Analysing the use and the effects of transportation for real estate with **Big Open Linked Data**

A case study on the residential market in Amsterdam

BOLD CITIES

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Executive summary

The urban population, the people that live in cities, has grown from 746 million in 1950 to 3.9 billion in 2014 (United Nations, 2014). This resulted in a fast growth of these cities in terms of size and density. The Netherlands is the fourth densest country in Europe (Central Intelligence agency, 2017). Amsterdam, the capital of the Netherlands, is an even more dense location compared to the average population density of the Netherlands (Gemeente Amsterdam, 2017b). Amsterdam has many workers and other visitors on a daily basis. All these people move around the city, and these movements, or flows, have to be structured. Furthermore, new developments are scheduled in the near future, which will attract even more people to Amsterdam. The municipality of Amsterdam has ambitions for mobility in these new areas. Transportation is important for analysing and structuring cities. The municipality of Amsterdam has many ambitions for enhancing mobility or transportation in the city. The key points of the ambitions of the municipality of Amsterdam are to stimulate smarter and cleaner uses of transportation, to stimulate a good and fast flow of traffic, to improve routes throughout the city and to create more efficient car parking in parking garages instead of on the street level. The municipality currently has difficulties in implementing these ambitions. The ambitions of the municipality of Amsterdam, to strive for efficient (or smart) solutions regarding mobility, are ambiguous since it is not clearly stated what the city defines as a solution for the mobility issues. Furthermore, there is less money and less space available for transportation. This leads to the inability to tackle transportation related problems within the city.

The problem regarding transportation exists on a city level. Project developments could be useful for implementing ambitions on a smaller scale because project developments give the opportunity the change (parts of) the city by implementing transportation concepts in the project brief. Nonetheless, transportation does not seem to be a very important topic in the development brief. It is furthermore hardly analysed what impact new developments have on transportation in general and if the ambitions are implemented in new developments.

Therefore a BOLD-driven method is needed to make the transportation issues more tangible. The BOLD-driven method combines 17 transportation related indicators and 10 publicly available data sets for analysing the use and effects of transportation for residential real estate in Amsterdam. BOLD for stands Big Open Linked Data. This data is ‘Big’, and thus presents itself in large volume. The data is ‘Open’, and thus easily accessible and widely available. The data is also ‘Linked’, which means that different types of data sets and sources are connected when they influence each other.

This research attempts to indicate if and how the triangle relation between project development, transportation and Big Open Linked Data can be used in the process of monitoring and implementing ambitions for residential project developments. This research is conducted from the viewpoint of the project developer.

Research shows the benefits of good transportation for residential real estate (Li & John, 2017; Muley & Tsai, 2017; Zondag & Pieters, 2005; Wang & Yan, 2011; Suparmono et al., 2017). BOLD can be used in the process of implementing ambitions regarding transportation in new project developments. Nonetheless, it is not clear how a project developer can implement BOLD into their development processes. The main goal of this research is thus to create a BOLD-driven method for project developers and municipalities to frame mobility in project developments. The main research question is stated as follows:

> *How can the triangle relation between project development, transportation and Big Open Linked Data be used in the process of monitoring and implementing ambitions for residential project developments?*

To answer the main research question, a theoretical background is created in the form of a literature study on journal articles and relevant market reports, a study into the policy documents of the municipality of Amsterdam is deployed, an interview with Ger Baron, the Chief Technology Officer of the municipality of Amsterdam, is conducted, a BOLD-driven method for analysing the use and effects of transportation is created based on the outcomes of the literature study, data sources and case studies, relevant and available data is collected on three case studies in Amsterdam, questionnaires for the users of the buildings are conducted, and semi-structured interviews with professionals are conducted to validate if the desired data collection and the transport analysis are comprehensive.

With the use of BOLD, three recently developed cases, completed in 2016, are analysed. This research analyses how the use and effect transportation for these buildings can be examined before and after completion of these developments. This results in historical evidence of the changes in transportation and if problems regarding transportation are present. It furthermore shows how the BOLD-driven method can be used in future residential project developments. The three monitored cases are large residential buildings in Amsterdam with different types of residents, e.g. students, families, etc. First background information on the cases is analysed to understand the typology and characteristics of the buildings, the surrounding neighbourhoods, and the residents of the buildings. Hereafter, the cases are analysed on three different subjects, *the building*, *the people* and *the city goals.* This is done on three different levels, *the building, the neighbourhood* and *the city*.

The three levels are analysed with three types of data, *social data, sensor data,* and *registration data*. Social data is relatively new, while sensor data and registration data exist for many years. BOLD is, while often implementing the already existing data types, a new phenomenon since it uses data with Volume (Big), Velocity, and Variety. The data is furthermore Open (accessible for research) and Linked to each other. The use of BOLD can lead to more qualitative and faster ways of describing and analysing the city. Researchers have used different types of data (or BOLD) to examine mobility,

e.g. mobile phone GPS data (Friso et al. 2015), traffic detectors (Shi & Abdel-Aty, 2015) or Twitter data (Salas-Olmedo & Rojas Quezada, 2017). In the United States, Canada, Australia and New Zealand the Walk Score is available. This is a score for a location within a city regarding several transport types. Researchers have started to underline the positive relation between the Walk Score and building values (Leinberger & Alfonzo, 2012; Bokhari, 2016). It is important to prevent privacy issues when researching data, use the data that gives the needed information and use the appropriate methodology for analysing the transportation related data.

An increase in quality of transportation generally results in an increase in building value. Other demographic factors, such as neighbourhood amenities, neighbourhood quality, affordability, etc. also need to be taken into account when analysing transportation. The quality of transportation can be enhanced by improving bike-ability and a better coverage of buses. Traffic and transportation concerns are generally more important at the neighbourhood level, trumping affordability, school quality, and proximity to friends and family.

To evaluate the goals and ambitions of the municipality of Amsterdam literature is analysed about policies in the Netherlands and other countries (Chorus et al., 2011; Crivello, 2015; Harms et al., 2016; Bertolini et al., 2005). A general summary of the policies in Amsterdam is to make transportation smarter and environmentally friendlier. There are multiple ways to achieve environmentally friendlier transportation, which include not travelling at all, walking, cycling, taking public transport and the use of cleaner cars (Bertolini et al., 2005). It does not seem easy to implement these suggestions in practice, since solutions regarding transport are often location specific, one can only learn from the process of policy making of other cities or institutions instead of the applied solutions itself. It is not often clear which out of multiple implemented interventions or which external context gave a solution (Crivello, 2015).

Providers of transportation can have a large influence on the municipal policies. Research has shown that six dimensions, namely Mobility, Identities and Lifestyle, Natural Elements, Land Cover, Economic Activities and Spatial Functions could be useful for analysing mobility (Gonçalves et al., 2017). Research has indicated that promoting, a route's velocity, and a route's attractiveness have an influence on the reason of people's choice for a certain type of transportation and for a certain route to their destination. Landmarks, neighbourhoods, and buildings are important for influencing the attractiveness of a place (Harms, Bertolini & Brömmelstroet, 2016).

The transport model of Amsterdam highly relates to the ideal-typical model, where the availability of transport modes determines the preferred location of activity (Bertolini & Le Clerq (2013). Different kind of mobility patterns create different flows of people either walking, cycling, by car, by train etc. BOLD can change the way these structures are analysed. For example, GPS data from mobile phones is much richer than survey data (Friso et al., 2015). A good structure in mobility patterns can stimulate people to choose a certain type of transport. Their choice behaviour could be influenced by promotion for example (Martens, 2007), the velocity of the transport type (Bertolini, Le Clercq & Kapoen, 2005) and how attractive routes of that type are being

perceived (Thomas & Tutert, 2015). The transport model of Amsterdam is structured by the availability of transport modes since these modes determine the preferred location of activity (Bertolini & Le Clerq, 2013). Transport in Amsterdam still changes due to the growth of the number of people present in Amsterdam on a daily basis.

Developers currently do not use Big Open Linked Data in their development process and do not deploy a location or transport analysis for the design of the project brief. Nonetheless, problems regarding transportation do occur in recently developed projects. Some of these problems could have been anticipated upon by the developers. The other problems could have become apparent during the execution of the location and mobility analysis within the BOLD-driven method. Developers often do not have the same vision as the municipality regarding transportation aspects.

In order to monitor transportation and to implement ambitions regarding transportation in residential project developments, local authorities need to integrate their ambitions or goals in these project developments. These goals thus need to be transformed into obligations for the project developer, for example within the land-use plan and other planning regulations. The projects need to be checked upon these obligations during the planning application, similarly to e.g. the implementation of pavements. Developers have to provide sufficient mobility solutions and local authorities should monitor mobility during the use phase. Therefore, transport simulation or transport analysis tools are needed.

This research proposes a Big Open Linked Data approach, in the form of the BOLD-driven method. The triangle relation between project development, transportation, and Big Open Linked Data is used for the creation of a method, that consists of a location background analysis for analysing transportation-related aspects and a mobility analysis for analysing transportation means. The BOLD-driven method provides a framework for analysing and implementing mobility in project developments through multiple spatial levels. The method could be deployed to get insights into a building, a neighbourhood, and the city to get a better understanding of what kind of transportation is needed in these locations.

The added value of a data-driven approach is the expansion of currently used data sources. Because the method is driven by BOLD it gives the possibility to analyse transportation with different types of data, namely social data, sensor data, and registration data. It gives the possibility to find real-time solutions and it gives better insights in how project developments could add to the quality of transportation by linking the information from these different data sources regarding project developments and transportation to each other.

The preliminary investigation of the project developer, with the use of these mobility tools, should be done to comply with feasibility and applicability studies of local authorities. Furthermore, the preliminary investigation can help developers negotiate with the municipality about transport related aspects and gives insights into the role and incentives of a project developer for analysing transport. The developer and the municipality, or private and public parties in general, also have individual incentives

and turnoffs for the use of the BOLD-driven method. The incentives for public parties for using the BOLD-driven method are the improvement in the process of (real-time) monitoring transportation, a better understanding of transportation, and a better understanding of what data is useful for the analysis of transportation. A turnoff could be a difficulty in implementing the method and the costs of creating a tool for the BOLD-driven method. The incentives for private parties for using the BOLD-driven method are a possible marginal increase in building value and the possibility to generate information about how and why people move through the city. The turnoff could be the extra costs that are needed for improving transportation and the time and skills needed for performing the analysis.

The municipality and the developer have separate incentives or using the tool. Nonetheless, to make it possible for the municipality and the developer to use this mobility tool in practice, the tool first has to be created. The main beneficiaries of this research, and thus of the BOLD-driven method, are for the city and the citizens. Therefore, the municipality should take the first step in creating a tool for the BOLD-driven method. The developer (and other private parties) have incentives to comply. The tool for the BOLD-driven method should thus be created by the municipality and implemented by the municipality and the developer. The tool can promote their collaboration for enhancing transportation in a neighbourhood.

The local authorities must obligate the project developer to implement the municipal ambitions regarding transportation. This can be done through planning regulations. The development must be checked upon transportation, next to e.g. sustainability, the land-use plan, construction costs etc. in the application of environmental permits. The local authorities should use the method themselves to check if the ambitions are really implemented or if changes are needed.

Abstract

This report presents my graduation research toward a BOLD-driven method which uses the triangle relationship between the project developer, transportation and Big Open Linked Data in the process of monitoring and implementing ambitions for residential project developments. The research is conducted for my graduation at the Technical University of Delft, within the Faculty of Architecture, Urbanism and Building Sciences of the Master Track Management in the Built Environment.

It is intriguing how massive the amount of available data and different data sources is nowadays. The amount and, more important, the quality of this data increases rapidly. While big data already seems to be a hot topic for businesses, this data is currently not (often) used or implemented correctly within the built environment. This research shows how (big) data-analytics can influence residential project developments and issues concerning transportation within the city.

The key points of the ambitions regarding transportation of the municipality of Amsterdam are ambiguous since it is not clearly stated what the city defines as a solution for the mobility issues. Project development could be useful for implementing the ambitions since project developments change (small) parts of the city. Nonetheless, transportation does not seem to be a very important topic in the development brief. It is furthermore not analysed what impact new developments have on transportation. Therefore a BOLD-driven method is needed to make the transportation issues more tangible. Within this research the main question is stated as follows:

How can the triangle relation between project development, transportation and Big Open Linked Data be used in the process of monitoring and implementing ambitions for residential project developments?

This research is conducted from the point of view of the project developer. The goal is to give a better understanding of how project developers could make use of the BOLD-driven method in a new residential project development. The answer could stimulate project developers to manage, classify and structure Big Open Linked Data in such a way BOLD can contribute to new projects. This research is an explorative research on the topics of BOLD, transportation and project development.

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Introduction

1. Introduction

1.1 Problem statement

The ambitions of the municipality of Amsterdam, to strive for efficient (or smart) solutions regarding mobility, are ambiguous since it is not clearly stated what the city defines as a solution for the mobility issues. Project development could be useful for implementing these ambitions, but transportation does not seem to be a very important topic in the development brief. It is furthermore hardly analysed what impact new developments have on transportation in general and if the ambitions are implemented in new developments.

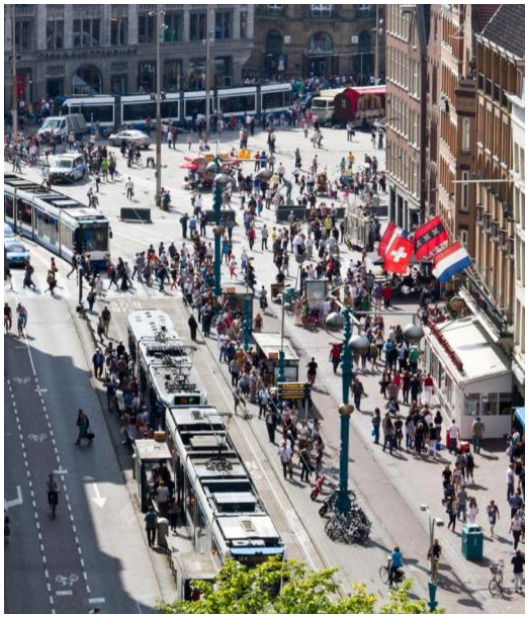


Figure 1. Crowds on the Dam, city centre of Amsterdam (source: Gemeente Amsterdam, 2013)

1.2 Mobility and the city

Cities have a tremendous impact on the world. The urban population, the people that live in cities, has grown from 746 million in 1950 to 3.9 billion in 2014, which is 54 percent of the world's population (United Nations, 2014). This leads to an increasing population density within the city, which has to be structured.

The Netherlands has a density of approximately 406 inhabitants per square kilometre. This makes the Netherlands the fourth densest country in Europe (Central Intelligence agency, 2017). Many of these inhabitants commute on a daily basis to work or school by car, by one of the many public transportation systems or by simply walking. The Netherlands is furthermore well known for the use of bicycles by its inhabitants, as the flat geography of this country grants itself well for cycling. There are approximately 1.3 bicycles for each person in the Netherlands, making it the number 1 biking country in the world. Especially in cities, since there are many people living, working and visiting cities, this can result in very crowded places, figure 1.

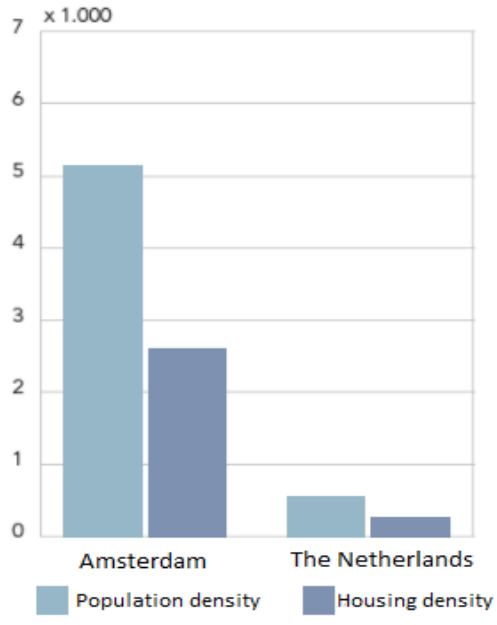


Figure 2. Population density and housing density per square km country on January 1, 2017 (source: Gemeente Amsterdam, 2017b)

The majority of the Dutch inhabitants live in a city. Therefore, mobility should be an important topic for the municipalities of Dutch cities. This is clearly the case in Amsterdam, since Amsterdam is a very dense city, see figure 2. Therefore, the municipality of Amsterdam has to provide good transportation for its many inhabitants, workers, and tourists on a daily basis. While transport is an important topic for the Municipality of Amsterdam, it seems rather difficult to implement ambitions regarding transportation. This is mainly due to the big pressure on the city. Amsterdam is booming. The city needs to grow (rapidly), as every year the city increases with approximately 11.000 new inhabitants (Van der Burg, 2017). Nonetheless, there are less financial resources for mobility (Gemeente Amsterdam, 2013). Therefore the municipality is always searching for new solutions in terms of mobility for new project developments. Everywhere around the city centre new developments are under construction or are high on the agenda. Amsterdam wants to create 40.000 to 70.000 new dwellings in the old port areas (Van der Burg, 2017). Mobility is an important subject for these new developments. In the new area named ''Haven Stad'' a division of 30% public transport, 30% bicycle, 25% pedestrian, and 15% car is desired (Van der Burg, 2017). However, it is not clearly stated how these ambitions will be met.

The ambitions of the municipality of Amsterdam regarding mobility are stated in three papers prepared by the municipality itself, namely the 'Agenda Sustainable Amsterdam' (Gemeente Amsterdam, 2015a), the 'Agenda Amsterdam attractively accessible (Gemeente Amsterdam, 2013)' and the 'Implementation Agenda for mobility' (Gemeente Amsterdam, 2015b). In the agenda's, the municipality states that they want to stimulate smarter and cleaner uses of transportation, and furthermore stimulate a good and fast flow of traffic (Gemeente Amsterdam, 2015a). One could argue whether these ambitions are really implemented in new developments. The municipality states they will improve routes throughout the city, construct more bicycle lanes, create more efficient bicycle storage and create more efficient car parking in parking garages instead of on street level (Gemeente Amsterdam, 2013). Some parts of Amsterdam still need solutions for staying accessible in the future, like the connection across the IJ (Gemeente Amsterdam, 2015b). These goals show that the city strives for efficient (or smart) solutions regarding mobility to enhance transportation in the city. As stated by Ger Baron, Chief Technology Officer at the municipality of Amsterdam, the most important issues in the mobility agendas are how to deal with growth and accessibility. It is the first time that pedestrians and cyclist are implemented in a mobility model (Interview, 15-01-2018). Despite having many ambitions, the municipality admits that there are less financial resources and space available for mobility, while a growing mobility demand is emerging due to an increasing number of residents, jobs, and visitors (Gemeente Amsterdam, 2013). It is therefore important to clearly know how these ambitions can be implemented. Project development should be aligned with these municipal ambitions, and the contribution should not be optional. Ger Baron states that an Urban Strategy model is made by TNO where one can check the influence of a new building on mobility. But this model is inaccurate due to the many assumptions in the model. Ger Baron also states that it is currently still difficult

to be adaptive when dealing with transport. Models should be dynamic but rules in the process of making changes, such as the need for permits, make it difficult to act fast (Interview, 15-01-2018).

An often analysed subject in the built environment is sustainability. This subject is an example of how a large scale problem, or a wicked problem, can be tackled on a smaller scale. During the last few years, sustainability has become a standard to build more sustainable buildings. One of the most important reasons for the current standard for new project developments to be more sustainable, is the fact that it is often imposed by Dutch municipalities to build sustainable buildings. In the year 2020, a new law will be in force in the Netherlands. This law, called BENG (Dutch: Bijna Energie Neutrale Gebouwen), obligates developers to build (almost) energy neutral buildings (Rijksdienst voor Ondernemend Nederland, n.d.). Another important reason to build more sustainable buildings is the trend of promoting sustainability as a unique selling point. Buyers acknowledge the importance of sustainability as well. Brounen & Kok (2011) found a significant price premium when comparing ‘’green’’ labels to lower energy labels. Residential properties with ‘’green’’ energy labels A, B, or C transact at an average price premium of 3.7%. Brounen & Kok (2011) state that this premium is partly related to the present value of future savings due to the higher energy efficiency of the property. Nonetheless, they state that a 15% price premium for A-labelled dwellings compared to G-labelled dwellings, seems to reflect more than just future energy savings alone (Brounen & Kok, 2011). This is intriguing since sustainability has not been an important topic in the built environment in the past. This does not mean that investing in good transportation can lead to the exact same effect, but it does show the importance of first of all clearly knowing the benefits of tackling a wicked problem on many different levels and for many different stakeholders, and second off all make the contribution of the developer mandatory.

1.3 Problem field defined

Transportation (or mobility patterns) are often analysed in scientific research. Nonetheless, they are not (or almost never) researched on the level of a single building, from the perspective of a project developer. To be able to analyse the influence of transportation on the building and vice versa, mobility should be analysed in an area specific context. This research analysis mobility to highlight what the use and the effects of transportation for residential real estate are and if and how project developers could contribute to (municipal) ambitions. This could show the influence of the building on the city through project development.

Figure 3 shows the interrelation between developments, transport and Big Open Linked Data (BOLD). This data is ‘Big’, and thus presents its large volume. The data is ‘Open’, and thus easily accessible. The data is also ‘Linked’, which means that different types of data sets are connected when they influence each other. Developments, transport, and BOLD together influence the city as a whole.

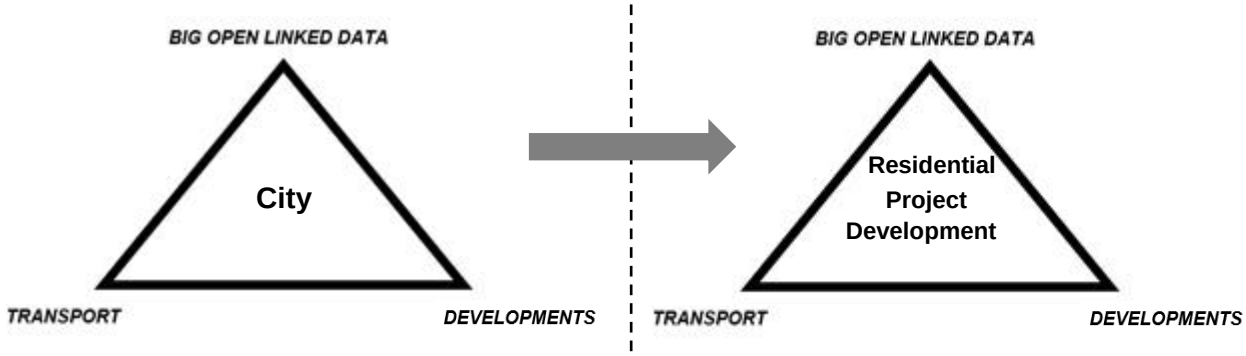


Figure 3: Problem field and research triangle (own figure)

The left triangle in figure 3 can be seen as the problem field within this research. The right triangle in figure three is the actual research triangle which exists on a smaller scale than the problem field. Transport can be analysed through BOLD by the project developer. The outcome of this analysis can have an influence on several features of residential project development. The right triangle thus narrows down the problem field into the research problem. Research into mobility often tends to be steered by the availability of data instead of having the actual problem or research gap as a focus point. This research strives to show exactly what kind of transport needs to be analysed, and how to analyse it. It could be beneficial to use BOLD for analysing transport since it is digital, actual and rich (consisting of large amounts of) data. BOLD consists of social data, sensor data, and registration data. As stated by Ger Baron, the municipality currently does not collect qualitative data, the thoughts and opinions of the user of the city, within their mobility analysis. Furthermore, Ger Baron states that mobility should be analysed for different types of transport on multiple scales. While a mobility impact analysis for new developments is obligated by Rijkswaterstaat the analysis after completion is not well structured (Interview, 15-01-2018).

This research introduces BOLD in the analysis of mobility and shows the available data, but also the data which should be available but currently is not. The rapidly growing amount of data could be beneficial for decision-making in a city and for decision-making in project developments. Since project developments change parts of the city, they have a relatively easier possibility for directly making changes in mobility as well.

Hence, it is important to evaluate the ways and possibilities a project developer could use to implement BOLD regarding transport in a project development. The focus of this research is visible in figure 4. New developments and the surrounding transportation have an impact on three levels, namely the building level, on people and on the city goals/ambitions. To analyse the three levels in new developments, three types of data are used, registration data, social data, and sensor data. This analysis can be used to monitor parts of the city and for implementing mobility goals.

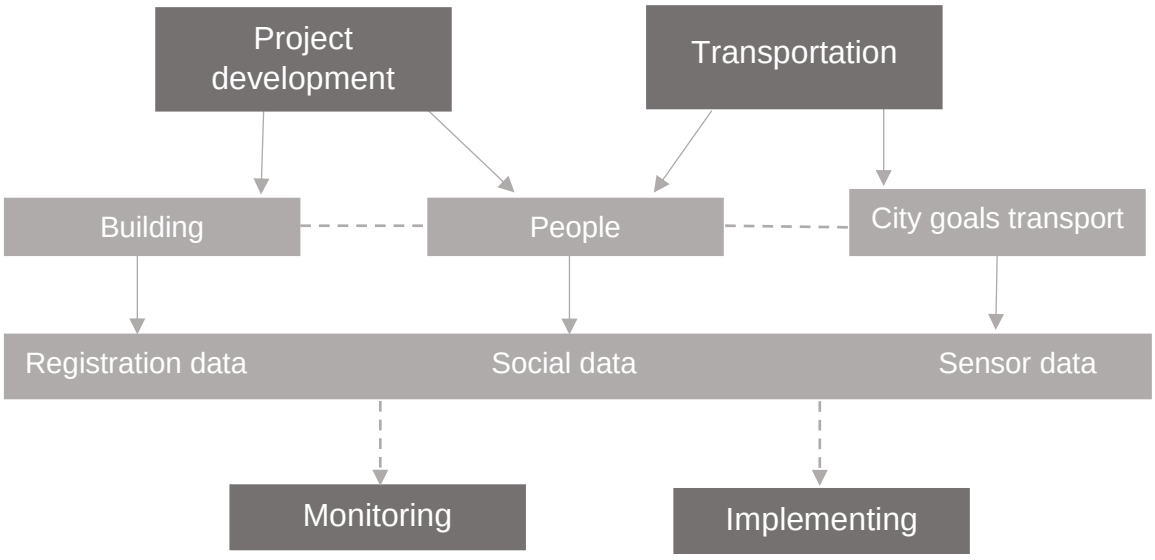


Figure 4: Summary of the research (own figure)

The outcome if the analysis can thus play an important role in implementing ambitions in new developments, and thus use the three types of data to enforce a better implementation of (municipal) ambitions into a new development. After construction, when the building is in use, transportation can be monitored to analyse if the transportation aspects have the desired quality and if changes regarding transportation are needed.

1.3.1 Utilisation potential

This research is conducted from the point of view of the project developer. This research shows how a project developer can make use of a transport analysis, shows the importance of the transport analysis for a project developer in general and indirectly also for the (new) residents. This research provides a framework for developers. It shows what kind of BOLD is available and what kind of BOLD is not. It furthermore shows how they can implement this framework in their location and transportation analysis.

This research could improve the connection between individual project developments and the surrounding transport possibilities, which could lead to better accessible buildings and thus a better quality of the end result of a project. Therefore, this research is beneficial for project developers, investors, and users (of the building). A good connection for commuting traffic and for transport to (daily) visited amenities can have a direct influence on the property value. For example, research shows that rail transit investments have positive effects on property values (Diaz & Mclean, 1999). New insights derived from this research could speed up the decision-making process, which could lead to a reduction of uncertainty through time and a better-estimated budget early in the project life cycle (Winch, 2010). Improvements in analysing mobility

by the municipality and the project developer on the basis of this research could generate changes in transportation. This could lead to a marginal increase of the building value. Furthermore, developers and the municipality could use the BOLD-driven method for citizen participation since the method highlights what transportation aspects are important for citizens and (new) residents. This research elaborates on the data transparency and accountability required for the BOLD-driven method.

Furthermore, this research can provide several benefits for the municipality of Amsterdam, as it provides insights into three analysed cases. The research shows if the use and effects of transportation, in the neighbourhoods the buildings are situated in, fits with the building characteristics. It shows if and how the transportation in these neighbourhoods should or could be improved. It also beneficial for the process of implementing ambitions of their three agenda's (Gemeente Amsterdam, 2013; the Gemeente Amsterdam, 2015a; Gemeente Amsterdam, 2015b). This research provides insights in how the municipality can monitor other parts of the city trough BOLD and how the data can be used for the many project developments that are to be constructed in the (near) future. This research and framework can provide information to the municipality on how to communicate their insights with developers and what the municipality can expect and demand from new developments.

1.3.2 Societal relevance

This thesis strives to improve the process of implementing ambitions for transportation in Amsterdam. The outcome could improve transportation and strives to prevent chaos regarding mobility in the ever-growing city. Transport is important for the people that make use of the city (tourists, workers, and citizens of Amsterdam) and, on a building level, for the residents of the building. Thus, for every user of transportation. This is done by providing a tool that stimulates the collaboration between the municipality and the project developer and by giving insights in how to improve transportation and how to make neighbourhoods better connected, more efficient and safer.

1.3.3 Scientific relevance

Many methods are applicable in research. This research contributes to the lacking body of knowledge in scientific research on how big data can be applied within the built environment. This research is an addition and an exploration of scientific research into a combination of the topics BOLD, transportation and project developments.

