scheepvaart
- ☐ Pleziervaart
- ☐ Geen
- ☐ [ ] Andere

20. Wanneer ervaart u overlast? (sla over in dien u geen overlast ervaart)

- ☐ Ochtend
- ☐ Middag
- ☐ Avond
- ☐ Nacht
- ☐ Doordeweeks
- ☐ In het weekend

21. Wanneer bent u over het algemeen thuis? *

- [ ] Ochtend
- [ ] Middag
- [ ] Avond
- [ ] Nacht
- [ ] Doordeweeks
- [ ] In het weekend

22. U ervaart uw leefomgeving als *

woonbuurt	tussen woon en gemengd in	gemengd	tussen gemengd en werken in	werkbuurt
○	○	○	○	○

23. Welke van de de volgende aspecten bent u bereid te delen met anderen? Heeft u een voorstel? *

- [ ] tuin
- [ ] autos
- [ ] werkplekken
- [ ] gemeenschapsruimte
- [ ] opslagruimte
- [ ] afval verzameling
- [ ] het uitwisselen van rest warmte (van bedrijven) voor woningen
- [ ] duurzame energie (zoals zonnepanelen)
- [ ] sport faciliteiten
- [ ] geen
- [ ] _____

Andere

24. Wat zijn naar uw mening de voordelen van wonen in een gemengd woon/werk gebied? *

25. Wat zijn de nadelen van wonen in een gemengd woon/werk gebied? *

26. Kent u bedrijven waar iets 'gemaakt' wordt in uw leefomgeving? *

27. Wat vindt u van de bedrijven in uw leefomgeving? *

11. INTERVIEW QUESTIONS - BUSINESSES

Gebied:

Bedrijf:

Afnemers:

Respondent:

Sfeer/bijzonderheden tijdens het interview:

1. Type bedrijf en activiteiten

1. Welke functie heeft u binnen het bedrijf?
2. Productieproces: wat maken jullie precies en hoe?
3. Van onderzoek naar productie (zie schema), waar houden jullie je mee bezig?
4. Bent u bezig met verduurzaming?

   4a. Zo ja, op welke manier?
5. Wie zijn jullie belangrijkste klanten?
6. Wat gebeurt er op deze locatie?
7. Sinds wanneer zijn jullie hier gevestigd?
8. Hoeveel werknemers heeft u op deze locatie? Werkt u ook met freelancers? Hoeveel?
9. Hoeveel m2 is deze bedrijfslocatie?
10. Heeft het bedrijf nog andere vestigingen?

10a. Indien ja, Hoe verhoudt deze locatie zich tot andere vestigingen van het bedrijf? Welke rol vervult deze vestiging (in productiecirkel)? Met welke andere vestigingen wordt vanuit hier samengewerkt?

11. Bij welke milieucategorie hoort uw bedrijf?
12. a) Wat zijn de openingstijden van uw bedrijf?

    ☐ Weekend ☐ dag ☐ nacht ☐ Maandag t/m Vrijdag; ☐ dag ☐ nacht

    b) Wanneer wordt er geproduceerd?

    ☐ Weekend ☐ dag ☐ nacht ☐ Maandag t/m Vrijdag; ☐ dag ☐ nacht

    c) Wanneer wordt er geladen/gelost

    ☐ Weekend ☐ dag ☐ nacht ☐ Maandag t/m Vrijdag; ☐ dag ☐ nacht

13. Hoeveel mensen werken in uw bedrijf?

14. Welke waarden zijn binnen uw bedrijf belangrijk? Waarom?

15. Op welke manier zie je deze waarden terug in praktijk?

2. Huidige vestigingsvoorwaarden

1. Waarom heeft u/ de eigenaar voor deze locatie gekozen?
2. Heeft u bewust voor dit gebied gekozen?
3. Zo ja, wat maakt dat u hier wilt zitten?
4. Heeft u bewust voor een binnenstedelijke locatie gekozen? Zo ja, waarom?
5. Wat is hierbij voor u het meest van belang?

    5a Hoe belangrijk was de huurprijs in uw beslissing? Heeft u andere locaties hierom laten liggen

    5b Welke rol speelde het imago van de locatie bij uw keuze?

    5c Welke rol speelde de nabijheid van klanten?

    5d. Welke rol speelde de nabijheid van toeleveranciers?

    5e Welke rol speelden andere netwerken of contacten?

6 Hoe tevreden bent u over uw locatie?

    6a Wat vindt u de belangrijkste voordelen aan deze plek?

    6b Wat vindt u de belangrijkste nadelen aan deze plek?

7. *Dit is een gebied waar maakbedrijven en woningen dichtbij elkaar gevestigd zijn.* Wat vindt u hiervan?

    7a. Welke voordelen ondervindt u hiervan?

    7b. Welke nadelen ondervindt u hiervan?

8. Hoe ervaart u de nabijheid tot bewoners in dit gebied?
9. Hoe is uw relatie met bewoners in dit gebied?
10. Maakt u gebruik van voorzieningen in de buurt?
11. Hoe is uw bevoorrading en levering georganiseerd?

    10a Ondervindt u hierbij moeilijkheden? Zo ja, welke?