For years, the research of urban areas is done with the use of census data and/or survey data. But, in recent years there is a rapidly growing amount of big data available. Furthermore, technical innovations have made it possible to capture this data within the urban landscape. These are innovations such as better cameras and better sensors. Researchers have already shown that rich, actual and digital big data can enhance the used input of their research data (Friso et al. 2015; Shi & Abdel-Aty, 2015; Salas-Olmedo & Rojas Quezada, 2017). Nonetheless, big data is still not often

applied within the built environment. Many companies talk about future possibilities of big data, but not many companies are able to implement big data in their proceedings. This is due to the fact that there are (too) many data sources and data available and companies struggle with selecting and implementing them with certain platforms. This research is relevant for scientist and engineers by showing how big data can be used in analysing the built environment. This research can be seen as a scientific instruction on how to use different data sources and data sets within the built environment. This research shows companies and municipalities how to create useful information out of the many available data sets. Thus, how data can be implemented. The used method will be applicable to other topics in the built environment for scientific research. This research could be a steppingstone for using BOLD for other aspects, besides transportation, that are important for new project developments. This could lead to the creation of a suitable data application for these project developments.

1.4 Research questions

The main goal of this research is to create a BOLD-driven method for establishing mobility goals and constraints. The main research question is stated as follows:

How can the triangle relation between project development, transportation and Big Open Linked Data be used in the process of monitoring and implementing ambitions for residential project developments? (1)

The relationship between the research questions and the research triangle visible in figure 5. The sub-questions which derive from the main research question are formulated as follows:

A. What is the main difference between the currently used data and BOLD?
B. What are the main factors that make transportation important for a project development?
C. How does a project developer include transportation into the development process?
D. What kind of policies complement the transportation goals of the Municipality of Amsterdam?
E. Is there a structure present in the transport flows in Amsterdam?
F. What are the main factors for people to choose a certain type of transport?

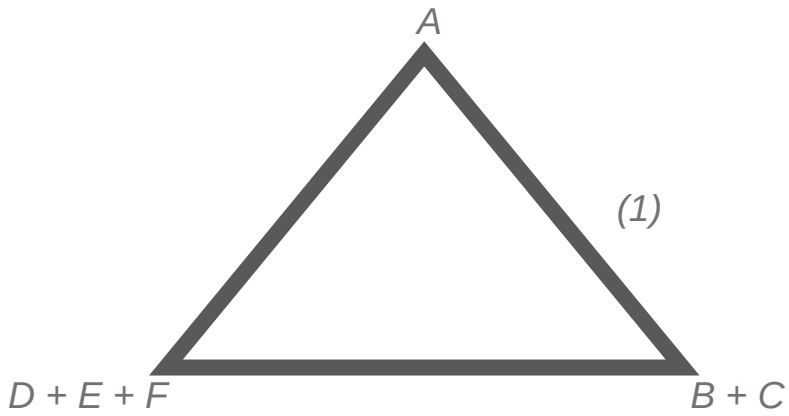


Figure 5: Relationship between the research questions and the research triangle (own figure)

1.5 Hypothesis

This research is focused on finding the possibility to use the triangle relationship between project development, transportation and Big Open Linked Data in the process of monitoring and implementing ambitions for residential project developments. The following hypothesis is formulated for this research:

> *The application of a BOLD-driven method for monitoring and implementing ambitions regarding transportation for residential project developments can improve transportation in the city.*

1.6 Research scope

This research narrows down (the neighbourhoods surrounding) large project developments with a minimum of 100 units per building within the residential market of Amsterdam. The residential market is chosen since this market does not exclude certain types of users of transportation in the neighbourhood surrounding these buildings. This would be the case when the research scope would, for example, focus on the office market. The office market excludes people that not work, like children. Office buildings are also often used by companies from a certain type of industry such as law, financial services etc. This further excludes certain types of users. Furthermore, different types of residential buildings are analysed, namely luxurious owner-occupied, private and social rental housing and student housing. This further increases the inclusion of multiple types of users of transportation. The year of construction of these residential buildings is 2016. Since buildings have a very long lifespan, normally over 50 years, the buildings are relatively new. Due to the recent year of construction of these buildings, it is possible to analyse the differences in the use of transportation before and after completion of these buildings.

This research focusses on Amsterdam because the city is rapidly growing. It is predicted that the number of inhabitants in Amsterdam will probably grow from 838.338 in 2016 to approximately 936.000 inhabitants in 2030 (Het Parool, 2017). Amsterdam is the largest city in the Netherlands. Furthermore, the size of Amsterdam will expand rapidly due to new developments as the Noordelijke IJ-oevers-West (+21.000 inhabitants until 2040), IJburg-Oost (+15.800 inhabitants), Zeeburgeiland / Nieuwe Diep (+14.4000 inhabitants) and Omval/Overamstel with +11.800 inhabitants (Het Parool, 2017). Amsterdam is a city with many ambitions regarding transportation in the existing areas of the city and in future developments. Furthermore, Amsterdam stimulates progressive initiatives, such as AMS (Amsterdam Institute for Advanced Metropolitan Solution), and the municipality of Amsterdam has its own Chief Technology Officer. Amsterdam is thus an innovate and expanding city in both geographical size and demographics. Together with the ambitions and goals of the municipality regarding transport, the city of Amsterdam is considered a suitable location for conducting this research. Within the analysis of transport in (the neighbourhoods surrounding) large project developments within the residential market of Amsterdam, the focus is on the analysis of car, public transport use, and bicycle use. The first two transportation types are the most suitable for this research since most data is available for these two types. The data for the car and public transport use is available in a larger extent and consist of richer data, consisting of more and better information. Car and public transport data is furthermore often publicly available, which is not the case for data sources about bicycle use. Well-available data can provide better insights into the possibilities of the analysis. Therefore, this research is mainly focused on the availability of data. Nonetheless, it also gives insights into data which is currently not well accessible, but could give recommendations for a transportation analysis. Transportation in a busy city such as Amsterdam is needed on a 24/7 basis. Since this research is mainly focussed on implementing the ambitions of the Municipality of Amsterdam to stimulate smarter and cleaner uses of transportation and stimulate a good and fast flow of traffic, the best time to analyse whether these ambitions are met is during peak hours. Therefore, this research is conducted during the morning peak between 06:30 AM and 09:30 AM (ANWB, n.d.).

1.7 Methodology & data

To understand how the use and the effects of transportation for residential real estate can be monitored with the use of Big Open Linked Data and how BOLD can be used in the process of implementing ambitions regarding transportation for new residential project developments, an explorative research with case studies and interviews is conducted. This means that it is not clear beforehand how the analysis should be conducted (Yin, 1984). Mills et al. (2010) state that the exploratory case study is a research method that is used when there is a lack of detailed preliminary research about a distinct phenomenon. Therefore different types of research methods are used in this research. These are theoretical research, several semi-structured interviews, questionnaires, and a case study analysis with data collection from several open sources on the internet. The process of this research is divided into several steps,

which are presented in figure 6. The research (sub)questions are answered throughout the different chapters.

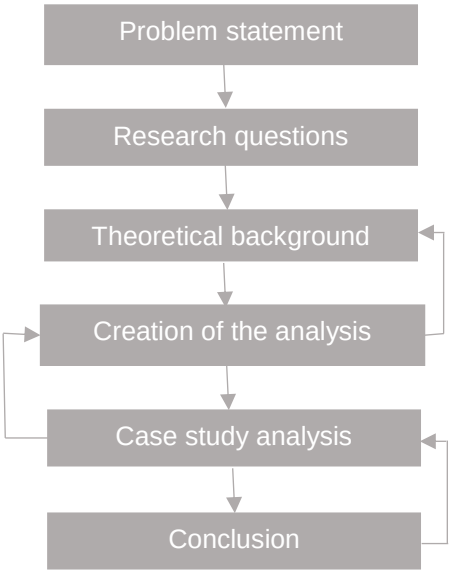


Figure 6. Research steps (own figure)

- First, a theoretical background is created in the form of a literature study on journal articles and relevant market reports.

  These sources have several important topics, e.g. BOLD, mobility patterns, municipal policies and project development. The literature study is deployed throughout the entire research, apart from the 'conclusion' phase. Due to the nature of an explorative research, not all variables and aspects are anticipated upon during the first phase of the research. Therefore, several feedback loops exist between the theoretical backgrounds phase, the data collection phase and the data analysis phase.

- A Study into the policy documents of the municipality of Amsterdam is deployed.

  to identify and analyse the current goals and approaches in the fields of mobility and urban development.

- An interview with Ger Baron, the Chief Technology Officer of the municipality of Amsterdam, is conducted

  to compare findings, highlight important issues and validate if the desired data collection would be comprehensive.

- A BOLD-driven method for analysing the use and effects of transportation are created based on the outcomes of the literature study, data sources, and case studies.

  This plan shows how transportation use and effects can be analysed on three levels: the building, the neighbourhood and the city. The three levels combined form a comprehensive transportation analysis for real estate.

- Within the data collection phase, relevant and available data is collected on the three case studies in Amsterdam.
- Questionnaires for the users of the buildings are conducted

  to compare findings and to detect transportation problems, such as (dis)satisfactions considering transportation. This is done through a web survey, which means that all the residents in the three case buildings are asked, through a note in the mailbox at their home, if they are willing to visit a website and fill in a short questionnaire. A web- questionnaire is used to reach as many residents as possible and thus gain as many opinions as possible. As mentioned by Bryman (2012) the advantages of online survey are the low costs, fast responses, and the attractive (in this case Google form) formats. An online survey has the disadvantage of a (possible) low response rate (Bryman, 2012). A gift card for one of the respondents is used as an incentive to fill in the questionnaire.
- Semi-structured interviews with professionals are conducted to validate if the desired data collection and the transport analysis are comprehensive.

  The interviews are conducted with Kasper Hesp, Development manager at G&S vastgoed, Fons Kurvers, Commercial director at van Wijnen West, and Marten Boerema, Commercial director at van Wijnen Midden. The professionals can be seen as experts within the field of project development . The choice for interviews, instead of an online questionnaire, is due to the subject of the interview. Where the questionnaire for the residents of the cases is only conducted to highlight important issues, the professionals are asked to check and, if needed, improve the methodology of analysing transportation. An online questionnaire is not suited for in depth questions and follow-up questions, whereas a face-to-face interview is suited for these type of questions.
- The findings from the literature study are checked in practice and knowledge are gained of using Big Open Linked Data in practice.

To analyse the use of BOLD within the city of Amsterdam, three existing housing cases are monitored through BOLD. The use and effects of transportation for these cases are analysed. Furthermore, an assessment is made for whether BOLD could have been useful for enhancing transportation for these projects and thus stimulate the main city goals regarding transportation. The three cases are new residential developments, consisting of a minimum of 100 units per building, and are presented in figure 7, 8 and 9. All cases are situated in Amsterdam, see figure 10.

Figure 7. case 1: 900 Mahler

Figure 8. case 2: Smiley

Figure 9. Case 3: Kwintijn

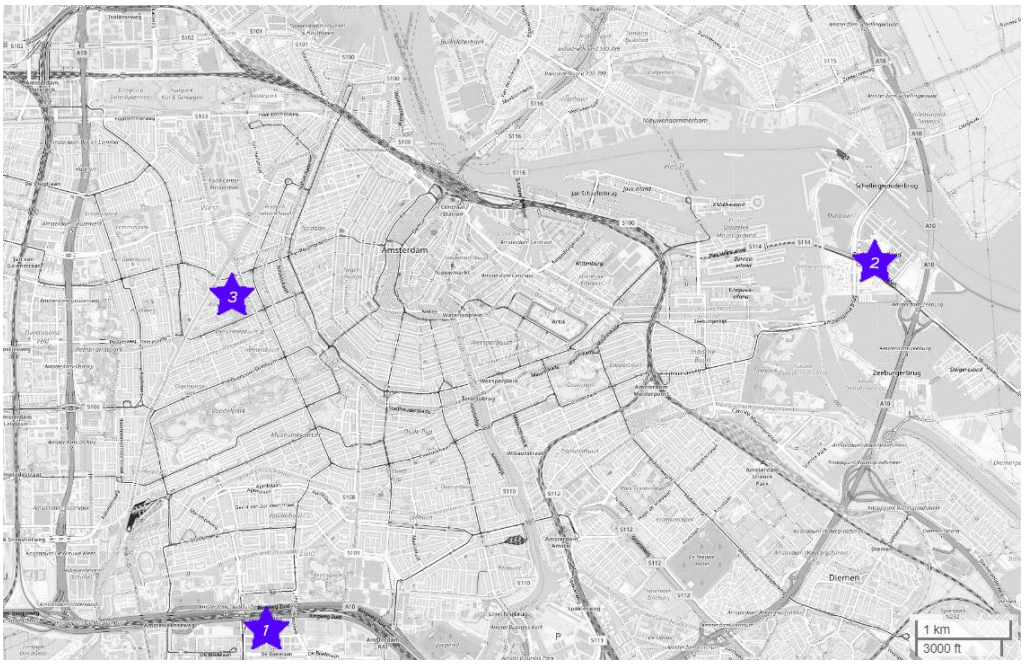


Figure 10: Three housing cases, spread over Amsterdam city. 1: 900 Mahler, 2: Smiley, 3: Kwintijn (own figure)

With respect to FAIR guiding principles, all data needs to be Findable, Accessible, Interoperable and Reusable (Wilkinson et al., 2016). The data used within this research can be derived from several sources, the ‘’data owner’’, e.g. Twitter, the Fietsersbond, the municipality of Amsterdam, and the owner of the building drawings.

When using data for this research, it must always comply with the FAIR guiding principles. Furthermore, the guiding principles of the owners of the data must be respected. These guidelines are stated on the website of the data owner. When analysing mobility patterns, the movements of a large number of people are analysed. The data are analysed in such a way that the privacy of these people is not disturbed. No names of personal information are used and the number of people analysed is large. This makes it hard to attach information to individuals.

1.8 Readers guide

The first chapter gives an introduction of the topics ‘’BOLD’’ and ‘’transport (problems) in Amsterdam city’’. It introduces the background and context of the research and shows the problem field wherein this research is conducted, namely the difficulty of monitoring and implementing (municipal) ambitions regarding transportation. This section subsequently formulates the main research question and research sub-questions which are derived from the problem field. The second chapter elaborates on the data collection and presents an overview of different variables and data sources which are deployed within this research. The second chapter furthermore shows in

what building phase the analysis should be conducted, on which level the analysis should be conducted, which data should be analysed, which stakeholders could provide data, and why the transportation analysis is important for these stakeholders.

The third chapter gives theoretical background on the research (sub)questions. The first sub-question: '*What is the main difference between the currently used data and BOLD?'* is answered in section 3.1, Big Open Linked Data. This chapter gives theoretical understanding of the usefulness of Big Open Linked Data. The theoretical background regarding the second and third sub-question: '*What are the main factors that make transportation important for a project development?'* and '*How does a project developer include transportation into the development process?'* is elaborated on in section 3.2, Project development. Theoretical background on the fourth, fifth and sixth sub-questions: '*What kind of policies complement the transportation goals of the Municipality of Amsterdam?'* , "*Is there a structure present in the transport flows in Amsterdam?'* and '*What are the main factors for people to choose a certain type of transport*?' is presented in section 3.3, Transportation policies.

Chapter four explains the case study analysis of this research and the subsequent fifth chapter elaborates upon the findings of the data analysis, gives a conclusion and discussion for this thesis, provides recommendations and the study targets, and provides a reflection on the creation of this thesis.

BOLD-driven method

2. BOLD-driven method

This chapter elaborates on the BOLD-driven method. This chapter first explains the usefulness of doing a transport analysis in a certain building phase in section 2.1. As explained in section 2.2, the transport analysis can be done on three levels, the building level, the neighbourhood level, and the city level. Section 2.3 elaborates on how the BOLD-driven method is created and if the method could be further enhanced. The analysis starts with indicators which give insights into the background of the case studies, these indicators are explained in section 2.4. Hereafter, section 2.5 shows what kind of Big Open Linked Data should be used in different case studies to analyse the use and effects of transportation. Furthermore, this section shows what the different options are for analysing the use and effects of transportation, and why a certain type or source of data is the best usable data type or data source. Section 2.6 elaborates on how stakeholders can deal with transportation problems and the subsequent section 2.7 elaborates on the incentives and the turnoffs for public and private parties of using the BOLD-driven method. This chapter ends with a summary in section 2.8.

2.1 Building life cycle

Figure 11 illustrates the main lifecycle of a building. The life cycle consists of two main parts. The first is ‘manage’ and the second is ‘transform’. The managing part of the building life cycle consists of two phases, the use and management phase, and an initiative phase. The transformation part of the building life cycle also consists of two phases, a brief and design phase and a (re)construction phase (Remøy, 2010).

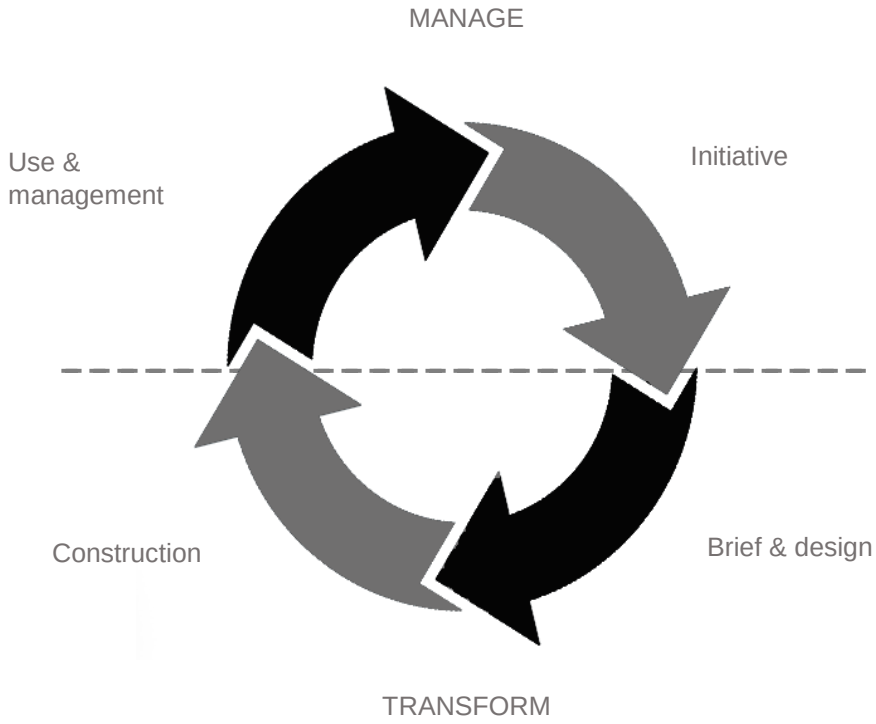


Figure 11: Building lifecycle (own figure based on Remøy, 2010)

This research is focussed on analysing transport within both parts of the building life cycle, but not on all four phases within the building life cycle. The analysis is created for the use and management phase and the brief and design phase. The reason to deploy the analysis in the brief and design phase is to realise a better implementation of ambitions regarding transportation for new residential project developments. Whether the ambitions are implemented in a new development can be considered as an uncertainty. Dealing with the uncertainties as early as possible eliminates uncertainties in a subsequent phase (Winch, 2010). Doing the analysis upfront is thus beneficial for all stakeholders. The reason to conduct the analysis in the use-phase is to monitor the use and effects of transportation in existing residential real estate. The analysis provides historical evidence. It gives insights into what influence a single building can have on transportation. Having a better understanding of how to analyse transportation in the city, is most of all beneficial for the municipally as it gives a good starting point for future developments. The municipality should transform this information into guidelines for future project developments.

2.2 Three levels

Within this research, transport is analysed on three different levels. The quality of transport in a place is in the first place depending on the transport in the entire city. Analysing the use and effects of transportation in the city can be done by analysing how easy it is to reach this city by public transport or car, but also by analysing the

quality of transportation in all different parts of the city. There are four ways to divide Amsterdam city. The first one in dividing the city into 7 districts, namely the Centre, New West, North, East, West, South, and Southeast. Amsterdam is further divided into 22 areas, 99 districts and 481 neighbourhoods (Gemeente Amsterdam, n.d.-a). For this research, a location specific context is important. Therefore, the main division of the city, the division into neighbourhoods, is used within this research. The second level for analysing the use and effects of transportation is the neighbourhood. If the neighbourhood is not well accessible, it will have effects on the buildings within that neighbourhood. The third level for analysing the use and effects of transportation is the building. Figure 12 gives an overview of the levels and the categories in the transportation analysis.

The category ‘’people’’ is important on every level, the building level, the neighbourhood level, and the city level. The category deals with issues such as safety, complaints, and satisfaction of people, but also deals with how people move through the city, either by car, by bicycle or public transport.

The category ‘’build environment’’ is important on a building level and on a neighbourhood level. Transport issues that affect the built environment are for example car parking issues, the safety of building exits and distances to the building. These subjects are important because they could have a direct influence on the building. For example on the building value but also on the design of the building.

The category ‘’city goals’’ regarding transportation is important on the neighbourhood level and the city level. This category mainly deals with roads, bicycle lanes, parking places etc.

This research does not examine how the building influences city goals regarding transport and how the city influences the built environment since one single building is on a completely different level than the city as a whole. Stakeholders using the BOLD-driven method for analysing transport should examine if and how the transportation should be improved and if it should be improved on a city level, a neighbourhood level and, or a building level.

Figure 12. Three levels of transportation (own figure)

2.3 The creation of the method

The BOLD-driven method that is created for this research consists of two parts. A location background analysis and a mobility analysis. The location background analysis consists of 17 indicators, which are transportation-related. The mobility analysis consists of 10 data sets regarding transportation itself. This section explains the choice for the two parts of the analysis and the choice for the particular indicators and data sets.

Research shows that transport-related aspects are important when analysing transportation in a city (Lasley, 2017; Salas-Olmedo et al., 2017, Gonçalves et al., 2017). The location background analysis elaborates on these transport-related aspects, which is based on the research of Gonçalves et al. (2017) for several reasons. Gonçalves et al. (2017) uses different approaches from scientific research to create a list of indicators, which is created by 19 researchers from 13 disciplinary backgrounds. The list of indicators is hereafter used for data collection. The variables within this data collection are first statistically characterized. Hereafter, multivariate statistical techniques of summarizing data and classify data are used by the research team (Gonçalves et al., 2017). The in-dept analysis of the different approaches results in a comprehensive list, and thus used as the basis of the design of a this research.

The research of Lasley (2017) elaborates on 14 reasons for people to choose a certain neighbourhood, namely Property, Neighbourhood, Crime, Convenience, Traffic, Family/Friends, Affordability, Schools, Job (re)location, Rent to Own, Hipness, Relationship Change, Health/Disaster, and Leave college (Lasley, 2017). While the importance of transport-related aspects is highlighted within this research, it is not clear which of the 14 aspects are transport-related. Furthermore, the research of Lasley (2017) does not show how these aspects (or dimensions) can be analysed. In other words, before certain topics can be added to the location background analysis within the BOLD-driven method, the analysed transport related topics need to be statistically underlined and the corresponding indicator or data set needs to be linked to this topic and accessible for use. Nonetheless, other research could add to the list of indicators used within this research, see section 2.4. Especially when researchers are focussed on finding the indicators to analyse the urban landscape of Amsterdam or other relatively large cities in the Netherlands, the list could possibly be enhanced. Section 2.4 elaborates on the content of the location background analysis.

The second part of the BOLD-driven method analyses mobility itself. The indicators of Gonçalves et al. (2017) are divided into six dimensions, see section 2.4. One of these dimensions is mobility. This dimension and the related indicators are the basis of the second part of the BOLD-driven method, the mobility analysis. The added data sets are derived from openly accessible data sources, which is thus publicly available information. The social data sources are Twitter and Fietsersbond meldpunt because these are openly accessible, in contrast to for example Facebook, see section 3.1. The sensor data sources Amsterdam City Data and Google maps. The registration data sources are the Dutch Kadaster and open data sources containing the building

drawings. Also within the mobility analysis other data sets could be added if other data would become available in the future. Section 2.5 elaborates in the content of the mobility analysis. There was no access to data from (commercial) data providers that is not publicly available. Therefore, this data is not used within this research.

2.4 Indicators

To analyse background information on the cases, five out of six dimensions of Gonçalves et al. (2017) are used, see table 1. These are Identities and Lifestyle, Natural Elements, Land Cover, Economic Activities and Spatial Functions. While Gonçalves et al. (2017) uses this methodology to divide peri-urban areas in Portugal instead of the dense city of Amsterdam, the methodology gives a well-structured typology analysis of an area or neighbourhood. The table of Gonçalves et al. (2017) consists of 85 indicators, see appendix E. Within the background analysis only 17 indicators are analysed. This section highlights several reasons for the difference in the number of used indicators.

The indicators of table 1 are only useful for analysing background information of the building and the neighbourhood the building is situated in. It does not analyse (the quality of) mobility. Therefore, the dimension ‘mobility’ is left out of this table and implemented in the complementing mobility analysis in the subsequent section. Furthermore, BOLD exists of open data. Therefore, only data which is available is used within this research. The indicators within the table of Gonçalves et al. (2017) which are currently not available in Amsterdam, are not used within this research. Indicators that are currently not available, but could influence the use and effect of transportation in Amsterdam are:

- Change in number of detached single-family homes
- Employment/company specialization and diversification index
- Percentage of people who work or study in other municipalities
- Road network density (km/km2)
- Pedestrian accident index

Moreover, some of the data listed in the table of Gonçalves et al. (2017) is available but exists in a different format. The tables within this research are thus an adapted version of the table of Gonçalves et al. (2017). An example of how to use table 1 is visible in chapter 4, section 4.1, where the background information on the three mentioned cases is described.

Table 1. Dimensions for the typology of a neighbourhood and the use and effects of transportation (own table adapted from Gonçalves et al. (2017))

	DIMENSION	SUBJECT	INDICATOR	LEVEL	**Adjustments from the table of Gonçalves et al. (2017)**
	***Identity and Lifestyle***	Identity re-composition	Typology building / Type of residential units / Amount of new residents	Building	Added to the table since the influence of a single building on the neighbourhood is analysed
			Change in resident population in last 5 years	Neighbourhood	Changes in the last 5 years instead of the last 10 years since the building are relatively new
			Amount of couples with children	Neighbourhood	No adjustments
			Amount of one person households	Neighbourhood	No adjustments
			Amount of couples without children	Neighbourhood	No adjustments
			Amount of single parents	Neighbourhood	No adjustments
			Amount of other ‘‘complex’’ families	Neighbourhood	A combination of ‘‘other coreless families’’ and ‘‘complex families’’ due to the division used in the Netherlands by the CBS
			Age index	Neighbourhood	Information about aging changes in the last five years not available
			Significant land use changes	Neighbourhood	No adjustments
			Amount of social housing	Building / Neighbourhood	No adjustments
	***Natural elements***	Valuable neighbourhood	Percentage of neighbourhood occupied by qualitative green or water (qualitative public space)	Neighbourhood	A combination of ‘‘% of area occupied by green elements’’, ‘‘% of area occupied by land cover categories with natural value’’, ‘‘% of area classified and Natura 2000’’, ‘‘Largest patch index and number of patches with natural value’’, and ‘‘length of channels (km)
	***Land cover***	Housing density	Housing density (residential units/km²)	Neighbourhood	No adjustments
	***Economic activities***	Attractiveness	Average value of housing supply (€/m2)	Building / Neighbourhood	No adjustments
	***Spatial functions***	Housing function	Population density in urban neighbourhoods (inhabitants/hectare)	Neighbourhood	No adjustments
		Specialized functions	Centrality potential	Neighbourhood	No adjustments

2.5 Mobility and data availability

The transport types that are analysed within this research are the bicycle, car, and public transport. It is important to understand that for every type of transportation different data is currently available. This is done by analysing three types of data. Namely, social data, sensor data, and registration data, see figure 13.

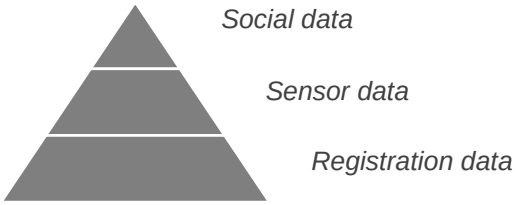


Figure13: Data pyramid (own figure)

The indicators within the dimension 'mobility' from the table of Gonçalves et al. (2017), see Appendix E, are the basis for the mobility analysis within the BOLD-driven method. The dimension 'mobility' is enriched with other available data about the neighbourhoods in Amsterdam. This research is only focussed on car use, bicycle use and public transport use.

First, the benefits of adding social data to the analysis are discussed in section 2.4.1. Then the benefits of analysing sensor data are elaborated upon in section 2.4.2. Thereafter the benefits of adding registration data to the analysis are explained in section 2.4.3. The analysis reflects collective knowledge by accommodating the perspectives from research, from the project developers, namely Kasper Hesp, development manager at G&S vastgoed, Fons Kurvers, Commercial director at Van Wijnen West, Marten Boerema, Commercial director at Van Wijnen Midden, and from Ger Baron the Chief Technology Officer of the municipality of Amsterdam.

2.5.1 Social data

Many people express their feelings, thoughts, desires, and problems through social media on a daily basis. While these people tend to get many reactions by their 'followers', the municipality, as stated by Ger Baron (Interview, 15-01-2018), does not use social media input for their own research into the use and effects of transportation for the city. Ger Baron states that social data is difficult to use because there is not always a geotag on social data (Interview, 15-01-2018). Furthermore, social data is not present in the table of Gonçalves et al. (2017). The use of social data could be an opportunity to incorporate what people actually want or need in their neighbourhood. Therefore, social data could be a source that quickly shows the present problems in a city.

Table 2: Social data information (own table)

LEVEL OF ANALYSIS	DATA SOURCE	DATA OWNER	DATA AVAILABILITY	DATA SET	USEFULNESS	INTEREST GROUP	TRANSPORT TYPE	USE**
Neighbour-hood	Twitter	Private	Open	Mobility patterns	Understanding of movements / Link patterns to target group	Municipality / PT provider* / Project developer	General	Monitoring
Neighbour-hood	Twitter / Fietsersbond meldpunt	Private	Open	Safety and (dis)satisfaction	Localized opinions and problems	Municipality	General	Monitoring

**PT provider = public transport provider*

*** used for implementing ambitions and/or for monitoring*

Table 2 explains what kind of social data could be used for analysing the use and effects of transportation, why this data should be used and by whom it should be used. The data sets in table 2 are thus an addition to the currently used data for analysing transportation. Topics or data that can be found within social data sources are for example road safety and mobility patterns. The analysis of mobility patterns is a city is useful to highlight what type of transportation is used most frequently in different neighbourhoods within the city and to analyse why certain types of transportation are used on particular routes. This analysis will be beneficial for the municipality. When the mobility patterns of the users of the city are clear, it is easier to deal with structural problems, such as busy and dangerous crossroads, and exceptional problems, such as the importance of a diversion in case of accidents. The patterns could also be linked to target groups to understand if there are patterns visible of how different types of households, for example, families with children or one person households, typically move through the city.

The fietsersbond meldpunt can be used by cyclist to report problems in the city. The website shows that in Amsterdam there are proximately 15 reports per month, and twenty solutions for cyclists per month (Fietsersbond Meldpunt, n.d.). On the website, it is visible what the problems are that people have reported, what the solutions were when the problem is solved, and what ideas are for improving the bicycle paths or routes. It seems that the website only shows the latest reports, solutions, and ideas, not all of them. Other sources, like blogs and forums, are not comprehensive enough for a municipality or project developer to use. These sources only give information about the thoughts of a small number of people, and their opinions are often very subjective. It is furthermore not clear where these blogs or forums can be found.

2.5.2 Sensor data

The municipality of Amsterdam primarily uses sensor data for their analysis of the city. A lot of this data is open for public use. Nonetheless, it is not always clear how a third party, such as a developer, could make use of this data and why this data is useful for their projects. This section provides insights in how

sensor data can be used for analysing the use and effects of transportation, why this data should be used and by whom it should be implemented.

Table 3: Sensor data information (own table)

LEVEL OF ANALYSIS	DATA SOURCE	DATA OWNER	DATA AVAIL A-BILITY	DATA SET	USEFULNESS	INTEREST GROUP	TRAN-SPORT TYPE	USE**
Building	GPS data	Public	Open	Distances	The distances to frequently used places indicates the transport type	Project developer	General	Both
Neighbour hood	Municipal data	Municipality	Open	Modal split: Amount of car / bicycle / public transport use	Link to target group / better-fit	Municipality / Project developer	Car	Both
Neighbour hood	Municipal data	Municipality	Open	Percentage of people who own more than one car	Insights in transport use	Municipality / Project developer	Car	Both
Neighbour hood	Municipal data	Municipality	Open	Bicycles at depot	Insights is bicycle storage problems	Municipality / Project developer	Bicycles	Both
Neighbour hood	Municipal data	Municipality	Open	Plusnetten	Insight in the crowded places	Municipality / PT provider* / Project developer	General	Both
Neighbour hood	GPS data / Public transport data	Private	Not open	Mobility patterns	Link to target groups / steering possibilities	Municipality /PT provider* / Project developer	General	Both

**PT provider = public transport provider*
*** used for implementing ambitions and/or for monitoring*

Table 3 is a combination of municipal data and the transportation-related datatypes in the table of Gonçalves et al. (2017) and shows the sensor data that is analysed within this research. The Municipal website shows a lot of transport related datasets, but often the requested information is not found (Gemeente Amsterdam, 2017b). There is no primary use of this type of data. Sensor data includes many types of data which can thus be useful for companies and other parties. Some data in table 3 is not available on a neighbourhood level. Therefore the data is analysed on a larger scale. These are modal split, the percentage of people who own more than one car, and the percentages of bicycles at the bicycle depot. This makes it more difficult to detect location specific problems and solutions.

Another topic or data that can be found within sensor data sources is road safety. The product Recorded Traffic Accidents and Network shortened to BRON, is a file with the accident reports from the police linked to the digital road network. This is a national file and contains data on all accidents registered by the police on the roads in the Netherlands (Gemeente Amsterdam, 2017b). While this data is useful for the

municipality of Amsterdam it is not divided into the neighbourhoods of Amsterdam. It is furthermore not clear if and how the municipality deals with this data and if citizens, visitors, and developers can expect that the municipality deals with the unsafe areas. This data is not listed in the table due to the lack of availability for this data and thus the difficulty of analysing transport safety in the neighbourhood.

The plusnetten (crowded places regarding transport), the parking pressure and the real-time traffic data show information amount the amount of traffic in a location. Ger Baron states that it is important to check whether there is traffic in a particular location because it is a final destination or merely because people are passing through. A detour could be an option for the second group if the area is to crowded (Interview, 15-01-2018). As stated by Ger Baron, due to GPS data from for example TomTom people always take the fastest route, which is not necessarily the best route for the city. Think of many cars passing by a school. It is also helpful to check models on different times of the day on the basis of the weather, hotel bookings, public transport information, events etc. to predict how busy it will be (Interview, 15-01-2018). TomTom (GPS data), NS and GVB (public transport data) have transportation data that is not publicly available. This data should also be open data to help municipalities and developers in having insights into mobility patterns. A substitute for this data is the modal split, which is the market share that each mode of transport has in all journeys. This data gives a view of the characteristics of the residents and how they prefer to move and is one of the indicators presented by Gonçalves et al. (2017).

2.5.3 Registration data

It is hard to directly draw conclusions from registration data. For example, the license plate registration shows the number of cars that are registered in a neighbourhood, but does not show the consequences of this amount of cars for the neighbourhood. Nonetheless, this data source should not be discharged completely. This section strives to highlight how registration data can be used for analysing the use and effects of transportation, why this data should be used and by whom it should be implemented.

Table 4: Registration data information (own table)

LEVEL OF ANALYSIS	DATA SOURCE	DATA OWNER	DATA AVAILA-BILITY	DATA SET	USEFULNESS	INTEREST GROUP	TRAN-SPORT TYPE	USE*
Building	Drawings	Project developer / Architect	Open	Building exits	Building characteristics	Project developer	Car	Implement ambitions
Building / Neighbourhood	Municipal data	Municipality	Open	Parking ratio	Building characteristics	Municipality / Project developer	Car	Implement ambitions

** used for implementing ambitions and/or for monitoring*

Table 4 is a combination of municipal data and the transportation-related datatypes in the table of Gonçalves et al. (2017). Registration data can primarily be used to identify the building characteristics and the characteristics of the neighbourhood. Something that is often overlooked when analysing transportation are the building drawings. The exits of the building are visible in these drawings. Therefore, these drawings can help in analysing transport. For example, in terms of safety. The safety level of transportation is completely different when the exit of a parking garage is connected to a busy crossroad than to a quiet side street.

2.6 Dealing with problems

Transport is an important topic for every development since all developments, big or small, need to be connected. Transportation is needed for stimulating interactions and networks. These interactions and networks, and thus transport aspects in general, are important for many different types of interest groups. This section highlights which problems or issues are important for every stakeholder, why it is important for them and what they could do with these problems.

Despite the many interest groups, problems relating to transport have emerged at certain (re)developments in the past. In the case of the Rijksmuseum in Amsterdam, there were several problems. Research of the TU Delft estimated that the passage through the Rijksmuseum would be too busy for bicycles for 85 days a year, due to peaks in museum visitors (Daamen & Hoogendoorn, 2010). After years of discussions with many opponents, the passage is currently open for cyclists, due to a renovation that separated the bicycle lane and zones for pedestrians (Van den Dool, 2012). This example shows the difficulties in the discussion between providing the many inhabitants of Amsterdam the shortest route through the passage by bicycle instead of having to take a detour and taking care of the safety of the many visitors of the Rijksmuseum on a daily basis. Therefore, it is important to look at multiple aspects that affect the use and effects of transportation, for which stakeholder the particular effect or need is important and if there are conflicting goals between the use and effects of transportation.

Table 5. Components divided by stakeholder (own table)

	Municipality	**Public transport provider**	**Project developer**	**Level**
Building	-	-	Building exits	Building
(and its direct	Road safety level	-	Road safety level	Neighbourhood
surroundings)	-	-	Amount of car / Public transport use by residents	Neighbourhood
	Parking pressure / ratio	-	Amount of parking spaces / ratio / pressure	Building / Neighbourhood
	People who own more than one car	-	People who own more than one car	Building / Neighbourhood

People	Safety and (dis)satisfaction	-	-	Neighbourhood / City
	Plusnetten	Plusnetten	Plusnetten	Neighbourhood / City
	Distances	Distances	Distances	Neighbourhood / City
	Patterns	Patterns	Patterns	Neighbourhood / City
	Bicycles at depot	-	Bicycles at depot	Neighbourhood / City
\City goals	Modal split	Modal split	Modal split	Neighbourhood / City
	Amount of parking spaces / ratio / pressure	-	-	Neighbourhood

The first step in improving transport related problems is to know whether the problem exists on a city level, a neighbourhood level or a building level. This helps in deciding which stakeholder is able to act on the problem. If the problem is on a city or neighbourhood level, it is likely that the municipality is able to deal with the problem accordingly. When the problem is on a building level, the developer can provide for a solution. Nonetheless, it is complicated to decide which stakeholder is responsible for dealing with the problem.

Table 5 lists the components that are important for the different stakeholders. The user is kept out of this table since the user should express their opinion, but the user is not the group that can provide solutions. Table 5 is divided by the three main subjects in this research, the building, the people and the city goals. The data sets and its usefulness is briefly described.

The project developer should have the highest interest in transportation and the related datasets on a building level. For example, information about the building exits, which are to be found in architectural drawings. The location of the building exits can influence the safety and (dis)satisfaction of transport. Therefore. the developer (and the project team surrounding the developer, including the designer) should check if the location of these exits matches with the direct surroundings of the building. Think of a crowded street adjacent to the exit and the direction of route people take. Furthermore, insights into the amount of car use and public transport use, and the occupancy and pressure on parking spaces can give a better fit for how many parking spots are needed in the building, thus the parking ratio. This is a concern of the municipality as well since parking pressure is a problem in the city of Amsterdam (Gemeente Amsterdam, 2017).

The Municipality has the most interest and influence on the level of the city goals since they are the stakeholder that created these goals in the first place. On the level of the people, the Municipality should be most concerned since the Municipality has the obligation to keep the city safe. Therefore, it is remarkable that the city does not use social data in their transportation analysis, as stated by Ger Baron (Interview, 15-01-2018). Insights into mobility patterns could be useful for all three stakeholders to create the best fit.

2.7 Incentives and turn offs

The BOLD-driven method could highlight what transportation is needed for a building/neighbourhood and what kind of considerations must be made in new developments. Therefore, the BOLD-driven method can improve the communication and collaboration between the municipality and project developers. Nonetheless, the municipality and project developers, or public and private parties in general, could have their own incentives and turnoffs for using the BOLD-driven method. This section elaborates on these incentives and turnoffs.

2.7.1 Incentives for using the BOLD-driven method by public parties

Within this research, the Municipality of Amsterdam is the public party that could use the BOLD-driven method. The municipality of Amsterdam has its own Chief Technology Officer with a team that is focussed on big data and analysing transportation. This shows that the municipality of Amsterdam probably promotes innovative methods to deploy the use of big data. This increases the change that the municipality of Amsterdam is willing to work with the BOLD-driven method since they already have the municipal team that understands big data.

As elaborated upon in section 1.2, the municipality of Amsterdam states that they want to stimulate smarter and cleaner uses of transportation, stimulate a good and fast flow of traffic (Gemeente Amsterdam, 2015a), improve routes throughout the city, construct more bicycle lanes, create more efficient bicycle storage and create more efficient car parking in parking garages instead of on street level (Gemeente Amsterdam, 2013). Some parts of Amsterdam still need solutions for staying accessible in the future, like the connection across the IJ (Gemeente Amsterdam, 2015b). Baron (2018) states that the Municipality of Amsterdam does not monitor and evaluate after the completion of a new development (area) to see whether problems occur regarding transportation and, or what he opinion of the user of traffic in that area is. He also states that it is necessary to be more adaptive in dealing with traffic. Currently, changes need to be planned two years in advance (interview 15-01-2018).

The BOLD-driven method gives the municipality of Amsterdam a possibility to monitor and evaluate the current state of transportation in a neighbourhood. This can lead to a better understanding of how to deal with existing problems, but also how to prevent new problems and implement ambitions. The BOLD-driven method can thus be used for a better understanding of the city. This method is a modern analysis, which is not static but can help to apply real-time solutions. It also shows the benefits of adding social data to transport analysis, which is currently not analysed. Furthermore, the BOLD-driven method gives a better understanding of how to link different types of data and how to implement mobility in planning regulations in the same way as e.g. transportation.

2.7.2 Turn offs for using the BOLD-driven method by public parties

As stated in section 1.2, despite having many ambitions, the municipality admits that there are less financial resources and space available for mobility (Gemeente Amsterdam, 2013). To BOLD-driven method can be transformed into a tool which can be used in the process of implementing these ambitions. Nonetheless, it is not guaranteed that the use of the BOLD-driven method leads to improvements in transportation. Therefore, it is not guaranteed that the BOLD-driven method proves to be a good investment. If the costs of creating the tool are substantial this could be a turnoff for the Municipality since there is less money available for transportation. The Municipality of Amsterdam could be restrained in investing in a tool for the method.

Baron (2018) states that it is currently still difficult to be adaptive when dealing with transport. Models should be dynamic but rules in the process of making changes, such as the need for permits, make it difficult to act fast (Interview, 15-01-2018). Therefore, the non-static nature of the method is not in line with the current context of dealing with transport.

2.7.3 Incentives for using the BOLD-driven method by private parties

As stated in section 3.2, research has shown that an improvement of transportation can result in a marginal increase in building value (Li & John, 2017; Muley & Tsai, 2017; Zondag & Pieters, 2005; Wang & Yan, 2011; Suparmono et al., 2017). The BOLD-driven method includes people's opinions and thoughts and gives a framework on how to better understand transportation. The BOLD-driven method gives project developers the opportunity to better understand transportation in a neighbourhood and to evaluate what people, and thus potential new homeowners or tenants, find important regarding transportation. Hence, it gives project developers the opportunity to evaluate what aspects contribute (most) to the increase in building value.The BOLD-driven method can generate a lot of information about how and why people move to the city by a certain transport system. Other private parties that could benefit from this information or data. Besides the developer, this information can also be beneficial for public transport providers, bicycle rental companies (or other vehicles), taxi companies etc.

2.7.4 Turn offs for using the BOLD-driven method by private parties

The use of the BOLD-driven method could lead to extra costs for the developer for enhancing transportation. This counters the incentive of the marginal increase in building value. For example, the developer could enhance transportation by increasing the storage space for bicycles, which is merely a cost, not a revenue. The costs of a parking garage underneath a building are approximately between €722,- per square meter gross floor area (for a parking garage of 1,500 m²) and €600,- per square meter gross floor area, for a parking garage of 8,000 m² (Vakmedianet Bouwdata, 2018). The traditional bicycle takes up a space of approximately 1.75 m x 0.7 meter, or between approximately 1.1m² and 1.5m². This is without the space for turning. This means that one car parking space gives room to 5 to 10 bicycles (Leefmilieu Brussels, n.d.). Pilots

could highlight if the increase in property value transcends the extra costs for the developer when implementing better transportation on the basis of the BOLD-driven method.

As stated in section 4.4, developers currently not deploy a location or transportation analysis. The reason could either be that the developer thinks that this is a governmental task or that they lack ICT skills for using big data in their analysis. Therefore, the tool for the BOLD-driven method should either be easy to use for a developer or the developer should hire other companies or employees to perform the analysis. This thus gives an extra task to the developer, which means that the use of the BOLD-driven method increases the time and money needed for the development process.

2.8 Summary of the transport analysis

The analysis within this research can be deployed during the brief & design phase and the use & management phase of the building lifecycle. The transportation analysis during the brief & design phase is needed to realise a better implementation of ambitions regarding transportation for new residential project developments. The transportation analysis during the use & management phase is implemented to monitor the use and effects of transportation in existing residential real estate. Furthermore, the transportation analysis can be done on three levels, the building level, the neighbourhood level, and the city level. Al three levels are connected to each other.

The method, existing of 17 location background indicators and 10 mobility data sets, is designed on the basis of scientific research of Gonçalves et al. (2017) and publicly available data. Other research and new (openly available) data sets could add to the list of indicators and data sets used within this research. After the analysis of the background information, it is clear what kind of transport is used and what kind of Big Open Linked Data is available for these transport types. These are thus different sources of social data, sensor data, and registration data.

Different types of problems are important for different types of stakeholders. Therefore, it is important to look at multiple aspects that affect the use and effects of transportation, for which stakeholder the particular effect or need is important and if there are conflicting goals between the use and effects of transportation. If the problem is on a city or neighbourhood level, it is likely that the municipality is able to deal with the problem accordingly. When the problem is on a building level, the developer can provide for a solution. The incentives for public parties for using the BOLD-driven method are the improvements in the process of (real time) monitoring transportation, better understand transportation, and better understand what data is useful for the analysis. The turnoff could be a difficulty in implementing the method. The incentives for private parties for using the BOLD-driven method are a possible marginal increase in building value and the possibility to generate information about how and why people move through the city. The turnoff could be the extra costs that are needed for improving transportation and the time and skills needed for performing the analysis.

Theoretical background

3 Theoretical background

3.1 Big Open Linked Data

Data is defined as ‘’Information, especially facts or numbers, collected to be examined, considered and used to help decision-making’’ (‘’data’’, 2017). The definition directly shows how useful data can be when properly collected and analysed. This chapter answers the sub-question: ‘*What is the main difference between the currently used data and BOLD?’.* To answer this question, this chapter first elaborates on the differences between BOLD and the existing data in section 3.1.1. Hereafter the possibilities for the usage of BOLD in scientific research are explored, in section 3.1.2. Section 3.1.3 highlights the usefulness of the ‘Walk Score’, a score for a building location regarding transportation, which is available in several countries. Section 3.1.4 contains a summary of the main findings and highlights the relation of this section with the research triangle.

3.1.1 Old data versus new data

The shift in cities becoming smart or BOLD is a very recent one. This transformation is due to the fact that the world has started to digitalize rapidly. On a daily basis, approximately 2.5 quintillion bytes of data are created (Jacobson, 2013). This has led to a massive amount of new data and data sources. The possibility of using this data for decision making within cities has led to the concept of smart cities, something Amsterdam strives to become (Gemeente Amsterdam, n.d.-d). Although the smart city concept is well known in urban sciences worldwide - recently Singapore is crowned as ‘smartest’ city in the world - there is no shared definition for the concept. Khan, Anjum & Kiani (2013) state that a smart city is ‘’a city which invests in ICT enhanced governance and participatory processes to define appropriate public service and transportation investments that can ensure sustainable socio-economic development, enhanced quality-of-life, and intelligent management of natural resources’’. Chourabi, Nam, Walker, Gil-Garcia, Mellouli, Nahon & Scholl (2012) state that a smart city is a city which is more efficient, sustainable, equitable, and liveable. Al Nuaimi. Al Neyadi, Mohamed, & Al-Jaroodi (2015) state that new data allowed cities to realise smart characteristics such as ‘’sustainability, resilience, governance, enhanced quality of life, and intelligent management of natural resources and city facilities’’. Despite the differences in definition, many researchers highlight the benefits of a ‘’Smart City’’, which in literature is also often referred to as a BOLD city. The different names for the concept can, and are used simultaneously in scientific research. Within this research, the term BOLD is used further on to enhance the readability.

Using data for project developments is not something new. In the 19th century, the Dutch ‘Kadaster’ was created to structure cities by using maps (Kadaster, n.d.-a). The Kadaster consist of the BAG. The BAG (in Dutch: Basisregistraties Adressen en Gebouwen) registrates building addresses in the Netherlands. In the BAG, the building

address, the construction year, the contour of the building, separate units within a building, and the type of use of the building are described. The owner of the information in the BAG is the municipality, but the information is public (Kadaster, n.d.-b). The BRP exist for many years as well. The information of the BRP (in Dutch: Basis Registratie Personen) is owned by the government and contains personal details of the inhabitants of the Netherlands (Rijksoverheid, n.d.-a). While the Kadaster currently still is an important data source for analysing the built environment, many new data sources have emerged. The used data within his research can be divided into three layers.

The first layer is the oldest and consist of registration and survey data. Registration data consists of 'population register' data, the 'Kadaster' data, and registered infrastructure data. There are big differences between countries in conjunction with how much data is registered and what kind of data is public. In France, the United Kingdome, Portugal, Greece, Cyprus and Malta, there is no population register at all. These countries only have a register of civil status (Rijksoverheid, n.d.-a). The big difference between the register of civil status and a population register is that the first contains information about life events of citizens such as birth, marriage or death, while in the latter all people living in a country are registered with information of current address and other important information for identification. There are even several differences between cities within the Netherlands. In Amsterdam for instance, much more data is registered, and open for public use, in comparison to smaller Dutch cities.

While registration data already existed in the late 19th century, linking this registration data is new. Some cities are further in linking this data, which again shows the differences between Amsterdam and smaller Dutch cities. The municipality of Amsterdam uses geological maps to visualise the linked data. These maps are publicly accessible and have many different themes. An example of these maps is the visualisation of the link between target groups and a building project. For example, which target groups live in what kind of building, a permanent building, a semi-permanent building or a temporary building. Nonetheless, many of these maps are merely a visualisation of a theme, instead of a link between different types of data. For example, a map that visualises the places where taxi stands are (not) allowed, a map that visualises the tram and subway lines, and a map that visualises the use of a building (Gemeente Amsterdam, n.d.-a). While a lot of information can be drawn from these visualisation maps, linkages between other types of data (or information in general) should be made before conclusions can be drawn. These linkages are sometimes also missing in survey data. In Rotterdam for example, several surveys are conducted every two years. Different municipal departments chose the survey topics. However, survey data is not always used in its full potential. There is a lack of knowledge about what the different departments survey about and if data from one survey is useful for multiple departments.

The second layer of data is sensor data. An example of sensor dat, is data derived from cameras tracing traffic. Sensor data already exists from the 20th century, but the purpose of creating and analysing sensor data has changed over the years.

Nowadays sensor data is created and analysed for purposes such as noise sensors or sensors which track the movement of people (Sagl Resch, Hawelka, & Beinat, 2012). Sensor data is the biggest data source of the three layers. To be beneficial for multiple actors, the large amount of data derived from sensors should be linked properly and should be open for use. Sensor data can be derived from different companies, e.g. the possibility to rent bicycles at the NS stations, and different sources. As explained in the previous chapter, the municipality of Amsterdam has a lot of publicly available sensor data on their website (Gemeente Amsterdam, n.d-a.).

The third layer of data is social media data. This data source is only circa 10 years old and has an impact on many people's lives. The creation of Facebook in 2004 and Twitter in 2006 changed the way people communicate with each other and within the internet. The impact and reach of social media were increased by the introduction of smart devices, such as the iPhone in 2007, or the iPad in 2010 (McAfee, Brynjolfsson & Davenport, 2012). These tools make it possible to be linked to the internet or GPS at any given moment and any given location. Social media data is data which is derived from sources such as Twitter, Facebook, Instagram, but also from blogs and forums. The data derived from social media is already used for advertisement. For example, the possibility to advertise on the Facebook page of people with a certain age, gender or interest. By capturing what people feel or do, this data source is very applicable for advertisement. However, there are still many questions about how this data can be structured and useful for other purposes. The Twitter platform is the most applicable data source for researchers since this data is open and therefore accessible (SalasOlmedo & Rojas Quezada, 2017). The Instagram platform is open as well but is very different since the data consist mostly of pictures instead of text. The Facebook platform does not have open data, making it difficult to research people on Facebook. An important note before using social data for research is that researchers have to keep in mind that not all people use social media, and it is therefore questionable if the whole spectrum of the city users is part of the research.

3.1.1.1 Key differences

There are several key differences between the 'old' data and the 'new' data, which are summarised as the 3V's: Volume, Velocity, and Variety (Mc Afee et al., 2012). Volume is the amount of available data. Since more data are created on the internet every second than the total amount of available data on the internet 20 years ago, and since billions of data are stored every second from, for instance, customer transactions, the volume of data is very large (Mc Afee et al., 2012). Velocity deals with the speed of the data. For some applications, the volume is less important than the velocity since these applications need real-time (or nearly real-time) data. Rapid insights can enhance competitive advantages, e.g. estimating sales by analysing occupancy data of a parking lot (McAfee et al., 2012). Applications for everyday use need velocity as well. The apps that calculate the best route through an analysis of traffic data for example. The Variety of the data is enhanced through social media and the use of smartphones. As previously mentioned, also data which shows people's opinions and pursuits are

available, through for example GPS signals, posting images or messages (McAfee et al., 2012).

Nonetheless, not only the 3V's are important when collecting data for a BOLD city, it is most of all important that this data is open and linked properly. Data which is not accessible or not linked can simply not be used in research. Table 6 summarizes the differences between the three types of data.

Table 6. Differences between types of data (own table)

	SOCIAL DATA	SENSOR DATA	REGISTRATION DATA
What	Everything that people have posted on the internet	Everything that is captured by sensors	Everything that is registered
When	People decide how often they make use of the data sources	Real-time data Changes constantly	Does not change often Changing something takes time
Volume	High	Very high	Low
Velocity	High	Very high	Very low
Variety	High	Very high	High

Sensor data is available in the highest volume due to a large number of sensors in the city. Sensor data also has the highest velocity since the data is real-time and the highest variety due to the many different types of sensors in the city. Registration data has a high variety because, as previously mentioned, many different things are registered in Amsterdam, but compared to the other types of data the volume is low. Since it takes a lot of time to make changes to registered information the velocity of this type of data is very low. The volume, velocity, and variety of social data is high, but the data is not always useful because it consists of opinions on (almost) every topic. Because of the large amount of data it is important to know what data is useful for an analysis.

For a transport analysis all three data types are useful, but not all data sources within these data types. A lot of conclusions can be drawn from this data, but the data is only operable for this research when it is available. Availability of data often tends to be a limitation for research into big data. Examples of research that make use of BOLD highlight the benefits of the concept. To understand what kind of big data is applied within research in the built environment and mobility, 3 papers are examined and elaborated upon within the next section.

3.1.2 The usage of BOLD

Friso, Rijsdijk, & de Graaf (2015) use mobile phone data of 3 big mobile phone providers in the Netherlands to enrich the transport model of the Rotterdam region. With this procedure, a destination is defined, by using OD-information (Origin-Destination), when a mobile device is at a certain location for more than half an hour. Privacy of the user is ensured by encrypting the identifying information, the phone

number. The information is only saved for a maximum period of one month. Also, a minimum of 16 phone numbers is used in the data set to prevent using information related to a single device. The home location of the user is determined by locating the mobile device in night hours. The data owner is, in this case, a data-processing company. The research enriches the traditional transport model, which describes a day in an average workweek, with a day to day analysis of the used transport.

Shi & Abdel-Aty (2015) study the viability of proactive real-time traffic monitoring strategy in Orlando, by using intelligent transportation systems (Microwave Vehicle Detection System). The research is primarily focussed on safety. The systems detect the speed, volume, lane occupancy and volume by vehicle type per lane on a minute basis. The data was derived from 275 detectors on expressways in Orlando. The detectors showed data about density and speed by analysing more than one million OD-trips. This resulted in a model predicting congestion and rear-end crash likelihood. The data could be enriched by other data sets that can detect the cause of crashes, e.g. weather data. Traditional congestion measures cannot capture the variability of congestion. This means that time and location-specific aspects are not detected in the traditional measures.

Salas-Olmedo & Rojas Quezada (2017) uses Twitter data to map the impact of public spaces of social interaction within malls, leisure areas, parks etc. This research is conducted within different parts of the metropolitan area of Concepción in Chile. Twitter data are publicly available at no cost with the Streaming API. A streaming API, or Application Programming Interface, is a tool of Twitter to push data, with for example relating keywords, toward the end user of the data. This is different from the Twitter Firehose since the Twitter Firehose assures delivery of 100% of the tweets that match your criteria instead of 1% to over 40% of the Tweets with the Streaming API. The streaming API is useful for light analytics or statistical analysis (BrightPlanet, 2013). It is furthermore possible to use Twitter's geographical dimension. The geolocalized data derived from Twitter is complementary to current origin-destination surveys that take place every 10 years in Concepción. It is screened and saved with the use of a Python language and thereafter transformed into point layers in GIS, Geographic Information System. The mapped mobility patterns associated with different types of public spaces show areas of social exclusion. These spaces are less visited by people living relatively near (Salas-Olmedo & Rojas Quezada, 2017). In this research, the preferred information is derived from data in the surrounding neighbourhoods of three cases. The three analysed papers show the importance of several aspects when using big data in research. The first aspect is privacy issues, as explained in Friso et al. (2015). Measures need to be taken to filter out data that gives information about a single device. The data must thus be used in large volume, not only for the validity of the data but also to avoid privacy issues. Shi & Abdel-Aty (2015) shows the importance of the type of data applied within the research. In the paper, only rear-end crashes are taken into account, while in real life different types of crashes occur for different types of reasons. The paper of Salas-Olmedo & Rojas Quezada (2017) shows the influence of the used methodology on the data set and subsequently on the results of the research.