    10b Welke logistieke voordelen biedt deze locatie?

12. Hoe tevreden bent u over dit pand?

11a. Past dit pand bij uw bedrijfsactiviteiten?

11b. Waar bent u tevreden over?

11c. Wat kan beter?

3. Relatie met gebied en stad

1. Wat draagt u als bedrijf bij aan dit gebied? (Denk aan circulaire stad, sociale voorzieningen, sponsoring van sportclubs...?)

2. Op welke manier draagt uw bedrijf bij aan de lokale economie van Amsterdam of Zaanstad?

3. Zijn er klachten van bewoners over overlast van uw bedrijf?

3a. Zo ja, welke klachten?

3b. Zo ja, hoe gaat u hiermee om?

3c. Zo nee, bent u bang dat er in de toekomst klachten zullen komen?

3d. Waarom bent u hier bang voor?

4. Huidige netwerken

1. a) Waar komen uw belangrijkste klanten vandaan?

☐ In de buurt ☐ In de stad ☐ Europees ☐ Globaal

b) Waar zijn uw belangrijkste toeleveranciers gevestigd?

☐ In de buurt ☐ In de stad ☐ Europees ☐ Globaal

2. Werkt u samen met andere bedrijven in de stad? In de regio?

2a. Zo ja, Met wie? Waar gevestigd?

2b. Zo ja, Hoe werkt u samen?

2c. Zo ja, met welk doel? (Doet u dit bijv. via formele samenwerkingsverbanden Of informele uitwisseling? gezamenlijke belangrijkbehartiging of uitwisseling kennis)

2d. Zo nee, waarom niet? Wel met bedrijven buiten de stad en regio?

3 Vindt u dat samenwerken en lokale kennisuitwisseling tussen bedrijven en kennisinstellingen in dit gebied meer moeten worden aangejaagd?

3a. Zo ja, welke partij, of partijen zouden hierin het voortouw moeten nemen?

3b. Zo ja, Welke rol ziet u hierin voor uzelf weggelegd?

3c. Zo nee, waarom is dat volgens u niet nodig? (Gebeurt het al? Of is het überhaupt niet nodig?)

4 Waar komt uw personeel vandaan?

4a. Is uw bedrijf gebonden aan personeel uit de directe omgeving?

5. Kunt u voldoende geschikte mensen vinden?

5a. Indien ja, verwacht u deze ook de komende jaren te kunnen vinden?

5b. Indien nee, waar loopt u hierbij tegenaan?

6. Werkt u samen met onderwijs en kennisinstellingen?

6a. Met welke? Hoe is samenwerking vormgegeven?

5. Vestigingsvoorwaarden voor de toekomst

1. Wilt u de komende jaren groeien?

1a. Zo ja, biedt uw huidige locatie hier genoeg mogelijkheden voor? / Wat is hiervoor nodig?

1b. Zo ja, kunt u hiervoor voldoende personeel vinden? / Wat is hiervoor nodig?

2. Verwacht u dat de manier waarop u werkt de komende jaren zal veranderen als gevolg van technologische ontwikkelingen? Zo ja hoe?

3. Verwacht u dat het product dat u maakt de komende jaren zal veranderen? Zo ja hoe?

4. Hoe verwacht u dat deze verandering(en) uw vestigingsvoorwaarden zal veranderen?

4a. Heeft u dan andere dingen nodig qua locatie?

4b. Heeft u dan andere mensen nodig? Waar wilt u deze mensen vandaan halen?

4c. Netwerken: Hoe verandert de relatie met andere bedrijven waarmee u samenwerkt?

5. Verwacht u in de toekomst meer met andere bedrijven samen te werken?

5a. Waarom (niet)?

5b. Zo ja, met wie en waar meer samenwerking?

5c. Welke rol speelt dit gebied hierin?

5d Welke rol speelt de regio of stad Amsterdam hierin?

6. Hoe verandert de relatie met toeleverancier en afnemers? Welke rol speelt dit gebied en de stad of regio Amsterdam hierin?

6a. Welke rol speelt dit gebied hierin?

6b Welke rol speelt de regio of stad Amsterdam hierin?

6. Verhuizen

1. Kunt u permanent op deze locatie blijven?
   - 1a. Zo nee, waarom niet?
   - 1b. Zo nee, hoe kijkt u hier tegenaan?
2. Heeft u plannen om te verhuizen?
   - 2a. Zo ja, op welke termijn?
   - 2b. Zo ja, waarom wilt u verhuizen?
   - 2c. Zo ja, waar naartoe? Waarom daar naartoe?
   - 2d. Zo nee, Wat zouden voor u redenen zijn om te verhuizen?

7. Toekomst van het gebied

1. Welke wensen heeft u voor dit gebied voor de toekomst?
   - 1a. Hoe zou deze locatie nog beter aan uw wensen kunnen voldoen?
2. Wat zou u de gemeente mee willen geven over het verbeteren van de ruimtelijke kwaliteit in dit gebied?

8. Extra vraag wanneer corona niet ter sprake is gekomen

1. Welke impact heeft het coronavirus op het bedrijf en de bedrijfsvoering?



P4 Master Thesis plan

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