3.1.3 Walk Score

This research is focussed on the availability of bicycle transport data, car transport data, and public transport data. This means that the data should exist and should be available, either publicly or merely for the municipality, the developer and, or the public transport provider. The level of availability of data is different for different countries. This can be due to the fact that some data owners are willing to release their data and some data owners are not. Or because the data is not linked properly, and thus the needed information that can be derived from the data is not clear. The Netherlands could learn from other countries that have managed to link transport data in such a way that the information that can be derived from the data is useful for project developers.

In the United States, Canada, Australia, and New Zealand the Walk Score is created. This is a score that measures the walkability on routes to destinations such as grocery stores, schools, parks, restaurants, and retail. The score is also available in the form of a 'Transit Score', a 'Bike Score', an 'Opportunity Score', a 'Predictive Analysis, the 'Pedestrian Friendliness' score, 'Public transit data', 'Score Details', and a 'Travel Time Analysis'. The 'Transit Score' shows the distance to the closest stop on each route and an analysis of route frequency and type. The 'Bike Score' measures the accessibility based on infrastructure, topography, destinations, and road connectivity. The 'Opportunity Score' measures the ease of accessibility to nearby jobs without a car adjusted to the population on a scale. The 'Predictive Analysis' is a custom analysis of the impact of proposed development on Walk Score (Walk Score, n.d.). This analysis could be helpful for municipalities in the process of convincing developers to invest in transport. The 'Pedestrian friendliness' includes population density, average block length, and intersection density. The 'Public transit data' is available for hundreds of transit agencies. It includes the location of all transit stops, routes, route frequency, and route type. The 'Score Details' includes grocery stores, parks, restaurants, coffee shops, transit locations, farmer's markets, and other nearby businesses. The 'Travel Time Analysis' maps food deserts, park deserts, or play deserts. It also analysis school walkability or compute the number of people or jobs within a given travel time (Walk Score, n.d.). Note that most of this data is also available in known mapping programs such as Google maps. The Walk Score gives merely a better visualisation of these subject. All scores are measured on a scale from 0 – 100. Walk Score has received grants from the Rockefeller Foundation and the Robert Wood Johnson Foundation to align their algorithms with the latest academic research (Walk Score, n.d.).

Research of Bokhari (2016) found that one Walk Score point can increase the price of a residential property in cities in the United States with 0.9 percent or 3,250 U.S. Dollars. Cities in the United States are different than cities in the Netherlands in terms of size, geography, accessibility and such. Furthermore, inhabitants of the U.S. are known for the frequent use of the car, while the inhabitants of the Netherlands are known for the frequent use of the bicycle. These aspect influence the effect of one

Walk Score. This research does not indicate a similar increase in property value for every Walk Score point, for residential properties in Amsterdam. Therefore, research into the effect of the Walk Score in Dutch cities would be beneficial for real estate owners, investors and for municipalities. Leinberger & Alfonzo (2012) Research Professor of Urban Real Estate at the George Washington University School of Business pleads for walkable cities in the United States. Leinberger & Alfonzo (2012) states a new form of development is needed in the US, the ‘’Walkable Urban’’ development, with a high density, multiple modes of transportation that get people and goods to walkable environments and with an integration of many different real estate products in the area. The Average vacancy-adjusted annual office rent in WalkUPs is $36.78 per square foot, compared to $20.98 for drivable sub-urban office rents. This means that there is a 75 percent rental premium. Furthermore, among for-sale housing, per-square-foot values for regionally significant WalkUPs are 71% higher than the average of all other places in the D.C. metro area (Leinberger & Alfonzo, 2012). While cities in the Netherlands are very ‘’walkable’’ compared to larger cities in the US, the research of Leinberger & Alfonzo (2012) gives a well-founded explanation of the benefits of accessible real estate by using the Walk Score point as a metric to compare rental prices and property values.

3.1.4 Main findings

This section summarizes the findings for the answer to the first sub-question: ‘*What is the main difference between the currently used data and BOLD?’.*

To understand what types of data exist and how it can be used for research, data can be divided into three layers. These are registration/survey data, sensor data, and social data. Social data is the newest type of data since it only exists for approximately 10 years. While registration/survey data and sensor data exists longer, the use of this data has changed. This has led to the creation of the concept BOLD, which is data that is available in large volume, is easily accessible, and linked to other data. The key difference of BOLD in comparison to other (contemporary) data is that BOLD contains the 3 V’s, which stand for Volume, Velocity, and Variety. Researchers have used BOLD to examine the built environment in combination with transportation issues. Examples are, research that analyses mobile phone data, research that analyses real-time traffic monitors and research that analyses twitter data. In the United States, Canada, Australia, and New Zealand the Walk Score is available. This is a score for a location within a city regarding several transport types. Researchers have started to underline the positive relation between the Walk Score and building values.

This section shows the importance of the use of Big Open Linked Data in the research triangle. It highlights the effect of BOLD, in the form of for example the Walk Score, on a development. It furthermore shows the benefits of this effect for a project developer, and it shows the possibilities for monitoring transport with BOLD.

3.2 Project development

This section shows the consequences of a good or a bad accessible city or neighbourhood for the built environment. This section gives theoretical background on the sub-questions*: 'What are the main factors that make transportation important for project developments?*' and '*How does a project developer include transportation into the development process?*'. To answer these sub-questions with theoretical background, this section first elaborates on the influence of transportation to project developments in the residential market. Subsequently, section 3.2.2 shows how transport is analysed in literature and how a project developer can include transportation into the development process. Section 3.2.3 contains a summary of the main findings and highlights the relation of this section with the research triangle.

3.2.1 Transport for new project developments

The user of the city can be part of multiple markets simultaneously. They could be part of the residential market and the office market when they work and live in the same city. Therefore, the importance of transport is not market specific. Nonetheless, this research is focused on the residential market.

This section first elaborated on the financial benefits of good transportation for residential real estate, hereafter this section elaborates on the social benefits of good transportation of residential real estate.

3.2.1.1 Financial benefits of good transport

Financial benefits of good transportation can stimulate real estate developers to create well accessible places in the city. Research has shown that an improvement of transportation results in an increase in building value (Li & John, 2017; Muley & Tsai, 2017; Zondag & Pieters, 2005; Wang & Yan, 2011; Suparmono, Darsono, Sarungu, Riyanto, 2017). Nonetheless, in the Netherlands, the effect of transportation on the building value is significant but rather small. Other demographic factors and their effects, such as neighbourhood amenities and dwelling attributes have a higher effect on the building value and thus on residential location choices. The reason that the influence of transportation is low is due to the fact that the effects of transportation changes between regions in the Netherlands are rather small (Zondag & Pieters, 2005). While the influence of transportation seems small, when multiple demographic factors would be seen as transportation factors, the level of influence would increase. Think of a lack of neighbourhood amenities which results in higher transportation needs from and to amenities in general. The quality of transportation is also influenced by how people prefer to travel. Research from the Netherlands shows that jointly enhancing bike-ability and transit transportation accessibility can generate positive effects on property values. Governmental strategies of spatially-joint bicycle and transit investment lead to higher property values (Li & Joh, 2017). In Santander, Spain, research estimated increases in property value of 1.8% for each additional transit line

present in the neighbourhoods surrounding the dwellings, as well as a reduction of 1.1% in property value for each additional minute in travelling time to the Central Business District. On the other hand, the number of buses that stop at one individual bus stop does not have a significant relationship with the property value. Nonetheless, public transportation seems to be an attractive feature to convince people to buy a specific house (Wang & Yan, 2011).

Based on a multiple linear regression analysis, with data on 379 land samples in Jogjakarta, Indonesia, it was shown that the influence of spatial distances on land prices was not significant. On the other hand, the travelling time did exert significant influences on land prices. Travelling times to Gadjah Mada University campus, Malioboro area, traditional markets, elementary schools, junior high school, and senior high schools exerted significant influences on housing land prices in Jogjakarta. The distance to markets also exerted significant influence on housing land prices in Jogjakarta (Suparmono, Darsono, Sarungu, Riyanto, 2017). While Amsterdam is a completely different city than Jogjakarta, it is likely that in every city the distance to amenities that are often used is very important for peoples location choices regarding their residence. The fact that people are willing to pay more for their dwellings when they are well accessible, or well connected, shows the importance of the use and effects of transportation for the inhabitants of the city and thus for every new project development. The subsequent section shows the social benefits of good transport.

3.2.1.2 Social benefits of good transport

Research shows that differences exist between types of home-owners in their amenity preferences. Apartment owners have a marginal implicit value of transportation needs to cultural amenities than single-family dwelling owners, while the marginal implicit value of workplace amenity transportation needs is greater to the single-family dwelling owner than the apartment owner (De Araujo & Cheng, 2017). These differences show the importance of housing submarkets and the differences between peoples preferences when estimating the quality of transportation.

The neighbourhood, and the transportation possibilities within the neighbourhood, also reflect different income groups. Research indicates that locations with better access to public bus transportation have a lower proportion of low-income households, both in the central city and the suburbs. Residential opportunities for low-income groups can be expanded by improving access to transits. This could also reduce spatial inequities in urban centres (Pathak, Wyczalkowski & Huang, 2017). This is confirmed by the research of Ta & Chai (2017) which state that low-income residents have a relatively smaller daily potential path and smaller daily activity spaces than other social groups. This is because low-income groups have disadvantages in mobility. Especially socio-economy, urban form and activity factors seem to have a significant impact on behaviour spaces. Middle-and low-income single residents have relatively small daily potential path areas and activity spaces. Women, older residents, and residents who work in local areas have relatively small activity spaces. Activity space

and daily potential path area are both positively related to facility density around one's home, while activity space is negatively related to facility density around one's workplace. Furthermore, residents who live far from railway stations and work near railway stations have relatively small activity spaces. Working hours have a significant negative impact on both daily potential path area and activity space. Space-time constraints significantly affect daily potential path area (Ta & Chai, 2017). Nonetheless, research shows that low-income households do not change their residential location unless it is really necessary. If these groups do decide to move, they are nearly unable to optimize their location in order to have better access to destinations. The reason is that there are very limited residential choices for low-income households (Sterzer, 2017). The social benefits of good transport thus exist when transport complements the needs of different types of people.

3.2.2 Analysing transport

Research of Lasley (2017) presents a paradigm shift in how transportation improvements could be viewed. Instead of the traditional view of only addressing transportation issues using transportation means, stakeholders may be able to analyse the one topic (transportation) by addressing completely different topics (e.g., neighbourhood quality, affordability, etc.). This paradigm was needed since areas do not exist in a vacuum. Other options and factors in the housing location decision specifically affect transportation (Lasley, 2017). This confirms the different aspects used for the analysis of the use and effects of transportation in chapter 2. Traffic and transportation concerns are generally more important at the neighbourhood level, trumping affordability, school quality, and proximity to friends and family. While traffic does not appear to deter people from moving to a new urban area, bad traffic and long travel times do appear to deter buyers from certain neighbourhoods, if more important factors are accommodated (Lasley, 2017). The inclusion of other topics related to transportation also proves to be useful for analysing the interactions between the characteristics of the present and potential new residential locations of individual inhabitants. It can highlight the role of their personal characteristics in the choice of a new residential location. For example, the correlation between location choices and number of workplaces of that location (Vorel, 2014). Furthermore, research of Salas-Olmedo, Wang & Alonso (2017) shows that the prediction of using the new indicators achieve better results for analysing transportation in an entire area, both when using it for a small neighbourhood as for a larger area. The research showed the convenience of using a GIS and LUTI combination to improve model accuracy and precision. GIS stands for Geographic Information System and includes all digital systems that provide information linked to geographic locations. LUTI stand for an accessibility-based land use and transport interaction model. The research combines existing LUTI models with a Metropolitan Activity Relocation Simulator (MARS) model by using the new transportation indicator based on local coefficients. The MARS model fits better with the real data in respect of the distribution of workplaces and residents (Salas-Olmedo et al., 2017). Research of Oni, Akinidele & Akiniare (2014) found that a graph-theoretic approach was useful in analysing and resolving the use and effects

of transportation and site selection issues in the real estate development process. A graph-theoretic approach uses a satellite map of the study area. The graph visualises the nodes in a network of roads. Hereafter, these nodes are serially numbered and translated into a simple matrix of the number to obtain the accessibility indices for the ranking of access routes in the study area. The findings provide a better determination of the use and effects of transportation which had been done by a mere intuition of real estate appraisers and planners through the application of the approach. This is applicable to inform developers in taking decisions in the location choices by scientifically establishing most of the use and effects of transportation for a location and thus assists in site selection (Oni, Akindele & Akinjare, 2014).

The positive effects of good transportation show the importance of including transport into the development process. This can first of all be done with a thorough location analysis regarding transportation and the described transportation factors. As stated by Hesp (2018), project developers first of all have to deal with the obligations they have toward the municipality regarding transportation, think of a parking ratio. In some places with a lot of traffic, this is not enough. The municipalities should come with solutions for the transport network or public transport because good alternatives are needed if car use is not desired. The investor should be convinced as well because they normally want many parking spaces. This is only possible when the developer provides for a good concept where people do not need the car (interview 20-08-2018).

3.2.3 Main findings

This section summarizes the findings of the theoretical background to the questions: *'What are the main factors that make transportation important for project developments?*' and *'How does a project developer include transportation into the development process?'*.

An increase in the quality of transportation can have a positive effect on the building value. Other demographic factors, such as neighbourhood amenities, neighbourhood quality, affordability, etc. need to be taken into account as well when analysing the use and effects of transportation for project developments. In Santander, Spain, increases of 1.8% for each additional transit line are present in residential areas, as well as a reduction of 1.1% in their prices for each additional minute in travelling time to the Central Business District. Locations with better access to public bus transportation have a lower proportion of low-income households, both in the central city and the suburbs. Nonetheless, low-income households do not change their residential location unless it is really necessary. Well-designed bicycle lanes can help to solve one of the key inherent weaknesses of the conventional transit-oriented development. Traffic and transportation concerns are generally more important at the neighbourhood level, trumping affordability, school quality, and proximity to friends and family. This section shows the importance of the residential project development, transport and the developer in the research triangle. It highlights why transport is important for a

residential project development. It furthermore shows how a project developer can steer a better implementation of transport for a new project development.

3.3 Transportation

The ambitions of the municipality of Amsterdam, as stated within their policy documents, are very broad. Therefore this section evaluates these ambitions by giving theoretical background on the sub-questions: '*What kind of policies complement the transportation goals of the Municipality?'*, *'Is there a structure present in the transport flows in Amsterdam?'* and '*What are the main factors for people to choose a certain type of transport?*'.

To answer this sub-question with theoretical background, this section first elaborates on the priorities of municipalities and governments in section 3.3.1. Subsequently, this section elaborates on the providers of different types of transportation in section 3.3.2. Section 3.3.3 elaborates on the different possibilities to analyse transportation models. The transportation model of Amsterdam is explored in section 3.3.4. Then, the reason for people to move by a certain type of transport is examined in section 3.3.5. Section 3.3.6. contains a summary of the main findings and highlights the relation of this section with the research triangle.

3.3.1 Municipal priorities

A general summary of the policies in Amsterdam is to make transportation smarter and environmentally friendlier. There are multiple ways to make transportation environmentally friendlier, which include not travelling at all, walking, cycling, taking public transport and the use of cleaner cars (Bertolini et al., 2005). These do not seem very revolutionary, but with the growing number of users in the city, the implementation of these types of transportation needs to change. Bertolini et al. (2005) suggests to develop multi-functional homes/workplaces (to stimulate not travelling), developing multi-functional neighbourhoods (to stimulate walking and cycling), promote public transport oriented developments/nodes (to stimulate public transport) and finally to develop multi-functional balanced urban regions (for car use). It does not seem easy to implement these suggestions in practice due to the fundamental dilemma that most alternatives of the car do not match its quality on an economic, social and political level (Bertolini et al., 2003). Municipalities could choose for these type of developments when they have a tender for a certain location or they can change the land use plan.

The effectiveness of municipal strategies and policies to improve transport needs to be evaluated, and improved when lacking. Therefore, a clear vision of the priorities of a municipality is needed. Chorus, Annema, Mouter, & van Wee (2011) have shown that Dutch politicians express their preferences in terms of emissions reduction, congestion reduction, operational costs, acceptability among the general public and acceptability among retailers. This research indicated that politicians' choices are driven by conscious trade-offs, discrete choice models and that choice-experiments may be successfully applied to show relevant determinants of choices. This outcome

is in line with the rather general or vague ambitions of the Municipality of Amsterdam in chapter 1. When policies or ambition are divined in general terms, trade-offs remain possible. Therefore it is important for a municipality to implement their main ambitions for enhancing transportation in new developments by making them obligated. This will make transport one of the priorities for new developments instead of a possible trade-off.

The way of creating policies has changed over the years. Crivello (2015) analyses the actors, processes, and networks in circulation in Turin, Italy. This research indicates that policy-making is becoming faster due to the currently faster mobility of policies. This is basically the transfer of knowledge from one institution to another. Implementing a successful policy created elsewhere is perceived as easier and safer than the creation of a policy 'ex novo'. But, there does not seem to be a ''best practice scenario'' of the implementation of the BOLD city at the moment (Crivello, 2015). The topic of transportation is a clear example of a location-specific subject, which needs a location-specific solution. Therefore, one can only learn from the process of policy making of other cities or institution instead of the applied solutions itself. The implementation of a ''best practice scenario'' is furthermore difficult since it is not often clear which intervention, out of multiple implemented interventions, gave a solution. For example, even though the Netherlands is often seen as a best practice for cycling policies, there are little insights in which interventions increased cycling rates and which did not. Cycling rates are furthermore influenced by many more aspects than only cycling policies, e.g. external 'context'. These are circumstances such as increases in total population, number of households and the proportion of one-person households, which makes it impossible to give statistically valid conclusions. Nonetheless, it seems that an improvement of quantity and quality of cycling infrastructure in combination with a decreasing attractiveness of car use (mostly by making parking within the city more expensive) increases cycling rates. It furthermore seems that measurable, monitorable and easily adaptive policy implementations in combination with an allowance for experimental measures, high levels of citizen participation and the presence of a strong leader have a positive effect on cycling policies (Harms, Bertolini & Brömmelstroet, 2016). To understand how the municipality of Amsterdam can influence choices regarding transportation it is important to know who the providers are of a particular type of transportation, e.g. providers of public transport, different types of streets, bicycle paths, sidewalks, rivers etc.

3.3.2 Transport providers

The national Dutch government plays an important role in the national rail network and services. The Dutch Minister is responsible for the construction and management of the Dutch railways (Spoorwegwet, 2003, §1, article 5). This means that the national government finances and decides upon large infrastructure projects. It has imposed competitive tendering, except for the four largest cities, including Amsterdam. On the contrary, urban bus and rail services are decentralized (Veeneman, 2016).

The ‘Vervoerregio Amsterdam’ (The Transport Region Amsterdam) is a collaboration between 15 the municipalities, including Amsterdam. The ‘Vervoerregio Amsterdam’ grants concessions to bus, tram and metro transport companies, grants subsidy for the operation of public transport, invest in new trams and metros and finances improvements in the regional infrastructure. It is furthermore responsible for the policies for better utilization and use of the road network and public transport and bicycle networks in the region, e.g. increasing quality of transportation, encouraging bicycle use and reducing the number of road casualties (Vervoerregio Amsterdam, 2017). The GVB, the ‘municipal transport company’, provides public transport, in the form of buses, trams, and subway in and around Amsterdam. It furthermore provides for the ferry across the IJ (GVB, n.d.). This transport is free, due to a policy of the municipality of Amsterdam. A lot of detailed data of the Dutch public transport is available due to the RFID-based ticketing system. However, operators (the owners of the data) see it as a strategic advantage to limit access to this data. The same counts for the GPS data from bus operations (Veeneman, 2016).

In the Netherlands, there are several road authorities. The provinces are responsible for the provincial roads, visible in orange in figure 14. Rijkswaterstaat (RWS) is responsible for the national highways visible in red in figure 14, 15, and 16. The municipalities are responsible for the local roads, visible in green in figure 16 (Rijksoverheid, n.d.-b). The municipality of Amsterdam is furthermore responsible for local sidewalks, bicycle paths, unpaved roads, squares, viaducts, roundabouts, playgrounds, traffic signs and street furniture (Gemeente Amsterdam, n.d.-b).

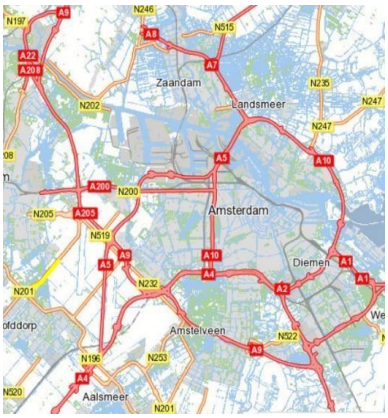


Figure 14: Provincial roads and highways in (the surroundings of) Amsterdam (Source: Rijkswaterstaat, n.d.)

Figure 15: National highways in (the surroundings of) Amsterdam (Source: Rijkswaterstaat, n.d.)

Figure 16: Local roads in Amsterdam (Source: Rijkswaterstaat, n.d.)

3.3.3 Analysing mobility

Mobility patterns are important for structuring cities. Different kind of patterns create different flows of people either walking, cycling, by car, by train etc. A good structure in these mobility patterns can stimulate people to choose a certain type of transport. The ferry that transports people across the IJ in Amsterdam, for example. If this ferry

would not exist, people would either cross the river by car or not even cross it at all. Mobility patterns are thus highly related to the use and effects of transportation for a building or neighbourhood. Researchers often overlook the direct benefits of analysing transport models for the built environment. The insights of a detailed transportation model can show which transportation type is mostly used and preferred in a certain neighbourhood. In the case of a new building project, the analysis can furthermore show if it is likely that the used types of transportation will change after completion and if adaptations are needed when more people will make use of the neighbourhood. Subsequently, transportation models can show if it is desirable to stimulate people to use a different (more sustainable) type of transportation.

There are several transportation models available. The most simple transportation model is based on the transportation flow from home to work and vice versa. In the OViN (Onderzoek Verplaatsing in Nederland) people are asked to fill in a travel diary for 2 to 3 days (Centraal Bureau voor de Statestiek, n.d.). This research provides much richer insights into the contemporary transportation movements of Dutch people in comparison to the old transportation model. These models are thus both based on the oldest layer of data, namely registration/survey data. It is also possible to use the other two types of data, sensor data, and social data to create transportation models.

The use of cell phone data provides information 24/7 regarding movement flows within designated neighbourhoods. The insights that this information provides is useful for various markets, like retail, city marketing, festivals, tourism, economy, and security (Friso et al., 2015). The application of mobile phone data within large infrastructural projects has proven to be desirable in optimizing the road network in Senegal, Boston and Rio the Janeiro. Mobile phone data gives the possibility to replace contemporary models for traffic distribution. A downside of applying mobile phone data into a transportation model is the lack of properly measuring short distance travels. This is mainly caused by people not bringing their mobile device along during short trips and because people do not stay at their destination for long enough to detect it as a destination (Friso et al., 2015).

Gonçalves , Gomes & Ezequiel (2017) identified five dimensions, related to mobility, to examine with specific indicators. These are (i) determining the type of area, e.g. more segregated, more elitist, independent or dependent on individual transport. Measuring the relationship between car use and public transport (ii), measuring mobility related work and study (iii), analysing the feasible types of mobility and the distinction between areas (iv) and measuring density by measuring the number of accidents (v) since it is considered that a low urban density area will have fewer accidents that involve pedestrians (Gonçalves et al., 2017). This research is mainly focussed on peri-urban areas. Therefore, the conclusion of the research will defer from research conducted in the city centre of Amsterdam. Gonçalves et al. (2017) used indicators for determining the five dimensions – Mobility, Identities and Lifestyle, Natural Elements, Land Cover, Economic Activities and Spatial Functions. These dimensions are used to give first insights into mobility issues for the three cases.

3.3.4 Transport in Amsterdam

The transport model of Amsterdam highly relates to the ideal-typical model illustrated in figure 17. The ideal-typical model is, regarding Bertolini & Le Clerq (2013), a model where the availability of transport modes determines the preferred location of activity. The neighbourhood around the Central Station of Amsterdam lays within the city centre and is best accessible by public transport. The Central Station connects with an important node, the international airport of Schiphol. Already in 2016, Schiphol airport had, after Frankfurt am Main, the most intercontinental connections, more than 52.000 (NOS, 2016). It furthermore has a direct connection to the regional/national motorway networks and railway networks. Other nodes, older and newer, have an increasing focus of specific concentrations. For example, the large-scale office complexes of financial and business services, e.g. the South Axes, locations for combined warehouse and office complexes, e.g. the area between Bijlmer station and the A2 motorway, or the extremely dynamic information and communication technology (ICT) sector. These locations are well connected to metropolitan facilities including the airport (Bertolini & Le Clerq, 2003).

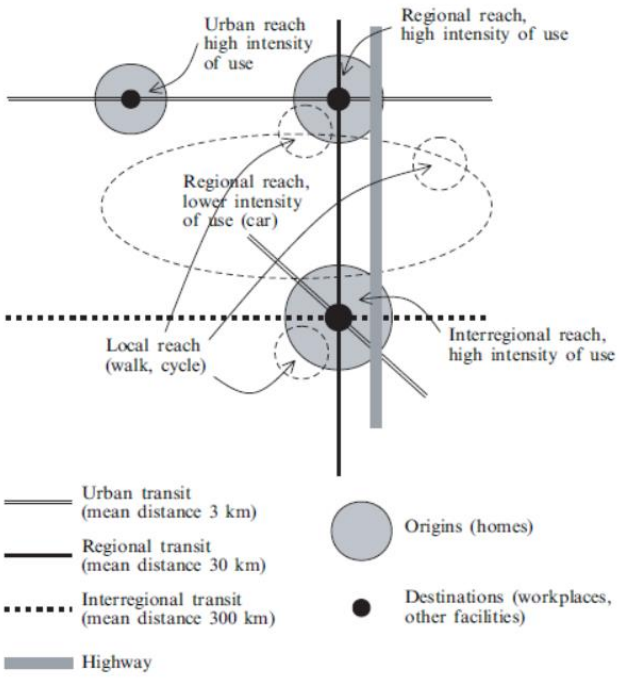


Figure 17. Morphological mobility scheme (Source: Berlolini et al., 2003)

The general transportation model is static. This means that large transport projects are not easily conducted in the historic city centre of Amsterdam. Nonetheless, the way transportation is used changes yearly. The number of people living and working in Amsterdam increases. Still, research of the municipality of Amsterdam shows that the number of people moving throughout the city is declined from 2,7 movements per day in 2015 to 2,5 movements per day in 2016. Inhabitants of Amsterdam city used the bicycle for transport in approximately 36% of the time in 2015, which is 4% more than in 2014. Visitors of Amsterdam use primarily a car for transport (51%) and public transport (36%). For the first time in years, an increase in car ownership was visible in 2016, from 25% in 2015 to 27% in 2016. Due to the increasing amount of cars and bicycles, an increasing amount of parking places is needed. In the city centre of Amsterdam, 92% of the parking spots for cars are occupied at night times. Especially in the City Centre and in West there are often inconveniences regarding the availability of parking places (Gemeente Amsterdam, 2017). This is in line with the ambitions of the Municipality of Amsterdam to create more storage for cars (in the form of parking garages) and bicycles (Gemeente Amsterdam, 2015a). Even though the

amount of bicycle parking places is increased with 15.000 places between 2012 and 2016, 57% of the inhabitants of Amsterdam thinks there aren't enough places to park their bicycles safely. The data from these statistics is derived from a survey called 'Business and Balance' (Gemeente Amsterdam, 2017). This is in line with the ambitions of the Municipality of Amsterdam to create more storage for cars in the form of parking garages (Gemeente Amsterdam, 2015a). The (general) transportation model of Amsterdam city is a starting point in understanding the reasons of people in Amsterdam for choosing a particular type of transport, and for choosing a particular route. When the municipality understands how people move through the city and why they choose a certain type of transport, it is possible to know how changes can be made.

3.3.5 Reasons to travel

There are several personal motives for taking a certain transportation type to reach one's destination. Research has shown that promoting a certain type of transport influences the choice of people for using that particular type of transport. Research of Martens (2007) analysis the successfulness of the promotion of bike-and-ride in Dutch cities. It states that the use and the user satisfaction of bike-and-ride is increased with the upgrade of secure bicycle parking at train stations country-wide. This increase is, even more, stimulated with smaller programs that combine the use of bike-and-bus.

The choice of a particular type of transport is also influenced by the velocity of that type of transport. Besides the choice of a type of transport, a choice for a particular route to one's destination has to be made. The transportation possibilities of a place have a great influence on the choice for the type of transport and the choice for the route to one's destination. The use and effects of transportation for a place can be defined as ''the amount and the diversity of places that can be reached within a given travel time and/or costs'' (Bertolini, Le Clercq & Kapoen, 2005).

Research shows that the routing behaviour of citizens is not only based on the shortest time route. An important aspect in choosing a travel route is ''route type velocity'' which indicates how fast and attractive routes of that type are being perceived (Thomas & Tutert, 2015). The research states that orbital routes are more attractive since they avoid the busy city centre, but drivers do, as a contradiction, like the direct route to their destination, which mostly goes across the city centre. Since orbital routes are created to stimulate people to take a different route than the route through the vulnerable (historical) city centre, the orbital route must be attractive enough. The attractiveness of routes and places are explored by many researchers. Lynch (1960) highlights the importance of landmarks and the influence of the neighbourhood or the sense of a place/sense of occasion. The latter means that when people have good memories of a place they tend to appreciate the place, and thus probably appreciate a route through that place. Verheul (2016) places an even greater importance on the sense of a place and states that a single building can make or break a place. These insights can be used in creating an attractive orbital route.

Accidents and conflicts related to transport types can also influence the choice behaviour of the user of the city. Think of the increase in the use of bicycles and motorised bicycles for example. While the use of bicycles is stimulated for numerous reasons, e.g. because it is healthy to exercise and because a (non-motorized) bicycle does not harm the environment, an increase in bicycles usage also increases the number of accidents and conflicts. Research of Van der Horst, de Goede, de Hair-Buijssen, & Methorst (2014) regarding safety on bicycle paths in Amsterdam and Eindhoven, has shown that the safety of the bicycle path has a correlation with the business of the bicycle path and the width of the bicycle path. Also, better countermeasures are needed on busy bicycle paths in Amsterdam.

3.3.6 Main findings

This section summarizes the findings of the theoretical background to sub-questions: '*What kind of policies complement the transportation goals of the Municipality?'*, *'Is there a structure present in the transport flows in Amsterdam?'* and '*What are the main factors for people to choose a certain type of transport?*'.

A general summary of the policies in Amsterdam is to make transportation smarter and environmentally friendlier. This could include not travelling at all, walking, cycling, taking public transport and the use of cleaner cars. It does not seem easy to implement these suggestions in practice due to the fundamental dilemma that most alternatives for the use of a car do not match its quality on an economic, social and political level. Politicians' choices are driven by conscious trade-offs. Research indicates that policy-making is becoming faster due to the currently faster mobility of policies. This is basically the transfer of knowledge from one institution to another. The implementation of a ''best practice scenario'' is difficult since it is not often clear which out of multiple implemented intervention or which external context gave a solution. Providers of transportation can have a large influence on municipal policies.

The traditional transportation model shows the flow of people from home to work and vice versa. A research where people are asked to fill in a travel diary for 2 to 3 days, provides much richer insights into transportation movements. Five dimensions, namely Mobility, Identities and Lifestyle, Natural Elements, Land Cover, Economic Activities and Spatial Functions could be useful for analysing mobility. Promotion, a route's velocity, and a route's attractiveness have an influence choosing a type of transportation and a route to one's destination. Landmarks, neighbourhoods, and buildings are important for influencing the attractiveness of a place. The transport model of Amsterdam highly relates to the ideal-typical model, where the availability of transport modes determines the preferred location of activity.

This section shows the importance of transportation in the research triangle. It shows who is responsible for different types of transportation, it highlights how transport can influence how people move through the city, and how these policies affect project developments.

Case studies

4 Case studies

This chapter shows how the use and effects of transportation regarding the three cases can be analysed. The analysis is based on comparing the use of transportation in the surroundings of the three residential buildings in Amsterdam before completion and after completion. The transportation analysis of these cases can be seen as an example of how the analysis should be done and what the benefits of the analysis are. Due to a large amount of available data, the analysis only focusses on the morning peak moment in transportation for the three cases, which is between 6:30 AM and 9:30 AM (ANWB, n.d.). The sections 4.1, 4.2 and 4.3 elaborate on the three case buildings and their respective neighbourhood. The sections provide an example of how the use and effects of transportation can be analysed. This is thus the monitoring part of the research as depicted in figure 18.

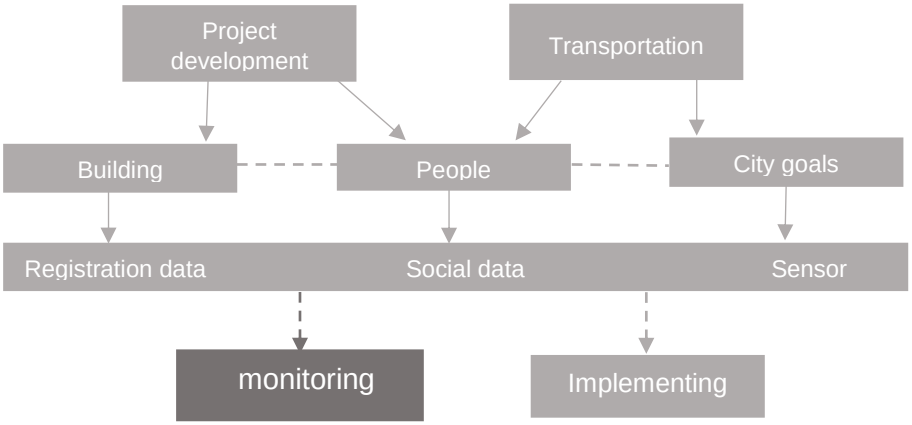


Figure 18: Monitoring (own figure)

This chapter also indicates the problems in the three neighbourhoods after completion of these developments and how these problems could be avoided when a BOLD analysis was deployed in the design phase of the development, thus the implementation of ambitions depicted in figure 19.

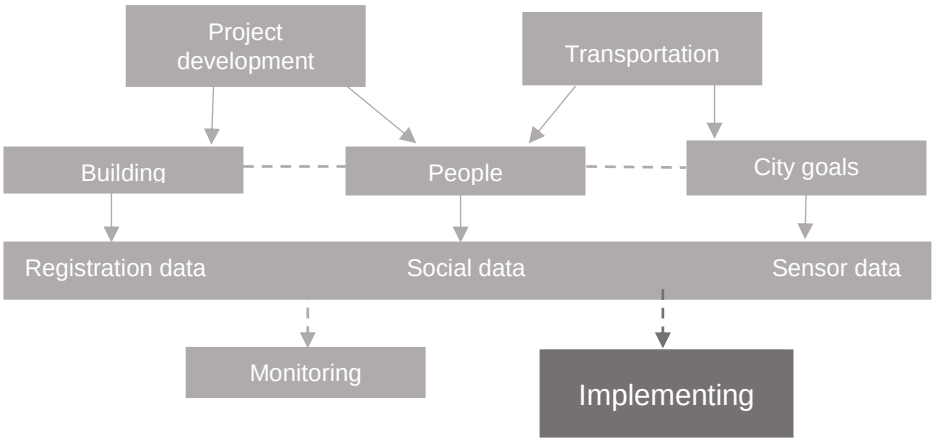


Figure 19: Implementing ambitions (own figure)

The location background analysis is divided into the five dimensions of Gonçalves et al. (2017) for analysing a neighbourhood, namely Identities and lifestyle, Natural elements, Land Cover, Economic Activities and Spatial Functions. To get valuable background information of the cases, some of these indicators are analysed on building level and some on a neighbourhood level. The background information shows the main uses of transportation. This gives direction to the second part where mobility is analysed. This chapter concludes with a summary of the findings in section 4.4. Since these cases are (at least) different in terms of location, as shown in figure 20, the number of parking places and type of residents, the transportation analysis has varying outcomes for the different cases.

Figure 20: The neighbourhoods (own figure)

Location background analysis

4.1 Location background analysis

This section is divided into background information about the neighbourhood in which the case buildings are situated in and the building itself. The information in this section is based on the background information analysis of section 2.3.

4.1.1 Case 1: 900 Mahler

The first analysed case is 900 Mahler. As listed in table 7, he building is located at the George Gershwinlaan and the Gustav Mahlerlaan in Amsterdam. The building is 23 stories high and the year of completion is 2016.

Table 7. Case 1: 900 Mahler (own table)

NAME OF THE BUILDING	***900 MAHLER***
Address	George Gershwinlaan 432 – 518 / Gustav Mahlerlaan 843 – 999
Developer	G&S vastgoed
Number of apartments	126
Height	23 stories
Year of completion	2016
Usage	Luxurious owner-occupied and rental apartments / Commercial space

4.1.1.1 The neighbourhood

The neighbourhood 900 Mahler is situated in is called ‘Zuidas Zuid’, see figure 21, and has a surface of 216772 m² (Gemeente Amsterdam, n.d.-a).

Figure 21: Map Zuidas Zuid (own figure)

Table 8: Change in resident population in the last 5 years in Zuidas Zuid (source: Gemeente Amsterdam, 2017b)

YEAR	POPULATION
2013	601
2014	719
2015	899
2016	1,018
2017	1,524
Total growth	923

As visible in table 8, the population is more than doubled during the last five years (Gemeente Amsterdam, 2017b). This fast growth is mainly caused by the many newly constructed residential buildings in this neighbourhood.

Table 9: Amount of households per household type in Zuidas Zuid (source: Gemeente Amsterdam, 2017b)

HOUSEHOLD TYPE	AMOUNT OF HOUSEHOLDS (on January 1, 2017)	PERCENTAGE OF TOTAL
Couples with children	98	9.7
One person households	662	65.4
Couples without children	223	22.0
Single parents	21	2.1
Other ''complex'' families	8	0.8
Total	1,012	100

Table 9 indicates that the neighbourhood Zuidas Zuid consist mostly of one person households. The table also shows that there is only a small amount of children living in the neighbourhood. Only 11.8% of the households are households with children.

Table 10: Age index in Zuidas Zuid (source: Gemeente Amsterdam, 2017b)

AGE	NUMBER OF PEOPLE *(on January 1, 2017)*	PERCENTAGE OF TOTAL
0 – 4	87	5.8
5- 14	50	3.3
15 – 24	101	6.6
25 – 49	1,066	69.9
50 – 64	165	10.8
65 +	55	3.6
Total	1,524	100

This is also confirmed in table 10, which indicates that there are only 137 children below 14 years old living in the neighbourhood. The largest amount of the people living in Zuidas Zuid are between 25 and 49 years old. The neighbourhood primarily used to be an office area, but many residential buildings, restaurants, and stores are constructed. All residential buildings are constructed after the year 2000.

Table 11: Housing stock in the last five years in Zuidas Zuid (source: Gemeente Amsterdam, 2017b)

YEAR	*HOUSING STOCK*
2013	441
2014	458
2015	467
2016	509
2017	667
Total growth	226

As visible in table 11, between 2013 and 2017, 226 new residential properties are added to the overall housing stock in Zuidas Zuid (Gemeente Amsterdam, 2017b). Table 12 lists the other indicators of Zuidas Zuid.

Table 12: Other indicators Zuidas Zuid (source: Gemeente Amsterdam, 2017b)

INDICATOR	#
Social housing (%)	23.5
Recreational space, agricultural terrain, forest and natural space (m²)	0
Water (m²)	12,381
Housing density per km² land	3,263
Average WOZ-value/m² (€)	4,671
Population density per km² land	7,457

There are 157 social housing properties in the neighbourhood (Gemeente Amsterdam, n.d.-a). In the land use plan is visible that there are three types of uses in the neighbourhood. These are ‘’mixed’’, ‘’residential’’ and ‘’office’’. The ‘’mixed’’ type of use can consist of residents, offices, retail, hotels, restaurants, bars, cultural buildings, sports and other services (Ruimtelijkeplannen.nl).

4.1.1.2 The building

The identities and lifestyle of the residents are highly connected to the type of building they live in. Table 13 and 14 show the indicators of the 900 Mahler building.

Table 13: Building characteristics 900 Mahler (source: Gemeente Amsterdam, 2017b)

INDICATOR	#
Owner-occupied	47
Private sector rental apartment	80
Social housing	0
Size units (m²)	70 – 120
Amount of bedrooms	2, 3 or 4
Amount of apartments	126

As visible in the table, the building consists of 126 apartments, and thus approximately 126 new households. There are 21 luxurious types of units in the building. The building furthermore contains commercial space and a restaurant on street level.

Table 14: Property value indicators 900 Mahler (own table)

INDICATOR	#	Source
Average WOZ-value/m² (€)	Between 4,380 and 3,195	Gemeente Amsterdam (2018)
Average rent (€)	1,140 – 1,765	Verwey Vastgoed. (n.d.).

It is likely that most residents go to work. Therefore the peak moments are probably the same as the general peak moments on the Dutch roads, namely 6:30 – 9:30 in the morning and 15:30 – 19:00 in the afternoon on Mondays until Fridays (ANWB, n.d.).

4.1.2 Case 2: Smiley

The second case used for the analysis is called Smiley. As listed in table 15, Smiley is located at the Kees Broekmanstraat 101 – 462 in Amsterdam. the building is 7 stories high and is completed in 2016.

Table 15. Cases 2: Smiley (own table)

NAME OF THE BUILDING	***900 MAHLER***
Address	Kees Broekmanstraat 101 – 462
Developer	Van Wijnen Projectontwikkeling Midden

Owner	Duwo
Number of apartments	364
Height	7 stories
Year of completion	2016
Usage	Student housing

4.1.2.1 The neighbourhood

Figure 22: Map RI Oost terrein (own figure)

The neighbourhood Smiley is situated in is called 'RI Oost terrein', see figure 22, and has a surface of 421905 m² (Gemeente Amsterdam, n.d.-a).

Table 16: Change in resident population in the last 5 years in RI Oost Terrein (source: Gemeente Amsterdam, 2017b)

YEAR	POPULATION
2013	0
2014	17
2015	186
2016	384
2017	1,232
Total growth	1,232

As visible in table 16, the neighbourhood is very new, as there were no people living in this neighbourhood prior to 2014. The neighbourhood has had a fast growth due to the construction of several large buildings such as Smiley.

Table 17: Amount of households per household type in RI Oost terrein (source: Gemeente Amsterdam, 2017b)

HOUSEHOLD TYPE	AMOUNT OF HOUSEHOLDS (January 1, 2017)	PERCENTAGE OF TOTAL
Couples with children	77	8.9
One person households	645	74.6
Couples without children	118	13.6
Single parents	21	2.4
Other ''complex'' families	4	0.5
Total	865	100

Table 17 shows that the neighbourhood RI Oost terrein consist mostly of one person households. The table also shows that there are only a small amount of children living in the neighbourhood.

Table 18: Age index in RI Oost Terrein (source: Gemeente Amsterdam, 2017b)

AGE	NUMBER OF PEOPLE *(January 1, 2017)*	PERCENTAGE OF TOTAL
0 – 4	59	4.8
5 – 14	81	6.7
15- 24	395	32.1
25 – 49	586	47.5
50 – 64	84	6.7
65 +	27	2.2
Total	1,232	100

This is also confirmed in table 18, which shows that there are only 140 children below 14 years old living in the neighbourhood. The largest amount of the people living in the neighbourhood RI Oost Terrein are between 25 and 49 years old, but the amount of people between 15 and 24 is also large. This is due to the large amount of student housing.

Table 19: Housing stock in the last five years in RI Oost Terrein (source: Gemeente Amsterdam, 2017b)

YEAR	*HOUSING STOCK*
2013	-
2014	3
2015	34
2016	185
2017	872
Total growth	872

The neighbourhood is very new. As visible in table 19, between 2014 and 2017 an amount of 872 new residential properties are constructed in RI Oost terrein (Gemeente Amsterdam, 2017b). Besides the 364 student housing properties of DUWO, there are 197 social housing properties in the neighbourhood (Gemeente Amsterdam, n.d.-a). Table 20 lists the other indicators in RI Oost terrein.

Table 20: Other indicators RI Oost terrein (source: Gemeente Amsterdam, 2017b)

INDICATOR	#
Social housing (%)	65.3
Recreational space, agricultural terrain, forest and natural space (m²)	0
Water (m²)	152,352
Housing density per km² land	3,235
Average WOZ-value/m² (€)	3,159
Population density per km² land	4,570

In the land use plan is visible that there are four types of uses in the neighbourhood. These are ‘’mixed’’, ‘’residential’’, ‘’sport’’ and ‘’green’’. The largest part of the neighbourhood consists mostly of the ‘’residential’’ type of use (Ruimtelijkeplannen.nl). Because there is not much space for amenities, the area has not a large centrality potential.

4.1.2.2 The building

The identities and lifestyle of the residents are highly connected to the type of building they live in. Table 21 and 22 show the indicators of the Smiley building.

Table 21: Building characteristics Smiley (source: Gemeente Amsterdam, 2017b)

INDICATOR	#
Owner-occupied	0
Private sector rental apartment	0
Social housing	364
Size units (m²)	18 - 29
Amount of bedrooms	1
Amount of apartments	364
Age index (approximate ages)	17 - 27

The 364 studios are for students only, this means that the residents have a special contract, which is only valid while the resident is a student or was a student in the last 6 months.

Table 22: Property value Indicators Smiley (own table)

INDICATOR	#	Source
Average WOZ-value/m² (€)	3,001	Gemeente Amsterdam (2018)
Average rent (€)	365	DUWO (n.d.)

Since students generally do not have a 40 hour a week work schedule, it is less likely that there are notable peak moments in the morning or in the evening. Peak hours also vary during the season. Many students go to their parents during summer holidays or example.

4.1.3 Case 3: Kwintijn

The third case used for the analysis is Kwintijn. As listed in table 23, the 8 stories high building is located at Tollenstraat 45 – 47, Bilderdijkstraat 54-58, Dichtershofje 1-47 in Amsterdam. The year completion is 2016 (Amsterdam woont, n.d.).

Table 23. Case 3: Kwintijn (own table)

NAME OF THE BUILDING	***900 MAHLER***
Address	Tollenstraat 53 – 59, Bilderdijkstraat 54-58, Dichtershofje 1-47
Developer	Van Wijnen projectontwikkeling West
Number of apartments	166

Height	8 stories
Year of completion	2016
Usage	Owner occupied / private & social rent / office

4.1.3.1 The neighbourhood

The neighbourhood Kwintijn is situated in is called ‘Bellamybuurt Zuid’, see figure 23, and has a surface of 163793 m² (Gemeente Amsterdam, n.d.-a).

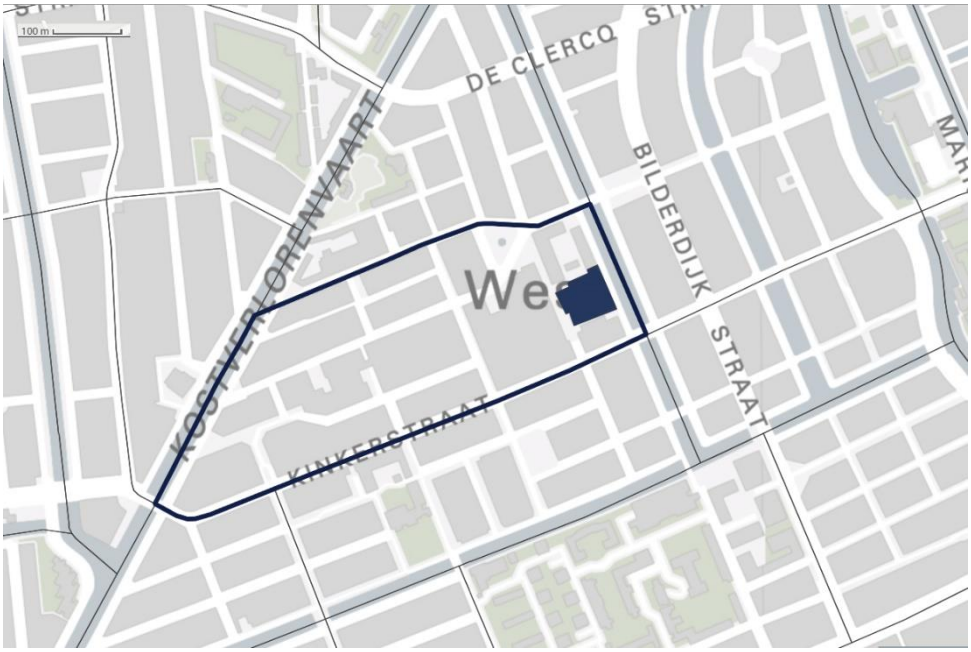


Figure 23: Map Bellamybuurt Zuid (own figure)

Table 24: Change in resident population in the last 5 years in Bellamybuurt Zuid (source: Gemeente Amsterdam, 2017b)

YEAR	POPULATION
2013	3,189
2014	3,207
2015	3,223
2016	3,535
2017	3,592
Total growth	403

As visible in table 24, there has been a population growth of 403 people between 2013 and 2017. These are relatively stable population numbers.

Table 25: Amount of households per household type in Bellamybuurt Zuid (source: Gemeente Amsterdam, 2017b)

HOUSEHOLD TYPE	AMOUNT OF HOUSEHOLDS (January 1, 2017)	PERCENTAGE OF TOTAL
Couples with children	216	9.6
One person households	1,373	61.0
Couples without children	470	20.9
Single parents	147	6.5
Other ''complex'' families	45	2.0
Total	2,251	100

Table 25 shows that the neighbourhood Bellamybuurt Zuid consist mostly of one person households. Table 26 shows that the largest amount of the people living in the neighbourhood Zuidas Zuid is between 25 and 49 years old.

Table 26: Age index in Bellamybuurt Zuid (source: Gemeente Amsterdam, 2017b)

AGE	NUMBER OF PEOPLE *(on January 1, 2017)*	PERCENTAGE OF TOTAL
0 – 4	185	5.2
5- 14	182	5.1
15 – 24	391	10.9
25 – 49	2,078	57.9
50 – 64	507	14.1
65 +	249	6.8
Total	3,592	100

Table 27 shows that most people in Bellamybuurt Zuid are between 25 years old and 9 years old.

Table 27: Housing stock in the last five years in Bellamybuurt Zuid (source: Gemeente Amsterdam, 2017b)

YEAR	*HOUSING STOCK*
2013	2,040
2014	2,040
2015	2,048
2016	2,229

2017	2,245
Total growth	205

As visible in table 27, between 2013 and 2017 an amount of 205 new residential properties are constructed in Bellamybuurt Zuid (Gemeente Amsterdam, 2017b). Besides the 21 social housing properties of de Alliantie in the Kwintijn building, there are 859 social housing properties in the neighbourhood (Gemeente Amsterdam, n.d.-a).

Table 28: Other indicators Bellamybuurt Zuid (source: Gemeente Amsterdam, 2017b)

	INDICATOR	#
	***Social housing (%)***	38.3
	***Recreational space, agricultural terrain, forest and natural space (m²)***	0
	Water (m²)	7,978
	***Housing density per km² land***	14,409
	***Average WOZ-value/m² (€)***	4,806
	***Population density per km² land***	23,054

Table 28 shows other indicators in Bellamybuurt Zuid. In the land use plan is visible that there are two types of uses in the Neighbourhood. These are ‘’mixed’’ and ‘’residential’’. These two types of uses are equally spread over the neighbourhood (Ruimtelijkeplannen.nl). Furthermore, the popular ‘’De Hallen’’ are situated in the area.

4.1.3.2 The building

The identities and lifestyle of the residents are highly connected to the type of building they live in.

Table 29: Indicators Kwintijn (source: Gemeente Amsterdam, 2017b)

	INDICATOR	#
	***Owner-occupied***	49
	Private sector rental apartment	69
	Social housing	48
	Size units (m²)	80 – 100
	Amount of bedrooms	2
	Amount of apartments	166

Table 29 shows the indicators of the Kwintijn building. The building is mixed used and consists, besides the 166 apartments, of office space, 1.400 m², and commercial space, 200 m². Table 30 shows the property value indicators of Kwintijn.

Table 30: Property value Indicators Kwintijn (own table)

INDICATOR	#	Source
Average WOZ-value/m² (€)	Between 5.005 and 3.449	Gemeente Amsterdam (2018)

4.1.4 Conclusion location background analysis

This section concludes on the background information of the three case studies. It shows the similarities and differences between the neighbourhoods and the buildings and how to deal with the characteristics of a neighbourhood regarding transportation.

4.1.4.1 The neighbourhoods

The neighbourhoods Zuidas Zuid, RI Oost Terrein and Bellamybuurt Zuid are very different on multiple levels. These differences influence the use and effects of transport in the neighbourhood. Table 31 summarizes the differences and similarities of the neighbourhoods.

Table 31: differences and similarities neighbourhoods

	Zuidas Zuid	RI Oost terrein	Bellamybuurt Zuid
Population growth*	++	+++	+
Main household type	one-person	one-person	one-person
Children beneath 14 y/o	137 (9.1%)	140 (11.5%)	367 (10.3%)
Main age of population	25 - 49 (69.9%)	25 - 49 (47.5%)	25 – 49 (57.9%)
Second largest age group	50 – 64 (10.8%)	15 – 24 (32.1%)	50 – 64 (14.1%)
Housing growth*	++	+++	+
Social housing*	+	+++	++
Ratio population density/ housing density*	+++	+	++
WOZ-value*	++	+	+++
Centrality potential*	+++	+	+++

** comparison made between neighbourhoods, +++ = largest, ++ = middle, + lowest amount or value*

The background analysis shows that the growth in population in Zuidas Zuid, where 900 Mahler is situated, is larger than the growth in the inner-city neighbourhood Bellamybuurt Zuid, where Kwintijn is situated. The largest growth is visible in RI Oost terrein, where Smiley is situated. This is because this is a newly constructed

neighbourhood. Due to the changing nature of Zuidas Zuid and RI Oost terrein it is easier to make changes in transport structures.

All three neighbourhoods consist mostly of one-person households. This percentage is the largest in RI Oost terrein since there are many studios in this neighbourhood, and it is not allowed to live in these studios with more than one person. The household types influence the amount of car and bicycle parking space needed in a new building. There are more households with children in Bellamybuurt Zuid than in Zuidas Zuid and RI Oost terrein. The analysis also shows that the presence of schools and other amenities for children in the neighbourhood is especially important in Bellamybuurt Zuid, since the number of households with children is larger within this neighbourhood. Nonetheless, the differences between the percentage of children beneath 14 years old in the neighbourhoods are not big. Amenities for children in a neighbourhood are important for every development when the target group is families with children. The percentage of people between 25 years old and 49 years old is the largest in Zuidas Zuid compared to the percentages in RI Oost terrein and Bellamybuurt Zuid. The population in RI Oost terrein is younger than the population in Zuidas Zuid and Bellamybuurt Zuid. In RI Oost terrein a percentage of 32.1% is between 15 and 24 years old, while this percentage is only 6.6% in Zuidas Zuid and only 10.9% in Bellamybuurt Zuid. This is due to the high percentage of students in the neighbourhood. This shows that it is important to know what kind of amenities students need in their own neighbourhood and to know how they tend to move through the city. If these students are likely to move around the city with the bicycle, the storage of bicycles needs to have extra attention in the development brief and hereafter in the design of the building.

The construction of residential housing started the latest in RI Oost terrein, 2013, compared to the construction in Zuidas in 2000, and the much older Bellamybuurt Zuid. Therefore, the growth in housing units between 2013 and 2017 is the largest in RI Oost terrein, compared to Zuidas Zuid and Kwintijn. This shows the extra pressure of the new residential buildings on already existing transport in the neighbourhoods.

Social housing amounts to 65.3% of total in RI Oost terrein, which is much higher than the 23.5% of social housing in Zuidas Zuid and 38.3% in Bellamybuurt Zuid. This is mainly caused by the many student dwellings in RI Oost terrein.

In Bellamybuurt Zuid, the housing density per km² land and the population density per km² land are notably larger compared to Zuidas Zuid and RI Oost terrein. Compared to the other two cases the ratio population density/housing density in Zuidas Zuid is higher. Approximately 2,5 / 1 versus 1,4 / 1 in the neighbourhood RI Oost terrein, and 1,6 / 1 in the neighbourhood Bellamybuurt Zuid. This shows that there are more high-rise residential buildings in the neighbourhood Zuidas Zuid than in the other two neighbourhoods. These numbers also indicate that there is more housing instead of other types of buildings in Bellamybuurt Zuid and RI Oost terrein.

The average WOZ-value/m² is the highest in the neighbourhood Bellamybuurt Zuid. It is slightly less in Zuidas Zuid. RI Oost terrein has the lowest WOZ-value/m². A clear view on the relationship between the value of the apartments and the transportation needs of the residents will enhance the prediction of the use and effect of transportation of the residents.

Due to the foremost ‘’mixed’’ land use plan in Zuidas Zuid, the neighbourhood has a centrality potential. Due to the many office buildings and luxurious image of the location, there is a high probability of many young urban professionals living in the neighbourhood. Bellamybuurt Zuids also has a lot of ‘’mixed’’ use of buildings in re land use plan. Furthermore, the popular ‘’De Hallen’’ is situated in the area. Therefore, the neighbourhood has a large centrality potential. RI Oost terrein has not a large centrality potential due to the land use plan. This means that it is likely that Zuidas Zuid and Bellamybuurt Zuid are likely to be busier than RI Oost terrein.

The neighbourhood characteristics could influence the use and effect of transportation in neighbourhoods in Amsterdam. Monitoring these neighbourhood characteristics gives a better understanding of how and how much these characteristics have an influence on the use and effects of transportation. This information can be used for a better implementation of transport in the project brief.

4.1.4.2 The buildings

The buildings 900 Mahler, Smiley and Kwintijn are very different on multiple levels. Table 32 summarizes the differences and similarities between the buildings.

Table 32: differences and similarities buildings

	900 Mahler	Smiley	Kwintijn
Amount of units*	+	+++	++
Sector	Private	Social	Mixed
Other functions	Commercial space	No other functions	Office space
Unit size*	+++	+	+++
WOZ-value*	++	+	+++

** comparison made between neighbourhoods, +++ = largest, ++ = middle, + lowest amount or value*

Smiley has the largest number of units. The building 900 Mahler has owner-occupied apartments, private sector rental apartments and zero social housing apartments. Commercial space, such as a gym and a dentist are situated on the ground floor. This is completely different than Smiley, which solely consists of student studios which are considered as social housing. In Kwintijn, the amounts are more equally divided between owner-occupied apartments, private sector rental apartments, social housing apartments, and office space. The differences between the apartments are also visible in the size of the units. The apartments in 900 Mahler are between 70 m² and 120 m² with 2, 3, or 4 rooms, in Smiley the apartments are between 18 m² and

29 m² and have 1 room, and in Kwintijn the apartments are between 80 m² and 100 m² and have 2 or 3 rooms.

To compare the properties in the three buildings the average WOZ-values/m² are compared. The average WOZ-value/m² in the 900 Mahler building is lower than the average WOZ-value/m² in Zuidas Zuid. The Smiley building also has an average WOZ-value/m² which is lower than the average in RI Oost terrein. But, the residents in the Smiley building all rent their apartments. These rents are only €365,- p/m. Some units in Kwintijn have a much lower WOZ-value/m² than the average in the neighbourhood and some units have a higher WOZ-value/m².

The developers of the buildings must take all these building characteristics into account when implementing transportation into the project brief. In Smiley the use and needs of transportation are likely to be similar between the residents because the students are likely to have more or less the same lifestyle. The differences are more visible in 900 Mahler and Kwintijn. First of all, the developer has to deal with the household types and how much they probably make use of different types of transportation systems. For example, the developer needs to know if the people in the social housing units have a car, if people with children are more likely to bring their children to a nearby school, if they need a car to bring them to school or to go to work, and if they are likely to use a bicycle. The developer also needs to take into account the people that go to the offices in Kwintijn and to the commercial space in 900 Mahler and what kind of transport they use.

Mobility analysis

4.2 Mobility analysis

This section shows what kind of BOLD regarding mobility is available for the three cases, and how this data can improve transport in a neighbourhood. This analysis shows if and why social data, sensor data, and registration data are useful in the BOLD-driven method for analysing the use and effects of transportation.

The first analysis uses social data of Twitter and the Fietsersbond meldpunt. The analysed Twitter data has a location tag on the surrounding streets of the case buildings and are placed on the website in the month may 2018 or listed in the first 100 top Tweets. Within the analysis is checked if transport related topics are present. The second analysis uses sensor data of the municipal website and Google maps. Several topics on the municipal website are not open for public use or not visible at all. This section elaborates on what data is easily accessible and what data should be presented differently. As there is not always specific data available from the different neighbourhoods in Amsterdam, a larger area is chosen for the analysis. Furthermore, data about the modal split can only be found in Municipal documents, not a data file on the municipal website. The third analysis uses registration data in the form of design drawings and the parking ratio.

4.2.1 Case 1: 900 Mahler

This section elaborated on the mobility analysis of the case 900 Mahler and the neighbourhood Zuidas Zuid.

4.2.1.1 Social data

The tweets are based on the three streets the 900 Mahler building is situated at, the Gustav Mahlerlaan, the George Gershwinlaan and the Benjamin Brittenstraat, The results are not all transport related, and thus not all useful, like tweets about apartments that have been sold or advertising for example. It furthermore shows the reports of fire service, ambulance, and police, without the cause. The municipality gives information about transport. For example, the Municipality tweeted on July 14, 2017, that there will be traffic decisions regarding the construction of electric charging points on the Gustav Mahlerlaan. People complain about bicycles, like Nico Janssen who tweets on February 1, 2018, in Dutch, that there is a bicycle mess in front of the ABN-AMRO on the Zuidas, and that this calls for a bicycle garage. The municipality retweets that this garage is situated 100 meters from the building and that Nico should spread the word. While this is obviously a joke, there is still no sign in front of the building that directs people to the garage. When ‘Loulou’ tweets December 17, 2017, that there is too much garbage around the containers on the Benjamin Brittenstraat, the municipality retweets that they are going to take care of it. This shows that the municipality thinks of garbage as a problem, and bicycles not. Furthermore, the fietsersbond meldpunt website is checked on the location. There is only one solution in the area, which is that the municipality has secured a loose tile on

the sidewalk. This is not ground-breaking information, but it does show that the municipality is responding to the problems of cycling citizens.

4.2.1.2 Sensor data

Table 33 shows several important distances from the building to various amenities that have a high likelihood of being frequently used by the residents of the building.

T*able 33: Distances between the building 900 Mahler and amenities (Source: Google maps)*

TYPE	DISTANCE
Nearest bus stop	50m
Nearest subway	350m
Nearest tram	350m
Nearest train station (Station Zuid)	400m
Train station (Central Station)	7,400m / 24 min pt.*
Distance to the nearest city hall	2,300m / 15 min pt.*
Nearest day-care (Kindercampus Zuidas)	1,100m / 4 min bicycle
Nearby elementary school (Olympia school)	1,400m / 6 min bicycle
Nearest elementary school (Merkelbachschool)	950m / 3 min bicycle
Nearest high school (Geert Groote College)	1,100m / 4 min bicycle
Nearby high school (St. Nicolaaslyceum)	1,000m / 6 min bicycle
Nearest supermarket (Albert Heijn)	140m
Nearby supermarket (SPAR)	700m

** pt. = public transport*

The building has a relatively large distance to the Amsterdam Central Station, and thus from the old city centre of Amsterdam. Nonetheless, the table also shows that there are many amenities in the neighbourhood. Therefore, there is a large probability that the old city centre of Amsterdam does not have to be visited on a daily basis. In other words, the neighbourhood has a centrality potential as previously described.

T*able 34: Information Amsterdam South (own table)*

Type	%
Modal split car **	32
Modal split bicycle **	30
Modal split public transport **	5
People who own more than one car *	5.5
Bicycles at the bicycle depot *	19.9

** Compared to the total of Amsterdam in 2017 (Source: Gemeente Amsterdam, 2017b)*
*** Compared to the other transport types in 2013 (Source: Gemeente Amsterdam, 2017c)*

Table 34 shows information about Amsterdam South. Public transport is not used often in the area compared to the car and the bicycle.

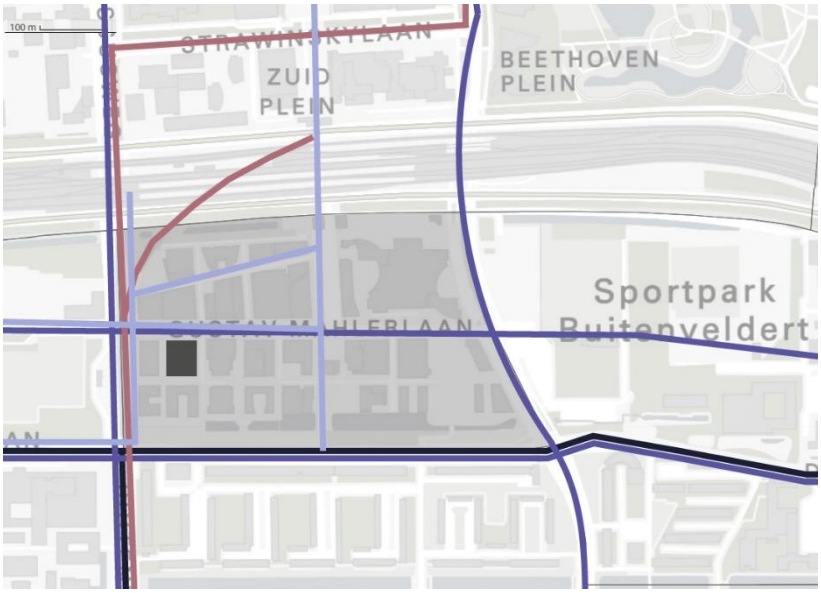


Figure 24: Plusnetten Zuidas Zuid

Figure 24 shows the plusnetten in Zuidas Zuid and the direct surroundings. Figure x shows that pedestrians and bicycles have a priority in Zuidas Zuid. Directly around the area also the car and the tram have a priority.

4.2.1.3 Registration data

There are 66 parking places in the building (Verwey Vastgoed, n.d.). This gives a parking ratio of 0,5. Bicycles of the residents can be stored in private garage boxes (Funda, n.d.). Figure 25 shows the entrances of the 900 Mahler building. There are no direct problems visible regarding the safety location of these entrances. There ground floor is almost completely reserved for commercial space. Nonetheless, there is no extra parking space created in and/or outside the building for visitors that arrive by car or bicycle at the commercial space.

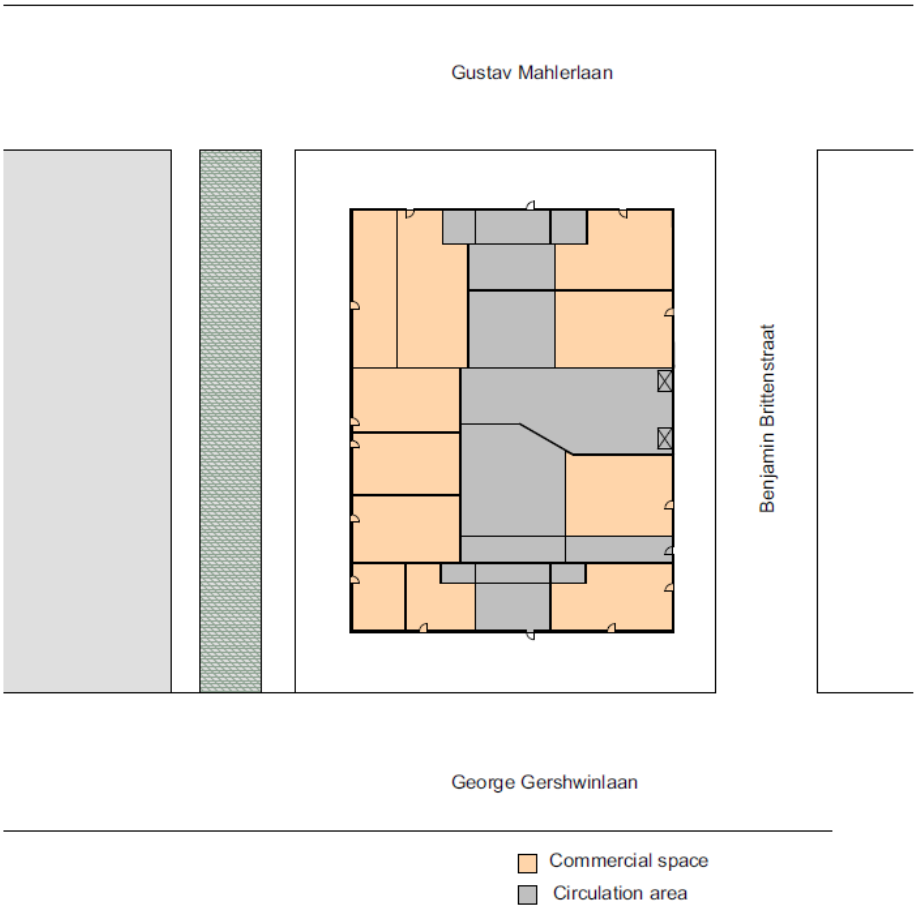


Figure 25: Entrances of 900 Mahler (own figure)

4.2.2 Case 2: Smiley

This section elaborated on the mobility analysis of the case Smiley and the neighbourhood RI Oost terrein.

4.2.2.1 Social data

The tweets are selected based on the two streets Smiley is situated at, the Kees Broekmanstraat and the Nida Senffstraat. The results directly show a discussion between many people, including a city planner, about the traffic flows in the neighbourhood. Many people express their discomfort, the city planner states they are complaining about things that are not that bad. Not all tweets are transport related, and thus not all useful, like tweets about apartments that are for rent or other advertising for example. It furthermore shows the reports of fire service, ambulance, and police, without the cause. The municipality gives information about transport. Furthermore, the fietsersbond meldpunt website is checked on the location. There are no problems, solutions or ideas for the area on August 27, 2018.

4.2.2.2 Sensor data

Table 35 list several distances from the building to different amenities that have a large probability to be visited often.

Table 35: Distances between the building Smiley and amenitie (Source: Google maps)

TYPE	DISTANCE
Bus stop	400m
Subway	4,700m
Tram	350m
Train station (Central Station)	5,900m / 19 min pt.* / 23 min bicycle
Municipality	3,900m / 21 min pt.* / 14 min bicycle
Vrije Universiteit (VU)	9,400m / 45 min pt.* / 36 min bicycle
Universiteit van Amsterdam (UvA, Roetersstraat)	5,500m / 25 min pt.* / 19 min bicycle
UvA (Science park)	3,600m / 23 min pt.* / 12 min bicycle
HvA (Fraijlemaborg)	9,500m / 37 min pt. * / 29 min bicycle
HvA (Wibautstraat)	4,900m / 23 min pt.* / 19 min bicycle
Supermarket (Albert Heijn)	3300m
Supermarket (Flevo)	2300m

** pt. = public transport*

The residents of the Smiley building have a large probability to travel a relatively long distance to amenities. When comparing it to the previous case of 900 Mahler, it becomes visible that the residents of Smiley need to travel longer distances to amenities. This results in a more important need for transportation on a daily basis.

T*able 36: Information Amsterdam East (own table)*

Type	%
Modal split car **	15
Modal split bicycle **	40
Modal split public transport **	20
People who own more than one car	4.1
Bicycles at the bicycle depot	15.1

** Compared to the total of Amsterdam in 2017 (Source: Gemeente Amsterdam, 2017b)*
*** Compared to the other transport types in 2015 (Source: Gemeente Amsterdam, 2017c)*

Table 36 shows information about Amsterdam East. The car is used less compared to the bicycle or public transport.

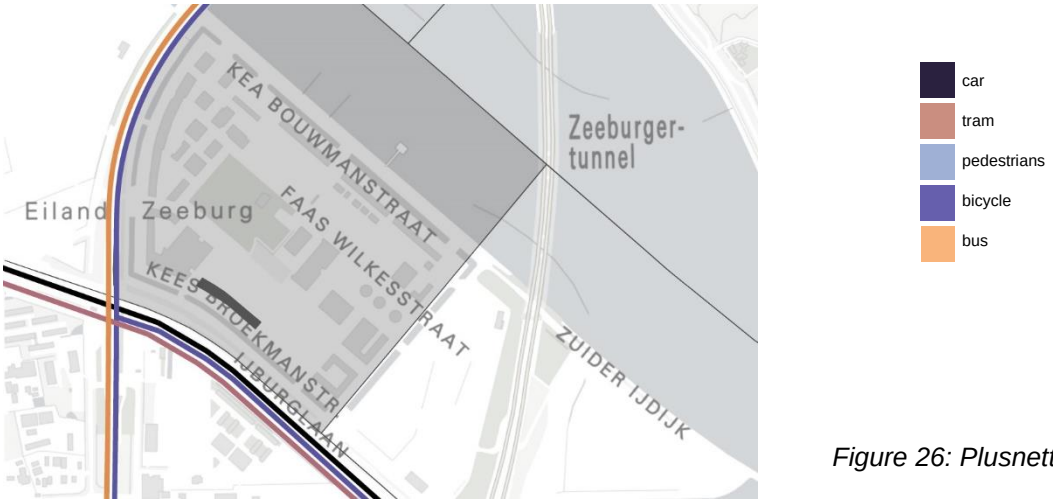


Figure 26: Plusnetten RI Oost terrein

Figure 26 shows the plusnetten in RI Oost terrein and the direct surroundings. Figure x shows that there is not a prioritised transportation system in RI Oost terrein. Directly around the area, the car, the bicycle, the bus, and the tram have a priority. These transportation systems have to cross each other on a crossroad which is especially dangerous for the cyclists.

4.2.2.3 Registration data

There are 0 parking places in the building. There is a garage for a shared bicycle or scooter storage indoor. Figure 27 shows the entrances in the Smiley building. There are no direct problems visible regarding the location of these entrances. The bicycle storage seems large and safe. The bicycle storage is separated into seven boxes. These boxes are secured with heavy doors. It could be inconvenient for the residents to park their bicycle in the bicycle storage area.

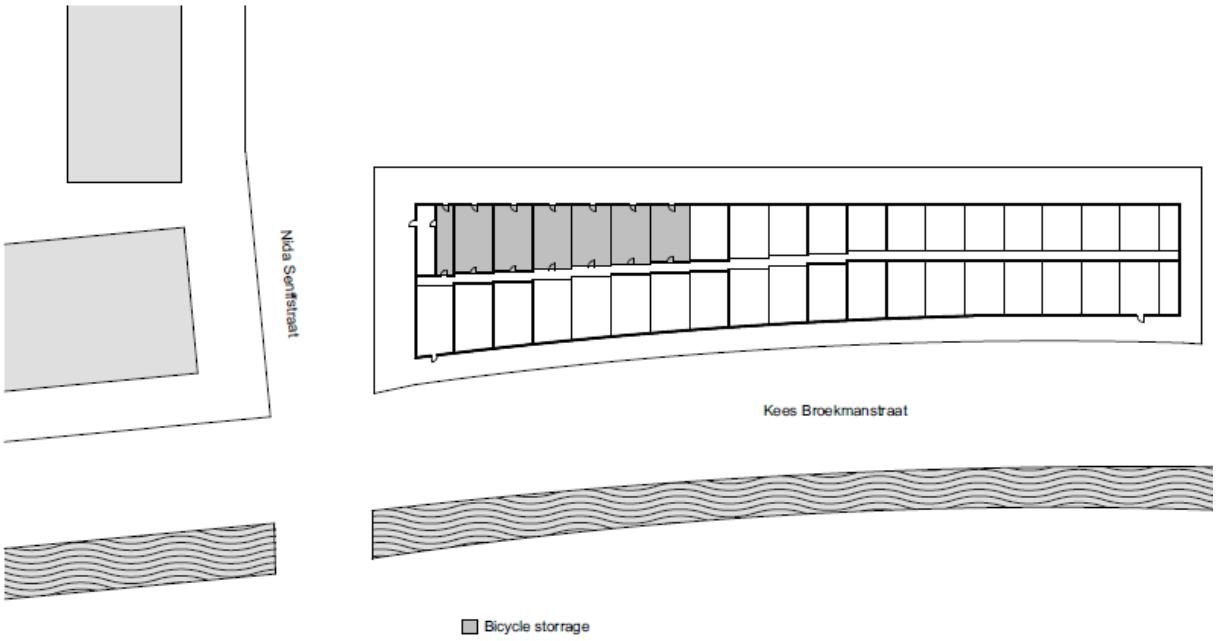


Figure 27: Entrances of Smiley (own figure)

4.2.3 Case 3: Kwintijn

This section elaborated on the mobility analysis of the case Kwintijn and the neighbourhood Bellamybuurt Zuid.

4.2.3.1 Social data

The tweets are selected based on the three streets Kwintijn is situated at, the Bilderdiikkade, the Tollenstraat, and the Hannie Dankbaar passage. The results are not all transport related, and thus not all useful, like tweets about apartments that have been sold or advertising for example. It furthermore shows the reports of fire service, ambulance, and police, without cause. Again there are many tweets about garbage, and the municipality retweets they will take care of this. Furthermore, the fietsersbond meldpunt website is checked on the location. There are no problems, solutions or ideas for the area on August 27, 2018.

4.2.3.2 Sensor data

Table 37 list several distances from the building to different amenities that have a large probability to be visited often.

T*able 37: Distances between the building Kwintijn and amenities(Source: Google maps)*

TYPE	DISTANCE
Bus stop	300m
Subway	3000m
Tram	300m
Train station (Central Station)	3,000m / 20 min pt.* / 13 min bicycle
Municipality	2,700m / 15 min pt.* / 11 min bicycle
Day-care	400m / 2 min bicycle
Elementary school (De Kinkerbuurt)	650m
Elementary school (de Vlinderboom)	650m
High School (Barlaeus Gymnasium)	1,700m / 10 min pt.* / 6 min bicycle
High School (Huygens College)	500m / 2 min bicycle
HvA (Fraiilemaborg)	9,500m / 38 min pt.* / 34 min bicycle
HvA (Wibautstraat)	3,600m / 19 min pt.* / 12 min bicycle
Supermarket (Dirk van den Broek)	350m
Supermarket (Albert Heijn)	450m

** pt. = public transport*

Most amenities are relatively nearby. It is likely that most residents go to work (or high school). Therefore, peak moments are probably the same as the general peak moments on the Dutch roads, namely 6:30 – 9:30 in the morning and 15:30 – 19:00 in the afternoon on Mondays until Fridays (ANWB, n.d.).

T*able 38: Information Amsterdam West (own table)*

Type	%
Modal split car **	10
Modal split bicycle **	35
Modal split public transport **	15
People who own more than one car *	2.5
Bicycles at the bicycle depot *	13.9

** Compared to the total of Amsterdam in 2017 (Source: Gemeente Amsterdam, 2017b)*
*** Compared to the other transport types in 2015 (Source: Gemeente Amsterdam, 2017c)*

Table 38 shows information about Amsterdam West. The car is used less compared to the bicycle, which has the largest modal split of the three transportation types, or public transport.

Figure 28: Plusnetten Bellamybuurt Zuid

Figure 28 shows the plusnetten in Bellamybuurt Zuid and the direct surroundings. Figure x shows that pedestrians have a priority in Bellamybuurt Zuid. Directly around the area also the bicycle and the tram have a priority. The car does not have a priority in the neighbourhood and the surroundings of the neighbourhood. This does not mean that the car is excluded from the area.

4.2.3.3 Registration data

The building includes 306 parking places in total, whereas 191 places are reserved for neighbourhood and 115 are reserved for the residents of Kwintijn Phase 1 (Gemeente Amsterdam, n.d.-c). This gives a parking ratio of 2,6 in total, but only of 1 when only the places reserved for the residents of Kwintijn are taken into consideration. There are places reserved for bicycle parking in the building (Q4U Bouwconsultant, n.d.). Figure 29 shows the entrances of the Kwintijn building. The entrance of the parking garage is situated directly next to the entrance of the Hallen. This could cause dangerous situations.

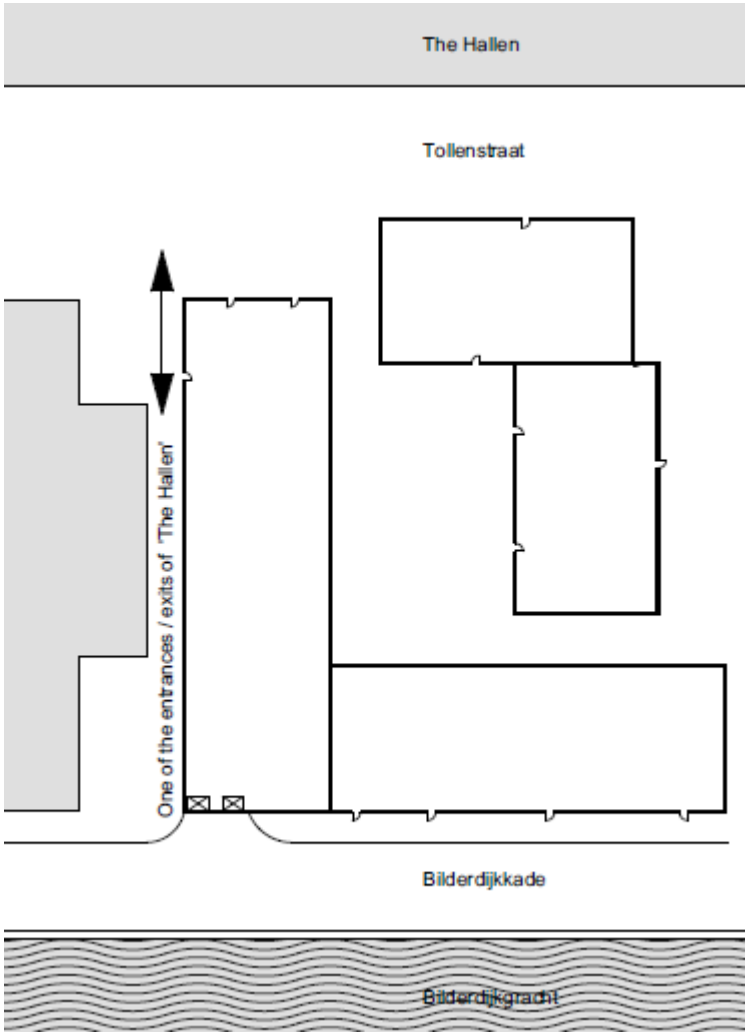


Figure 29: Entrances of Kwintijn (own figure)

4.2.4 Conclusion mobility analysis

This section concludes on the mobility analysis and highlights the differences and similarities between the three case studies.

4.2.4.1 Social data

The analysis on Twitter used a relatively small sample of Tweets. If a longer time period was used for the collection of Tweets, it could easily be possible that more information about transport related complaints would be found. Nonetheless, several complaints are found. Ger Baron stated that the municipality does not implement social data into their transport analysis. This is confirmed on Twitter since the municipality does not respond with solutions to these complaints. If the municipality would use Twitter as a platform for detecting problems, they could also stimulate people to give their opinion on Twitter, also in places where Twitter is used less often. The complaints could also be useful for new developments. For example, when there is a problem visible for bicycle storage in a neighbourhood, the municipality and the developer could provide for a solution in the brief of the new building. There is

not much data available on the fietsersbond meldpunt, therefore, it is difficult to highlight its usefulness. Since the two platforms generally could work the same, namely people giving their opinion about problems, also other platforms such as the fietsersbond meldpunt are useful for the analysis, as long as people are stimulated to give their opinion.

4.2.4.2 Sensor data

Table 39 shows which building is situated nearest to certain types of amenities. This gives an indication of the quality of the location.

T*able 39: Distances between the buildings and amenities in the neighbourhood (own table)*

TYPE	900 Mahler	Smiley	Kwintijn
Nearest bus stop	+++	+	++
Nearest subway	+++	+	++
Nearest tram	++	++	+++
Nearest train station	+++	+	++
Distance to Amsterdam Central Station	++	++	+++
Distance to the nearest city hall	+++	+	++
Nearest day-care	+	n.a.	+++
Nearest elementary school	++	n.a.	+++
Nearest high school	+++	+	++
Nearest supermarket	+++	+	++

** comparison made between distances from the buildings, +++ = smallest, ++ = middle, + = largest distance*

The Smiley building is located the furthest from most amenities, compared to the other two buildings. A municipality or a developer could use the analysis to detect if amenities which are important for a certain target group are nearby (enough) to the building.

T*able 40: Other indicators (own table)*

TYPE	Zuidas Zuid	RI Oost terrein	Bellamybuurt Zuid
Modal split car **	+++	+	+
Modal split bicycle **	++	+++	++
Modal split public transport **	+	+++	++
People who own more than one car *	+++	++	+
Bicycles at the bicycle depot *	+++	++	+

** comparison made between distances from the buildings, +++ = smallest, ++ = middle, + = largest distance*

Table 40 shows the comparison between the distances from the buildings to amenities in the neighbourhood. The car is more often used in Zuidas Zuid than in RI Oost terrein and Bellamybuurt Zuid. There are also more people that have more than one car in Zuidas Zuid. The bicycle is slightly more often used in RI Oost terrein, but the bicycle is used often in all three neighbourhoods. In Zuidas Zuid people do not often use public transport. There are more bicycles at the bicycle depot in Zuidas Zuid, which means that more bicycles are parked wrongly. The reason could be that the train station is next to Zuidas Zuid and many people park their bicycle in that neighbourhood.

The Plusnetten highlight the type of transport that have a priority in an area. The maps of the plusnetten do not show all the transport systems in one figure, therefore possible dangerous crossroads are not highlighted. A different visualisation of the Plusnetten, as is constructed in this research, helps the municipality and developers to make concepts about how to deal with these dangerous situations.

4.2.4.3 Registration data

Section 3.1 explained that registration data has a very low velocity. The data that is registered is not likely to change quickly. First of all, it is a time-consuming process to makes changes to registration data. Second of all, the municipality needs to be in favour of these changes. This affects the changeability of the parking ratio. Developers often have a different vision than the municipality about the parking ratio in a new development (Interview, 14-09-2018; interview, 31-08-2018; interview, 20-08-2018). If the parking ratio would be linked to data regarding the parking pressure in the neighbourhood, this could give developers leverage in the negotiation with the municipality. Furthermore, better insight into the number of parking spaces needed for the new residents could help developers in the creation of good concepts regarding parking space.

Section 3.1 also elaborates on the Kadaster, which consists of maps that structure the city. If the information of the Kadaster is added to the BOLD-driven method and enriched with information about the building exits of real estate, the building exits can be analysed on safety.

4.2.4.4 Data availability and comprehensiveness

Figure 30 elaborates on the availability and comprehensiveness of the data types and data sources for the mobility analysis in the BOLD-driven method.

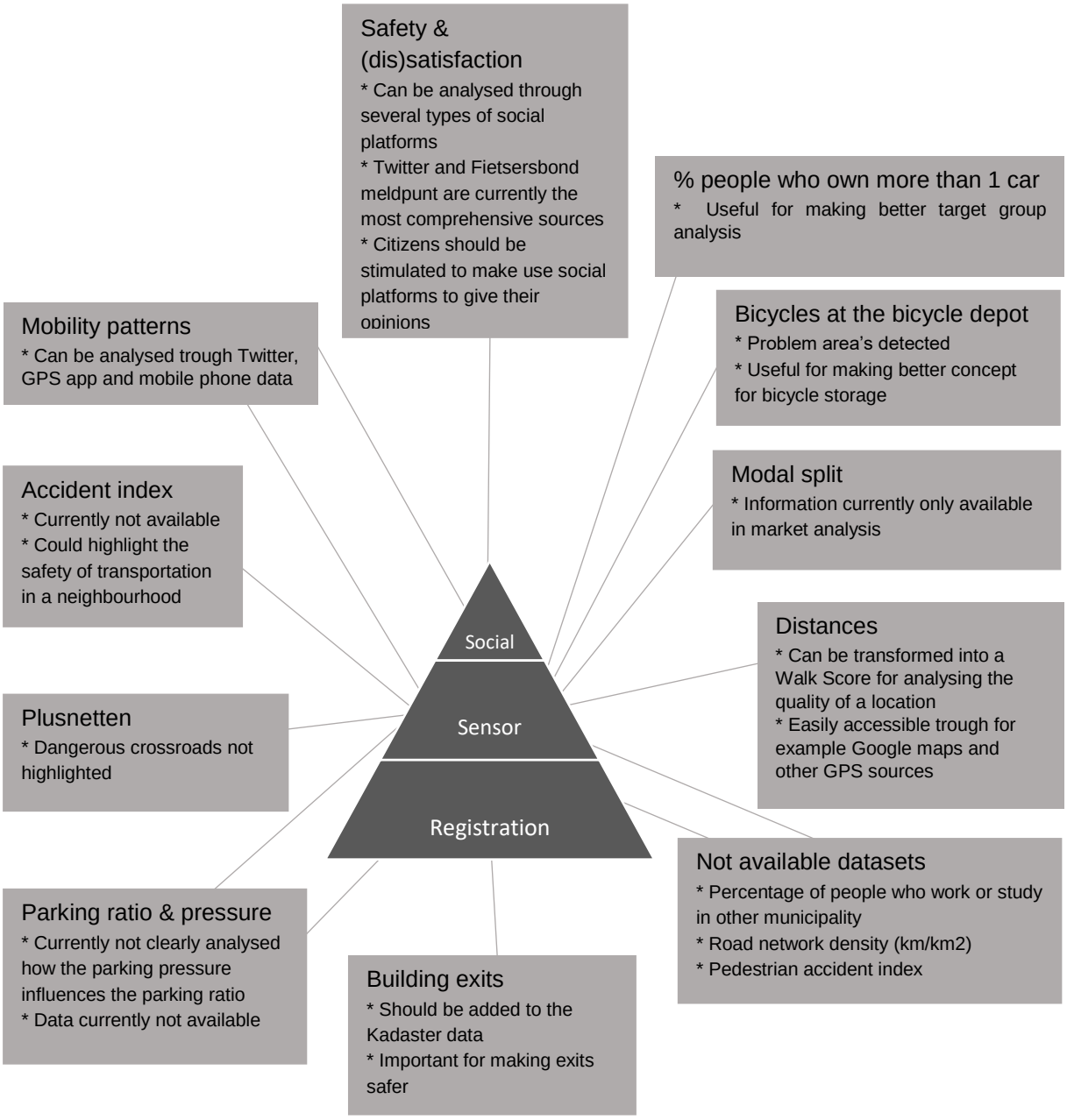
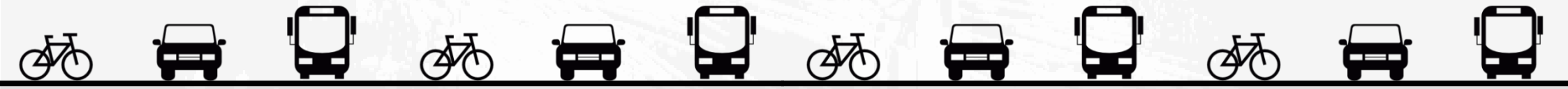


Figure 30: Availability scheme (own figure)

The mobility analysis within the BOLD-driven method for analysing the use and effects of transportation for residential real estate in Amsterdam is currently limited by the amount of available data and the comprehensiveness of this data. Capturing more data within the city, making more data publicly available and linking different data can result in ongoing additions to the BOLD-driven method.



Problems and improvements cases

4.3 Problems and improvements cases

The analysis of the previous sections can be done during the design and brief phase of the development. In this research, the analysis is done after completion. Therefore, it is possible to analyse problems that have occurred during the use phase of the building. This analysis shows how these problems can be avoided when the transport analysis is deployed during the design and brief phase, showing the usefulness of a comprehensive transport analysis. This section elaborates on the site visits and the questionnaire executed with the residents of the cases to detect problems regarding transportation in the neighbourhood. The site visits are all done in the morning during peak hours, between 6:30 am and 9:30 am. Furthermore, this section elaborates on the interviews with experts in the field of project development and their view on the transportation analysis.

4.3.1 Case 1: 900 Mahler

This section elaborates on the case 900 Mahler and its surroundings. It firsts elaborates on the site visit, then on the questionnaire filled in by the residents of 900 Mahler and ends with a conclusion.

4.3.1.1 Case visit

The figures 31-36 are photographs made during a case visit to the 900 Mahler building on Wednesday 20-06-2018.

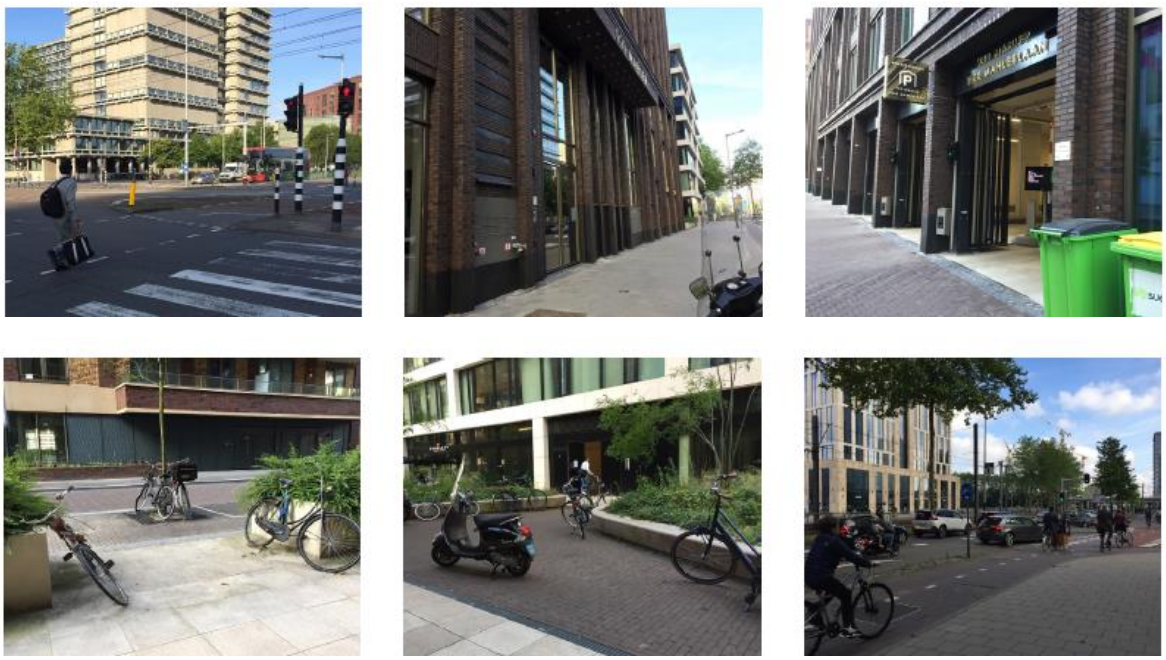


Figure 31 – 36 (from top to bottom, from left to right): Mahler location visit (own figures)

Figure 31 shows the arrival at the nearest tram and bus station. This is the path to cross the tram tracks. These tram tracks divide Zuidas Zuid and the University neighbourhood of the Vrije Universiteit Amsterdam. Because of this physical barrier, these students are less likely to go to the amenities in Zuidas Zuid. Figure 32 shows the entrance of the residential part of the building. This is a very luxurious entrance. It is strictly not allowed to stall bicycles against the façade of the building (interview 20-08-2018). Also, the garage entrance is luxurious, as visible in figure 33. This garage is used by the people living in 900 Mahler but also by the workers for offices nearby. The developer was allowed to make many parking spaces in the building. On the other hand, the bicycle storage in the building is too small. Therefore the municipality has made extra parking storage on the street afterward (interview, 20-08-2018). As visible on figure 34 and 35, the correct places to stall the bicycle, or the scooter, are not always used. Visitors are likely to stall their bicycle temporarily as nearby to the entrance as possible. The bicycle storage is either situated in the wrong place, too small or not convenient for users since it is not used properly. The developer has not made bicycle storage for the visitors of the commercial space in the building themselves (interview, 20-08-2018). The street on figure 36 tends to get very crowded at certain moments in the day, this results in little traffic jams.

4.3.1.2 Questionnaire

The results from the questionnaires filled in by several residents of the 900 Mahler building show the same problems. The residents of the building live generally in a two or 3 persons household with an age between approximately 20 and 60 years old. The respondents generally depart from at 06:45 AM and 07:00 AM and return home at 07:00 PM. Out of the two respondents, one travels most frequently by bicycle, and one travels most frequently by car. This car is parked in the street. Both respondents think that there is not sufficient parking space for the car, because the spaces are too expensive. The respondent who mostly travels by bicycle states that the amenities are too far away, the respondent who travels by car does not. Both respondents have a bicycle and think there is not sufficient bicycle storage. Both respondents are satisfied with the public transport possibilities in the area and do not experience traffic disturbances around the building 900 Mahler. One respondent states the main street is fairly busy. The respondent furthermore states that the crossroad at the Mahlerplein is dangerous for cyclist because they have priority, but cars do not expect this. Bicycle traffic around at the ABN AMRO head office is allowed to go two ways, in the rest of the street, this is not allowed. Nonetheless, cyclists cycle on the entire street length 2-sided.

4.3.1.3 Conclusion

The site visit and the questionnaire show that there are problems regarding bicycles. Due to the expensive nature of the car parking places, and because not all residents have a car, the bicycle is used by the residents. Also, non-residents travel to the

building due to the commercial spaces. The analysis shows that there is not sufficient, or not good enough, parking space for the bicycles in the building. Something that the developer could have known if the analysis was deployed up front. The developer states that they do not do these kinds of analysis (interview. 20-01-2018). Furthermore, the traffic in the neighbourhood is busy with cars and bicycles. This can lead to unsafe situations, something that the municipality should prevent, either with a social data analysis or better surveys.

4.3.2 Case 2: Smiley

This section elaborates on the case Smiley and its surroundings. It firsts elaborates on the site visit, then on the questionnaire filled in by the residents of Smiley and ends with a conclusion.

4.3.2.1 Site visit

The figures 37-48 are photographs made during a case visit to the Smiley building on Monday 18-06-2018.

Figure 37 shows the arrival at the nearest tram station. The building already visible behind the busy crossroad. Figure 38 shows the area around the tram station. The area has many parking spots, but not many empty parking spots are left (6:30 am).






Figure 37 – 48 (from top to bottom, left to right): Location visit smiley (own figures)

The area seems to be very busy. Figure 39 shows one of the small bicycle parking areas, which are spread all over the neighbourhood. All these bicycle parking areas are relatively full. Figure 40 shows that the area has wide bicycle paths and wide sidewalks. This fosters safety during busy time periods. Figure 41 and 42 show the parking meter next to the smiley building. While parking is not free in the area, the parking area is relatively busy. Figure 43 shows that many new buildings are and will be developed in the (near) future. It also shows a large parking area behind the Smiley building which is almost full. Due to the number of constructions, it is likely that even more car parking places are needed in the (near) future. Figure 44 and 45 show the two main entrances of the building. While there is a large indoor parking space area in the building, as visible in figure 46, the residents of the Smiley building park their bicycles near the entrance, see figure 47. They also park their bicycles in front of their apartment as visible in figure 48. This can either mean that the residents have more than one bicycle (which is very common in Amsterdam) and are only allowed to park a limited amount of bicycles in the bicycle parking garage, they are merely too lazy (or it is inconvenient) to park their bicycle inside, or a combination of both. The bicycle paths are crowded, but also wide. Therefore, the busy traffic in the neighbourhood should not give a major problem. Nonetheless, the figures show that there is a parking problem present in the area.

4.3.2.2 Questionnaire

The results from the questionnaires filled in by several residents of the Smiley building show the same problems. The respondents, which are students between

approximately 17 and 27 years old, depart from home and return home on a normal workday or school day at very different hours. The transport type which is used the most frequent are both the bicycle and public transport since almost no respondent owns a car. Nonetheless, some of the respondents mention that they think there is not sufficient parking space for the car in the neighbourhood. All the respondents state there are sufficient bicycle storage possibilities, but some state that, as highlighted from the case visit, there are not sufficient bicycle storage possibilities for visitors of the building. One respondent also stated that the exit of the indoor bicycle garage is inconvenient. Furthermore, the traffic lights on the busy crossroad are red for a relatively long time, therefore many cyclists cross the street while the traffic light is still red. This can cause dangerous situations. The public transport in the area is good, but only several lines (tram 26 and bus 37) depart nearby to travel through the city. There are many complaints about delays since there are no other travel possibilities by public transport when there is a delay on one line. Six out of eight respondents state that there are not sufficient amenities for everyday groceries in the neighbourhood.

4.3.2.3 Conclusion

The site visit and the questionnaire show that there are problems regarding bicycles. Most residents do not own a car, therefore the bicycle is used by most residents. The analysis shows that there is a lot of bicycle storage. Nonetheless, this storage is not used properly. There are multiple reasons for this problem. There is only place for one bicycle per inhabitant, while many residents have more than one bicycle per person. There is no bicycle storage for visitors. Stalling the bicycles on the street is easier than in the large bicycle storage. This is something that the developer could have known if the analysis was deployed up front. While the residents have to travel by bicycle across the city for daily amenities, they do not have a priority at the crossroad and tend to cross the road at moments they are not allowed to, which could cause dangerous situations.

4.3.3 Case 3: Kwintijn

This section elaborates on the case Kwintijn and its surroundings. It firsts elaborates on the site visit, then on the questionnaire filled in by the residents of Kwintijn and ends with a conclusion.

4.3.3.1 Site visit

The figures 49-60 are photographs made during a case visit to the Kwintijn building on Tuesday 19-06-2018 between 6:30 am and 9:30 am.

Figure 49 – 60 (from top to bottom, left to right): Location visit smiley (own figures)

Figure 49 and 50 shows the entrance of the parking garage. This garage is not only for the residents but, as explained earlier, there are many more parking places available. The entrance of the parking garage is situated directly next to one of the entrances of ‘De Hallen’, see figure 51. ‘De Hallen’ is an old tram depot redeveloped into a media, culture, fashion, food, drinks and crafts centre. The indoor centre attracts approximately 2,5 million visitors a year (Hamans, 2016). While the Bilderdijkade, the street where the garage entrance is situated in, is relatively quiet on Tuesday between 6:30 am and 9:30, the street can have more visitors of De Hallen at a later time. The two entrances situated directly next to each other, one for pedestrians and one for cars,

could cause dangerous situations. Figure 52 shows a mirror as an extra safety measure. Figure 53 shows the entrances of Kwintijn on the Bilderdijkkade. The figure shows that many bicycles are parked in front of the building. Similar to the case at the Smiley building, this can either mean that the residents have many bicycles (which is very common in Amsterdam) and only have space to park a limited amount of bicycles in their storage, or that the residents are merely too lazy (or it is inconvenient) to park their bicycle inside, or a combination of both. Nonetheless, there are no bicycle racks available on the street. Figure 54 shows the parking places at the Bilderdijkkade, there are no empty parking places left (6:30 am – 9:30 am). Figure 55 shows one of the multiple building entrances on the Tollenstraat. Figure 56-58 shows that many residents tend to park their bicycle in their garden. Figure 59 shows the sign that the Tollenstraat is only accessible for pedestrians. Since the signs are visualised on large fences there is a possibility that there has been, or there still is, a problem with safety on the street if bicycles would be allowed. Figure 60 shows one of the many signs that bicycle parking is not allowed in the street. This also indicates a bicycle parking problem in the area.

4.3.3.2 Questionnaire

The results from the questionnaires filled in by several residents of the Kwintijn building show the same problems. The residents of the building live generally in a two person household with an age between approximately 28 and 50 years old. The respondents generally depart from home between 08:00 AM and 09:30 AM and return home between 06:00 PM and 07:30 PM. These hours could be considered as the rush hours of the building. Out of the six respondents, four travel most frequently by bicycle, one travels most frequently by public transport, and one travels most frequently by car. Five out of six respondents have a car in the parking garage of the building. One respondent states, as was highlighted in the case visit, that the garage exit is not safe. The same respondents is not satisfied with the public transport possibilities since it takes longer to travel with public transport, to e.g. the Southeast of Amsterdam city, than by car. The respondents state there are sufficient car parking places in the building and in the neighbourhood. All the respondents have bicycles, only two respondents are not satisfied with the storage possibilities of the bicycle. One respondent states there are sometimes disturbances at the building exit, mostly due to construction work.

4.3.3.3 Conclusion

The site visit and the questionnaire show that there are problems regarding transport. The bicycle and the car are both used frequently by the residents and many residents possess both. Also, non-residents travel to the building because of the offices in the building. The analysis shows that there is enough, but possibly not sufficient enough, parking space for the bicycle in the building. Something that the developer could have dealt with upfront. Furthermore, the exit of the parking garage of the building and the exit of the Hallen is situated directly next to each other. This can lead to unsafe

situations, something that the developer could have prevented with a safer and thus better design of the building.

4.3.4 Conclusion on the problems and improvements

Multiple problems have become visible during the site visit and in the questionnaire. Some of these problems are:

- A too small bicycle storage area in the building
- Inconvenient bicycle storage area in the building
- No bicycle storage in the building for the commercial space in that same building
- Bicycle racks outside the building, placed by the municipality are either not used properly or not at all
- Bicycles parked against the building and in gardens
- Not enough (affordable) parking space
- Dangerous exits parking garage due to the location next to perpendicular sidewalk directly next to the exit

The desired outcomes of a project development are stated in the brief. The brief furthermore deals with the project's background, objectives, scope, constraints, assumptions, stakeholders, approach etc. The described problems are all problems that a developer could have prevented in the development brief. A well-executed transport analysis would give the developer insights in the target group, the location and thus insights in the existing use and effects of transportation in the neighbourhood and the probable use and effects of transportation of the new residents. In the current context, developers neglect the effect of these problems. The effect of the problem depends on the number of people that experience there is a problem. For example, if only one of the resident thinks the bicycle storage is inconvenient and parks his or her bicycle outside the effect of the problem is very small. But, as visible in the analysis, many of the residents of the Smiley building find the bicycle parking storage inconvenient and store their bicycle next to the building. Therefore a bigger problem arises. The pile of bicycles trigger theft, the pile of bicycles change the characteristics of the street by distracting the view on the design of the building. Since the Smiley building is situated at the entrance of the neighbourhood, the pile of bicycles could change the characteristics of the whole neighbourhood itself. The negative influence could lead to an overall reduction of the quality of the neighbourhood. Furthermore, the pile of bicycles could be dangerous during heavy storms etc. In other words, a small problem could become a larger problem in some cases while the solutions are relatively easy. The same goes for the dangerous exit of the parking garage. This does not have to be a problem when exiting drivers are careful, but if for example a child or jogger runs on the sidewalk and an accident occurs, the problem becomes large. While this problem could have been prevented with a different location of the parking garage exit. Which would have been a relatively easy solution as well. If developers do not

think these problems are their responsibility, the municipality should obligate the developers to come up with a solution for possible transportation problems such as the problems listed in this section.

This research has only detected the problems that became visible during the case visit and in the questionnaire. It could be possible that in different locations, or with a more thorough analysis, different problems would have occurred. Therefore, it is important to do the transportation analysis by using the BOLD-driven method up front. Other problems that became visible during the site visit and in the questionnaire are:

- A fiscal barrier between two parts of the city due to the tramline prevents the flow of people into a neighbourhood
- Dangerous bicycle paths at crossroads
- Traffic jams in busy hours at crossroads
- Many delays in public transport
- Insufficient daily amenities in the neighbourhood

These problems are not to be solved by the developer but by the municipality. This research has highlighted the importance of good transportation for a project developer. Nonetheless, experts in the field of project development tend to have a passive attitude toward the municipality for enhancing transportation in the area adjacent to the building that is going to be developed. The BOLD-driven method could help developers in convincing the municipality to make improvements in the neighbourhood and, or in their location choices for new developments.

Expert view

4.4 Expert view

This section elaborates on the interviews with experts in the field of project development. Semi-structured interviews are conducted with the developers of the three case buildings, namely Kasper Hesp, the developer working on the project 900 Mahler, Marten Boerema, the developer working on the project Smiley, and Fons Kurvers, the developer working on the project Kwintijn. Table x highlights the differences and similarities of the most important findings within the interviews, and thus between the development process of the three development companies, namely G&S Vastgoed, Van Wijnen Midden and Van Wijnen West.

4.4.1 Expert view on the BOLD-driven method

The interview protocol of the semi-structured interviews is constructed on the basis of the BOLD-driven method. All separate parts on the method are transformed into a clear question that explains every topic. The interview protocol and the answers from the interviewees are visible in the appendix.

T*able 41: Expert view on transport (own table)*

	Kasper Hesp ***900 MAHLER***	***Marten Boerema*** ***SMILEY***	**Fons Kurvers** **KWINTIJN**
The importance of transportation for the project developer	* Often wants to build more parking places than allowed * Creating good concepts for less parking spaces to convince investors * Interesting to know the modal split	* Discussions with the municipality about parking ratios * No influence on the infrastructure	* Only important in a large scale development * Rent advisors, the developer does not have the knowledge. * Transport flows important
Influence of target group on transportation	* Yes, on the parking ratio and transport movements * Also the functions in a building and mobility concepts	* Yes large, the parking ratio * We do not analyse it, but we know the market	* It depends on the target group what kind of transport-related aspects are important

Table 41 elaborates on the expert view on transportation in a project development. The developers all think that the parking ratios are important when dealing with transport. A notable difference is that at G&S vastgoed, many parking places are desired because parking space is something to make a profit on. At van Wijnen Midden and West, the developers normally want to develop less parking places than the ratio since they state that these cost more than they yield in the neighbourhoods where they normally develop. Hesp (2018) states that the upcoming years can be seen as a transition period to find other solutions than car use and solutions in convincing parties in the market to think differently about transport (interview 20-08-2018). The project developers have to deal with the municipality since they are obligated to build a certain parking ratio and the investor that prefers another parking ratio. Municipalities should come with solutions for the transport network or public transport because good alternatives are needed if car use is not desired. All three developers do not have transport very high on the agenda. G&S vastgoed only develops in areas which are popular in the market or upcoming. Van Wijnen Midden and West are willing to build everywhere. In bad locations, they make the residential

buildings cheaper. All three developers state that target groups influence the use of transportation.

T*able 42: Expert view on location analysis (own table)*

SURVEY SECTION	***Kasper Hesp*** **G&S vastgoed** ***900 MAHLER***	***Marten Boerema*** **Van Wijnen Midden** ***SMILEY***	**Fons Kurvers** ***Van Wijnen West*** **KWINTIJN**
Importance of amenities in a location (Walk Score)	* No specific amenities * Preference for locations near a train station * Good locations (for example. by the water)	* Depends on the target group	* Good location: build for a higher segment. Bad location: build for example social housing
Action when transport in a location is lacking	* No action except for telling the Municipality you think it is lacking	* No action	* Build for a different target group
Location analysis	* No, our network tells us what the market needs * No analysing just checking if the market thinks it is a good location * If the municipality does the analysis, they probably have a different vision	* Depends on how well you know the location * bicycle lane connection to the city centre is important, but a concern of the municipality	* if the development is large enough to do a location analysis you hire someone to analyse the location * Some things are part of the assignment: change not possible * other things can help you in being distinctive, innovation is important

Table 42 elaborates on the expert view on the location analysis in a project development. When the developments are commissioned, the location is important for a developer. When the development is not commissioned a location choice has to be made. Hesp (2018) state that G&S vastgoed choses their location on how well it is positioned in the market because they build for a higher segment (interview 20-08-2018). At G&S vastgoed the developers automatically assume that they build in good places that have the needed amenities in the neighbourhood. When they build in a less accessible area, think of the Houthavens in Amsterdam, G&S vastgoed only expresses their concerns and hope/think that the municipality will provide for solutions. Boerema (2018) states that in a good market like now, everything they can buy, they buy, especially in Amsterdam (interview 14-09-2018). Kurvers (2018) states that if the development is large enough, Van Wijnen West becomes part of the development group and hires someone to analyse the location and transportation for them (interview 31-08-2018). The developers do not have an active approach in analysing and enhancing the neighbourhoods they develop in.

T*able 43: Expert view on big data (own table)*

SURVEY SECTION	***Kasper Hesp*** **G&S vastgoed** ***900 MAHLER***	***Marten Boerema*** **Van Wijnen Midden** ***SMILEY***	**Fons Kurvers** ***Van Wijnen West*** **KWINTIJN**
Parking ratio analysis (bicycle and car)	* No the municipality does this, we often have a different vision, sometimes it is negotiable	* developers have a vision which you tell the municipality, but they also have obligations	* The municipality analyses parking pressure themselves
Using big data in development process	* Big data tool for explaining development to clients	* pilots where big data is used for a target group analysis, another company did the analysis	* There is too much big data I am from another generation but some colleagues probably use it more often. Uses Land

		* if you do not know you are missing information you probably do not miss it	use plans, Google, accessibility, market research. Extra analysis when there is a large risk profile
Other techniques	* Volker Wessels is making a location analysis tool * Using BIM for analysing our developed buildings	* No	* As a developer you should not be distracted by too many things, if you need information, you will find it somehow

Table 43 elaborates on the expert view on big data in a project development. G&S vastgoed used big data to convince the customer or investor. If these parties have questions, G&S vastgoed can provide real-time answers. Open data is thus very useful. It is useful to know how people move through the city. G&S vastgoed also used BIM to generate data but they are still very new in working with BIM. Volker Wessels, the parent company of G&S vastgoed, has a larger data tool to analyse locations. Van Wijnen Midden has had two pilots in using big data for a target group analysis, another company has made the analysis for them. Kurvers (2018) states that he is not from a generation that uses big data (interview 31-08-2018).

T*able 44: Expert view on the cases (own table)*

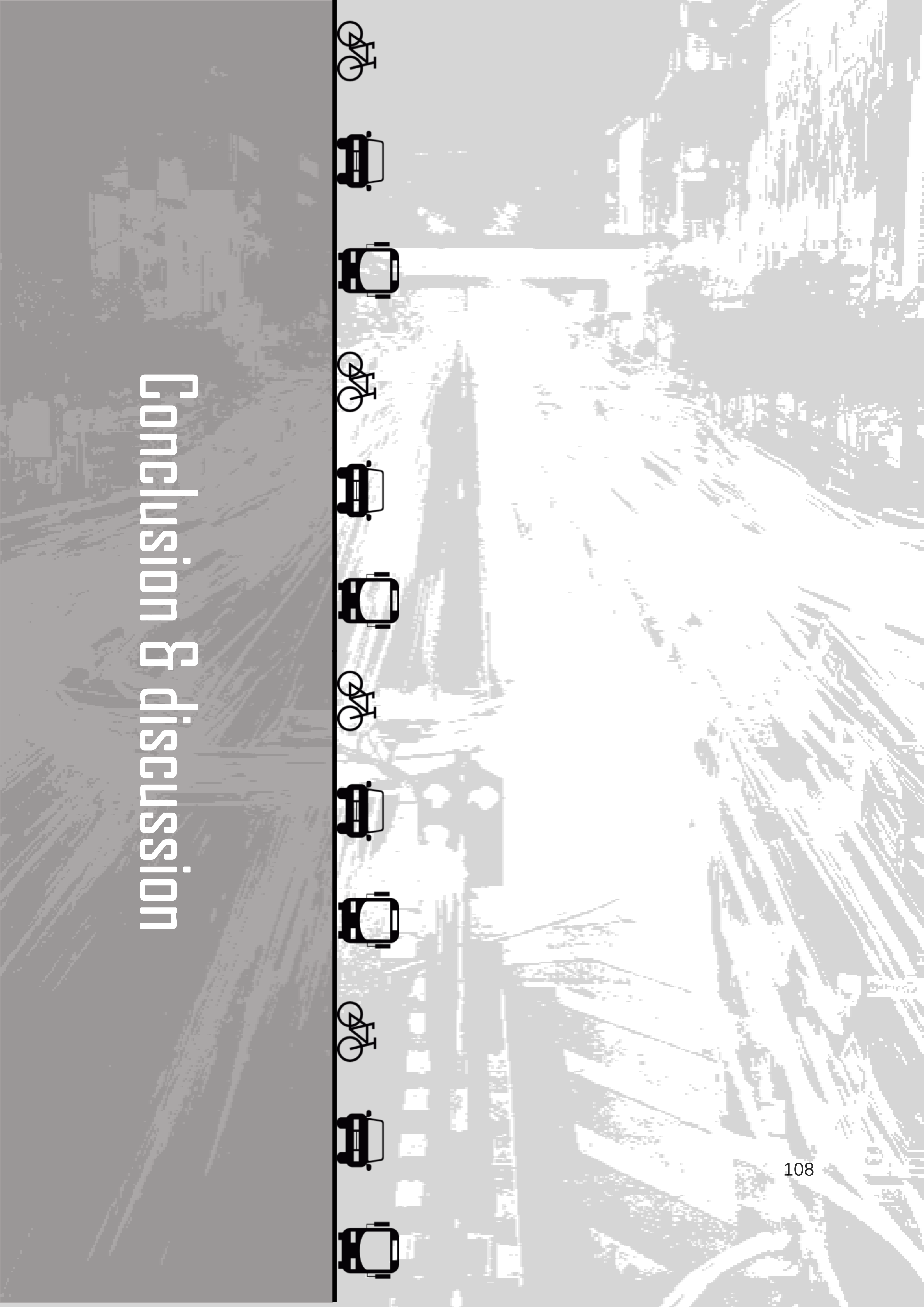
SURVEY SECTION	***SUBJECT***	***Kasper Hesp*** **G&S vastgoed** ***900 MAHLER***	***Marten Boerema*** **Van Wijnen Midden** ***SMILEY***	**Fons Kurvers** ***Van Wijnen West*** **KWINTIJN**
Case building	*Parking (car and bicycle)*	* Old parking ratio, many parking spaces for cars * too small bicycle storage (extra storage on the first floor, inconvenient) * No bicycle storage for the commercial space	* parking ratio of municipality	* Large-scale development, extra parking spaces for the municipality in the garage * Enough bicycle storage for the residents
	Provision level neighbourhood	* Slowly gets better on the South Axes	* No amenities, but the development was provisioned thus not our problem	* The location is excellent, not much you can / have to change
	Improvements transport on a neighbourhood level	* A direct connection between south axes and west side of the tram rails	* Transport is bad, but that was DUWO's problem, not ours * The should make it safer to cross the roads to the city. The municipality said they would but I do not see any improvements	* No improvements

Table 44 elaborates on the expert view on the cases they developed themselves. All three developments are won in a tender. In 900 Mahler there are many, and thus enough, parking places but there is not enough bicycle storage. The storage is too small, there is another storage on the second floor but that is inconvenient. There are no bicycle parking places for the commercial space on the first floor. A transportation problem was clearly visible in the neighbourhood of Smiley, but Van Wijnen Midden did not feel obligated to talk with the municipality about it.

4.4.2 Conclusion on the expert view

The developers have different development processes. Nonetheless, all three developers do not perform a transport or a location analysis. Nonetheless, they do not

always agree with the municipality about transport related aspects. The developers are obligated to listen to the municipality and only sometimes the municipality listens to their opinion. The BOLD-driven method could be helpful in their negotiations with the municipality. The developers clearly make a distinction between developments they invest in themselves and developments in which are commissioned by a client, whilst good transportation could and should always be of importance and implemented in the project development brief.



Conclusion & discussion

5 Conclusion & discussion

5.1 Conclusion

The main goal of this research was to create a BOLD-driven method for establishing mobility goals and constraints. This section first answers the sub-questions of this research. Hereafter, the main research question and the hypothesis can be answered.

5.1.1 Research questions and answers

Within this research the research sub-questions are answered as follows:

A. What is the main difference between the currently used data and BOLD?

The main difference between data which is not BOLD and BOLD is that the latter possesses a combination of multiple characteristics. The data is big and thus presents itself in large volume. The data is open and thus accessible for many parties. The data is linked which means that different types of data sets that influence each other are connected. New data types have a high velocity and a high variety. Nonetheless, BOLD does not exclude the currently used data, as long as the total amount of data is Big, Open and Linked. BOLD consist of social data, sensor data, and registration data. BOLD is an addition to older data types. For example, registration data which exist in low volume and has a very low velocity is still just as important as other types of data.

B. What are the main factors that make transportation important for a project development?

Transportation is not only how people travel, for example by car, public transport, bicycle, walking etc. Transport is also how far and through with route people have to travel. To amenities like supermarkets, schools, municipal buildings, for example. Research shows that there are differences between types of home-owners in their amenity preferences. Good transportation can result in multiple benefits for project development. These are financial benefits and social benefits. Improvements in transportation, thus drive-ability, bike-ability., walk-ability etc., and shorter distances to public transport and amenities can result in an increase in building value. Lower income groups seem to have a smaller daily potential path area and activity space. Developing and providing good transportation thus also has social benefits for these income groups.

C. How does a project developer include transportation into the development process?

Research shows there is a paradigm shift in how transportation improvements could be viewed. The developer can help in improving transportation on different levels. First of all the traditional view of only addressing transportation issues using transportation means. But, the project developer should also take into account different subjects that affect transportation, e.g. school quality, affordability etc. The analysis can either be useful for a better site selection, a better target group selection for a certain location, and for a better understanding and discussion with the municipality of how to improve transportation in a neighbourhood altogether.

D. *What kind of policies complement the transportation goals of the Municipality of Amsterdam?*

A general summary of the contemporary policies regarding transport in Amsterdam is to make transportation smarter and environmentally friendlier, which include options as not travelling at all, walking, cycling, taking public transport and the use of cleaner cars. Municipalities should make the improvement of transportation obligated, by changing the land use plan for example. Research suggests to develop multi-functional homes/workplaces (to discourage travelling), developing multi-functional neighbourhoods (to stimulate walking and cycling), promote public transport oriented developments/nodes (to stimulate public transport) and finally to develop multi-functional balanced urban regions (for car use). Nonetheless, there is no best practise scenario for every location. Therefore, the municipality and the project developer together should find the best solution for every new development location.

E. Is there a structure present in the transport flows in Amsterdam?

The transport model of Amsterdam highly relates to an ideal-typical model of transportation. The ideal-typical model is a model where the availability of transport modes determines the preferred location of activity. The general transportation model is static. This means that large transport projects are not easily conducted in the historic city centre of Amsterdam. Nonetheless, the way transportation is used changes yearly. Between 2014 and 2015 the bicycle transport in Amsterdam has increased by 4%. Between 2015 and 2016 car ownership has increased with 2% in Amsterdam. Visitors of Amsterdam use primarily car transportation (51%) and public transport (36%). In the city centre of Amsterdam, 92% of the parking spots for cars are occupied at night times. Especially in the City Centre and in West there are many complaints about the inability to find parking places. The amount of bicycle places is increased with 15.000 places between 2012 and 2015. Nonetheless, 57% of the inhabitants of Amsterdam thinks there aren’t enough places to park their bicycles safely.

F. What are the main factors for people to choose a certain type of transport?

The choice of a particular type of transport is influenced by several aspects. First, the velocity of the type of transport. The transportation possibilities of a place have a great influence on the choice for the type of transport. Second, the choice for a particular route to one's destination has to be made. An important aspect in choosing a travel route is ''route type velocity'' which indicates how fast and attractive routes of that type are being perceived. Research also highlights the importance of landmarks and the influence of the neighbourhood or the sense of a place/sense of occasion. Accidents and conflicts related to transport types can also influence the choice behaviour of the user of the city. Promoting a certain type of transport influences the choice of people for using that particular type of transport.

The main research question is answered as follows:

How can the triangle relation between project development, transportation and Big Open Linked Data be used in the process of monitoring and implementing ambitions for residential project developments?

In order to monitor transportation and to implement ambitions regarding transportation in residential project developments, local authorities need to integrate their ambitions or goals in project developments. These goals thus need to be transformed into obligations for the project developer, for example within the land-use plan and other planning regulations. The projects need to be checked upon these obligations during the planning application, similarly to e.g. the implementation of pavements in these developments. Developers have to provide sufficient mobility solutions and local authorities should monitor mobility during the use phase. Therefore, transport simulation or transport analysis tools are needed.

This research proposes a Big Open Linked Data approach, in the form of the BOLD-driven method. The triangle relation between project development, transportation, and Big Open Linked Data is used for the creation of a method, that consists of a location background analysis with 17 indicators for analysing transportation-related aspects and a mobility analysis with 10 data sets for analysing transportation means. The BOLD-driven method provides a framework for analysing and implementing mobility in project developments through multiple spatial levels. The method could be deployed to get insights into a building, a neighbourhood, and the city to get a better understanding of what kind of transportation is needed in these locations.

The added value of a data-driven approach is the expansion of currently used data sources. Because the method is driven by BOLD it gives the possibility to analyse transportation with different types of data, namely social data, sensor data, and registration data. It gives the possibility to find real-time solutions and it gives better

insights in how project developments could add to the quality of transportation by linking the information from these different data sources regarding project developments and transportation to each other.

The preliminary investigation of the project developer, with the use of these mobility tools, should be done to comply with feasibility and applicability studies of local authorities. Furthermore, the preliminary investigation can help developers negotiate with the municipality about transport related aspects and gives insights into the role and incentives of a project developer for analysing transport. The developer and the municipality, or private and public parties in general, also have individual incentives and turnoffs for the use of the BOLD-driven method. The incentives for public parties for using the BOLD-driven method are the improvement in the process of (real-time) monitoring transportation, a better understanding transportation, and a better understanding of what data is useful for the analysis of transportation. A turnoff could be a difficulty in implementing the method and the costs of creating a tool for the BOLD-driven method. The incentives for private parties for using the BOLD-driven method are a possible marginal increase in building value and the possibility to generate information about how and why people move through the city. The turnoff could be the extra costs that are needed for improving transportation and the time and skills needed for performing the analysis.

5.1.2 Hypothesis

This section reflects on the comprehensiveness and feasibility of the BOLD-driven method. Hereafter the hypothesis can be affirmed or disproved. The following hypothesis was formulated for this research:

> *The application of a BOLD-driven method for monitoring and implementing ambitions regarding transportation for residential project developments can improve transportation in the city.*

The current context municipalities and developers work in leads to a disproval of the hypothesis.

The comprehensives of the BOLD-driven method is limited by the availability of data. A lot of data for analysing the use and effects of transportation is already available. Nonetheless, there is also data which is not available. Data owners could limit the comprehensiveness of the BOLD-driven method when they keep useful data, and thus useful information, private. It is therefore important that stakeholders participate in the creation of the BOLD-driven method.

The feasibility of the BOLD-driven method depends on several things. The willingness of different stakeholders, most of all the municipality and the developer, to use the method for improving transportation. Due to the different interests regarding project development, increasing the collaboration between the project developer and the municipality could be challenging. If the municipality and the developer use the

method separately, they could steer on the conclusions that are in their own best interest instead of that of the city. Furthermore, the willingness to make the required investments to transform the BOLD-driven method into a useful tool where all the data is linked and open. It is not clear beforehand how and in what quantity the investments will lead to improvements and returns.

5.2 Discussion

In this research, a BOLD-driver method is designed which helps in the process of analysing the use and effects of transportation for residential real estate cases in Amsterdam. This is an explorative research based on existing methodologies in scientific research, the availability of data and experts in the field of project development and big data.

5.2.1 Limitations of the research

Due to the nature of an explorative research and due to the limited amount of research in this field, this research is only a first step in the creation of the BOLD-driven method. An actual implementation of the methodology could encounter difficulties or desired changes that are not yet visible or researched. Furthermore, the method is limited to the current availability of data and highly dependent on the amount of data that the different stakeholders are willing to provide. When more data becomes available in the future, the methodology could change. This shows the non-static nature of the methodology. The BOLD-driven method is assessed against thee cases in Amsterdam. The cases are chosen for this case study are different from each other in terms of location within the city, type of households and the building typology. Therefore the method seems to have a generic nature, it seems that the method can be used for every large residential building in Amsterdam. Nonetheless, it does not show how large the cases should be and how far from the city centre the case could be (or which locations) for the method to be applicable.

Several limitations became visible during the case visit, for the questionnaires and interviews. The cases were visited in the morning, during peak hours listed by the ANWB. Nonetheless, there were almost no residents exiting the building at the time. It could be possible that this was a quiet week, day or quiet hours, and that more problems would have occurred at another moment. The questionnaire had only 18 respondents, while the buildings have many more residents. It could be possible that other outcomes would be achieved with a larger respondents group.

The interviews were held with three experts in the field of project development. The choice for interviewing project developers is made during a later phase in the research process. Two of the selected cases where from the same mother concern, namely Van Wijnen. It is probable that the two companies, Van Wijnen Midden and Van Wijnen West, use the same development process, methods, and tools. If the decision for doing the research from the point of view of the developer was made earlier

on in the research process, a case from another development company was chosen. This could have resulted in the explanation of other methods and tools in the development process.

5.2.2 Limitation of the method

Several limitations became applicable during the collection of data for the BOLD-driven method on the three residential cases.

First, the social data had to be selected on a specific time period and a location tag. This is done to limit the number of Tweets that had to be analysed. The choice of a different time period could lead to different conclusions.

Second, the available data on the municipal website is not always divided into the neighbourhoods. Since this research is deployed on the building level, data is needed from the direct surroundings, and thus on the neighbourhood level.

Third, some sensor and registration data that the municipality collects in not publicly available. Since this research is from the point of view of the developer, this data is not available for the BOLD-driven method.

5.3 Recommendations for further research

This research is an explorative research, it is a first step in analysing the use and effects of transportation for residential real estate. Exploratory case study research can lay the foundation for further analysis regarding the use of BOLD for the built environment. Exploratory research creates a framework of the study and can be considered as an example for future research (Yin, 1984).

This thesis evaluates transportation in several locations within the Amsterdam residential market. Amsterdam is chosen due to the larger availability of data, the willingness of the Municipality of Amsterdam to analyse big data, the many project developments that are scheduled in the near future and the number of people the city. It would be beneficial to extend this research towards other cities within the Netherlands. This thesis could show other municipalities how local developers could help improving transportation in their cities. Furthermore, other transport systems could be added to the BOLD-driven method. For example, data regarding pedestrians or other motorized vehicles besides the car.

The BOLD-driven method could hereafter be transformed into an analysis tool. With this tool, a statistical regression analysis could be performed to gain further insight into the benefits of good transportation. After the data collection, the variables, or the data, should be statistically characterized first. Hereafter several types of multivariate statistical techniques of summarizing the data are possible. This can be done with a principal components analysis (PCA), for example (Gonçalves et al., 2017). This corrects the fact that the dataset exists of data with different units or scales of measurement. The PCA is used to standardize these measurements. One software to

carry out a PCA is STATISTICA software (Gonçalves et al., 2017). The data can also be analysed with the use of a GIS platform, for example, ArcGIS. Data from different platforms could be linked to the public sources of Geodata of the municipality of Amsterdam. In further research, it is also possible to use the same methods of big data analysis for other subjects in the built environment.

5.3.1 Creating and implementing a mobility tool

This research can be continued by making a tool based on the findings of this research. This should be a tool or a model that can implement different types of data from different types of data sources on the basis of the created BOLD-driven method within this research. The BOLD-driven method could first be extended with more data to tackle the limitations that were present within this research.

Hereafter, the different components in the analysis could be linked to a certain score, whereas a high score means that the level of quality of transport is good and a low score means the level of quality of transport is bad. A clear example is the existing Walk Score that shows the quality of a building trough distances to amenities, or the sustainability labels that clearly show how sustainable a building is. An equivalent score could be created for all the different components within the tool. The tool can evaluate the quality of transportation on a building level, a neighbourhood level and even on a city level when analysing all neighbourhoods together.

The municipality and the developer have separate incentives or using the tool. Nonetheless, to make it possible for the municipality and the developer to use this mobility tool in practice, the tool first has to be created. The main beneficiaries of this research, and thus of the BOLD-driven method, are for the city and the citizens. Therefore, the municipality should take the first step in creating a tool for the BOLD-driven method. The developer (and other private parties) have incentives to comply. The tool for the BOLD-driven method should thus be created by the municipality and implemented by the municipality and the developer. The tool can promote their collaboration for enhancing transportation in a neighbourhood.

The local authorities must obligate the project developer to implement the municipal ambitions regarding transportation. This can be done through planning regulations. The development must be checked upon transportation, next to e.g. sustainability, the land-use plan, construction costs etc. in the application of environmental permits. The local authorities should use the method themselves to check if the ambitions are really implemented or if changes are needed.

Statistical research on these data sets could highlight the importance of the particular data sets. The impact of one specific data set regarding transportation could, for example, have a low influence on safety, but a high influence on the reason for people to live in a certain neighbourhood. The data set could in theory thus be different when used for different purpose by the municipality.

5.4 Personal study targets

This research is conducted for my graduation at the Technical University of Delft, Faculty of Architecture, Urbanism and Building Sciences of the Master Track Management in the Built Environment. It is the biggest research within this master and the end result of the two-year master programme. The graduation format gives students the opportunity to develop a research which is in line with their personal interest.

My personal interests have been very broad during my study at the Faculty of Architecture. One of my interests has been geomatics. Due to the fact that I think big data will have an ever-growing role in the built environment. Big data could possibly have a large impact on the built environment. This could mean that many companies strive to go towards a data-driven decision-making model. Data is information, and information is important for companies. But, turning data into useful information (information that can be applied) within a certain field, is most important. This research gives me the perfect opportunity to get familiar with the use of big data. Therefore, my personal study target is to become an expert on using big data for real estate purposes and use my new data skills to positively influence the built environment. The knowledge gained from this research could be useful in future employment.

Reflection

Researching the use of big data in the built environment is not done very often. Therefore, the research subject BOLD cities is a new subject for the master track Management in the Built Environment. This research is thus an addition to previous research subjects available for our master track. This thesis fills up the research gap of the use of big data in project developments.

My personal interest in big data and project development are very broad. This resulted in the creation of a very broad main research question, which implemented many different topics regarding the use of big data in project developments. The main research question is changed many time since the start of my research process. The process of making the subject of my thesis more specific was very important during the entire AR3R010 course. This has been a time-consuming process, but the process helped me in creating a clear view on what I wanted to research and what I needed for this research. The downside of the lengthy process is that there was not much time left to focus on the case studies. In the remaining time I was almost completely focused on conducting a thorough literature study, and thus less on the cases.

After the p2 I wanted to know more than only general things about transport in the surroundings of the cases. This would probably give a clear view on what kind of transport, and thus on what kind of data, I need to focus on. Performing the literature study seemed a steady process. Nonetheless, it is also a process that brings insecurities. Trying to search for useful literature sometimes seemed like searching for something that does not exist. It is furthermore a 'never-ending' process since a lot of literature is available. Some weeks, when reading many journal articles in a relatively short time, resulted in losing focus on what kind of literature I needed. There have been several moments before and after the P1 where it was difficult to continue the process because you tend to lose a clear structure during the process. Therefore, the many meetings with the graduation mentors within the theme 'BOLD cities', Alexander Koutamanis and Ellen van Bueren, where very helpful. After every meeting, I knew what my next steps would be in the process towards the P2. In the first period after the P2, and towards the P3, the methodology for this research has changed a few times. This was done through meetings with the graduation mentors and a lot of thinking, reading and searching for big data on the internet. This period is completely different from the end period toward the P2 where a lot of time is used for writing the thesis instead of thinking about the process. Thinking about the process (the research steps) was needed to create a new, and better, methodology. There were moments within this period where I had difficulties in visualising the end result of my thesis. This has led to a lot of ''trial and error'' since all the choices I made had to be tested to create the new methodology for this research, something that is needed in an explorative research. After the P3 presentation, I made the decision to postpone the P4 for three more months. The reason for this decision is time management and the nature of an explorative research. Besides writing this thesis, I work 4 days a week at a project development company. While I have learned a lot during these workdays about project development, my weeks tend to be very busy. While having less time for my thesis, I still want to create an in-depth analysis with a very good quality of the end result. The research is explorative, and thus not much information about the topics in this research are available. This research is new. Therefore, it is a very time consuming process to analyse what kind of data is needed, where this data can be found and analyse all the usable data. This was only possible whit the three additional months for writing my thesis. Toward the p4 I was very content with my decision to postpone the p4, since in these moths it became very clear which direction I wanted to follow with my research and it became clear how I was able to create the desired end result.

This research helps project developers and municipalities to monitor (parts of) the city and to implement ambitions regarding transportation in the project brief. This research explores what data should be used in the transport analysis. It only uses open data to prevent privacy issues.

References

Al Nuaimi, E., Al Neyadi, H., Mohamed, N., & Al-Jaroodi, J. (2015). Applications of big data to smart cities. *Journal of Internet Services and Applications*, *6*(1), 25.

Amsterdam Woont. (n.d.). Kwintijn Fase 1. Retrieved 11-2-2018, from https://www.amsterdamwoont.nl/nieuwbouwprijs/amsterdamse-nieuwbouwprijs-2016/kwintijn-fase-1/

ANWB. (n.d.). Dagelijkse drukke trajecten ochtend en avondspits. Retrieved 18-3-2018, from https://www.anwb.nl/verkeer/nederland/verkeersinformatie/dagelijkse-drukke-trajecten

Bertolini, L., & Le Clercq, F. (2003). Urban development without more mobility by car? Lessons from Amsterdam, a multimodal urban region. *Environment and planning A*, *35*(4), 575-589.

Bertolini, L., Le Clercq, F., & Kapoen, L. (2005). Sustainable transportation effects and needs: a conceptual framework to integrate transport and land use plan-making. Two test applications in the Netherlands and a reflection on the way forward. *Transport policy*, *12*(3), 207-220.

Bokhari, S. (2016). How Much Is a Point of Walk Score Worth?. Redfin Corp.

Breheny, M. J. (1992). Sustainable development and urban form (Vol. 2). London: Pion.

BrightPlanet. (2013). Twitter Firehose vs. Twitter API: What's the difference and why should I care?. Retrieved 21-12-2017, from https://brightplanet.com/2013/06/twitter-firehose-vs-twitter-api-whats-the-difference-and-why-should-you-care/

Brounen, D., & Kok, N. (2011). On the economics of energy labels in the housing market. *Journal of Environmental Economics and Management*, *62*(2), 166-179.

Bryman, A. (2012). Sampling in qualitative research. Social research methods. Oxford University Press.

Centraal Bureau voor de Statistiek. (n.d.). Onderzoek Verplaatsingen in Nederland (OViN). Retrieved 14-12-2017, from https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/

Central Intelligence Agency. (2017). The World Factbook. Retrieved 23/11/2017, from https://www.cia.gov/library/publications/the-world-factbook/geos/nl.html

Chorus, C. G., Annema, J. A., Mouter, N., & van Wee, B. (2011). Modelling politicians' preferences for road pricing policies: A regret-based and utilitarian perspective. *Transport Policy*, *18*(6), 856-861.

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., & Scholl, H. J. (2012). Understanding smart cities: An integrative framework. *System Science (HICSS), 2012 45th Hawaii International Conference on* (pp. 2289-2297). IEEE.

Crivello, S. (2015). Urban policy mobilities: the case of Turin as a smart city. *European Planning Studies*, *23*(5), 909-921.

Daamen, W. & S.P. Hoogendoorn, S.P. (2010). Onderzoek passage Rijksmuseumdata. TU Delft.

Data. (2017). In: Cambridge Dictionary Online. Retrieved 29/09/2017, from http://dictionary.cambridge.org/dictionary/english/data

De Araujo, P., & Cheng, K. (2017). Do Preferences For Amenities Differ Among Home

Buyers? A Hedonic Price Approach. *Review of Urban & Regional Development Studies*, *29*(3), 165-184.
Diaz, R. B., & Mclean, V. A. (1999). Impacts of rail transit on property values. In *American Public Transit Association Rapid Transit Conference Proceedings* (pp. 1-8).
DUWO. (n.d.). KEES BROEKMANSTRAAT 101-464. Retrieved 11-2-2018, from https://www.duwo.nl/over-duwo/onze-gebouwen/overzicht-gebouwen/informatie/
Fietsersbond. (n.d.). Meldpunt. Retrieved 27-8-2018, from https://fietsersbond.verbeterdebuurt.nl/gemeente/amsterdam/
Friso, K., Rijsdijk, J., & de Graaf, S. W. (2015). Enriching the transport model of the Rotterdam region by cell phone data. *Models and Technologies for Intelligent Transportation Systems (MT-ITS), 2015 International Conference on* (pp. 237-242). IEEE.
Funda. (n.d.). Gustav Mahlerlaan 843. Retrieved 11-2-2018, from https://www.funda.nl/huur/verhuurd/amsterdam/appartement-40481722-gustav-mahlerlaan-843/
Gemeente Amsterdam (2013). Amsterdam Aantrekkelijk en Bereikbaar. Retrieved 16/11/2017, From https://www.amsterdam.nl/parkerenverkeer/openbaar_vervoer/
Gemeente Amsterdam. (2015a). Duurzaam Amsterdam. Retrieved 16/11/2017, from https://www.amsterdam.nl/bestuur-organisatie/volg-beleid/agenda-duurzaamheid/
Gemeente Amsterdam. (2015b). Uitvoeringsagenda Mobiliteit. Retrieved 17/11/2017, from https://www.amsterdam.nl/parkeren-verkeer/uitvoeringsagenda/
Gemeente Amsterdam. (2017). Amsterdam in cijfers 2017. Retrieved 12-1-2018, from https://www.ois.amsterdam.nl/assets/pdfs/2017
Gemeente Amsterdam (2017b). Stadsdelen in cijfers 2017. Retrieved 25-5-2018, from https://www.ois.amsterdam.nl/feiten-en-cijfers/stadsdelen
Gemeente Amsterdam (2018). Woningwaarde – WOZ. Retrieved 9-9-2018, from https://maps.amsterdam.nl/woningwaarde_woz/?LANG=nl
Gemeente Amsterdam. (n.d.-a). Maps Data. Retrieved 3-12-2017, from https://maps.amsterdam.nl/
Gemeente Amsterdam. (n.d.-b). Wie gaat er over het plaatsen van verkeersborden? Retrieved 12-1-2018, from https://www.amsterdam.nl/veelgevraagd/
Gemeente Amsterdam. (n.d.-c). Kwintijn, nieuwbouw. Retrieved 11-2-2018, from https://www.amsterdam.nl/projecten/kwintijn-nieuwbouw/
Gemeente Amsterdam. (n.d.-d). Asterdam Smart city. Retrieved 1-09-2018, from https://www.amsterdam.nl/wonen-leefomgeving/amsterdam-innovatie/european-capital/platforms-partners/amsterdam-smart-city/
Gonçalves, J., Gomes, M. C., Ezequiel, S., Moreira, F., & Loupa-Ramos, I. (2017). Differentiating peri-urban areas: A transdisciplinary approach towards a typology. Land Use Policy, 63, 331-341.
Hamans, H. (2016). Hallen is succesproject voor buitenlui én buurt. Retrieved 19-6-2018, from https://www.parool.nl/amsterdam/
Harms, L., Bertolini, L., & Brömmelstroet, M. T. (2016). Performance of municipal cycling policies in medium-sized cities in the Netherlands since 2000. *Transport Reviews*, *36*(1), 134-162.

Jacobson, R. (2013). 2.5 quintillion bytes of data created every day. How does CPG & Retail manage it? Retrieved 8-1-2017, from https://www.ibm.com/blogs/insights-on-business/consumer-products/

Kadaster. (n.d.-a). Mijnpalen in de geschiedenis van het Kadaster. Retrieved 13-10-2017, from https://www.kadaster.nl/

Kadaster. (n.d.-b). Wat is de BAG? Retrieved 8-1-2017, from https://www.kadaster.nl/

Khan, Z., Anjum, A., & Kiani, S. L. (2013). Cloud based big data analytics for smart future cities. *Proceedings of the 2013 IEEE/ACM 6th international conference on utility and cloud computing* (pp. 381-386). IEEE Computer Society.

Lasley, P. (2017). *The Influence of Transportation on Residential Choice: A Survey of Texas REALTORS® on Factors Affecting Housing Location Choice* (Doctoral dissertation).

Leefmilieu Brussel (n.d.). Gids Duurzame Gebouwen. Retrieved 27-10-2018, from https://www.gidsduurzamegebouwen.brussels/nl/de-gids-duurzame-gebouwen

Leinberger, C. B., & Alfonzo, M. (2012). DC: The walkup wake-up call. *The Nation's Capital As a Model for Walkable Urban Places*.

Li, W., & Joh, K. (2017). Exploring the synergistic economic benefit of enhancing neighbourhood bikeability and public transit transportation effects and needs \ based on real estate sale transactions. *Urban Studies*, *54*(15), 3480-3499.

Lynch, K. (1960). The Image of the City. *Cambridge, MA: The MIT Press.*

Martens, K. (2007). Promoting bike-and-ride: The Dutch experience. *Transportation Research Part A: Policy and Practice*, *41*(4), 326-338.

McAfee, A., Brynjolfsson, E., & Davenport, T. H. (2012). Big data: the management revolution. *Harvard business review*, *90*(10), 60-68.

Mills, A. J., Durepos, G., & Wiebe, E. (Eds.). (2010). Encyclopedia of case study research: L-Z; index (Vol. 1). Sage.

NOS (2016). Schiphol is tweede luchthaven ter wereld. Retrieved 9-4-2018, from https://nos.nl/artikel/2118255-schiphol-is-tweede-luchthaven-ter-wereld.html

Oni, A. O., Akindele, D. B., & Akinjare, O. (2014). Graph-Theoretic Approach to Resolving the Transportation effects and needs and Site Selection Issues in Planning and Development. *Mediterranean Journal of Social Sciences*, *5*(8), 11.

Pathak, R., Wyczalkowski, C. K., & Huang, X. (2017). Public transit access and the changing spatial distribution of poverty. *Regional Science and Urban Economics*, *66*, 198-212.

Q4U Bouwconsultants. (n.d.). Kwintijn te Amsterdam. Retrieved 11-2-2018, from http://www.q4u.nl/bouwconsultants/project.php?id=818

Remøy, H.T. (2010) Out of Office - A study on the cause of office vacancy and transformation as a means to cope and prevent. Dissertatie, TU Delft.

Rijksdienst voor Ondernemend Nederland. (n.d.). Energieprestatie – BENG. Retrieved 9-8-2019, from https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels-gebouwen/nieuwbouw/energieprestatie-beng

Rijksoverheid. (n.d.-a). Basisregistratie Personen (BRP). Retrieved 8-11-2017, from https://www.rijksoverheid.nl/onderwerpen/persoonsgegevens/

Rijksoverheid. (n.d.-b). Wat voor wegen zijn er in Nederland en wie is de Wegbeheerder? Retrieved 12-1-2018, from https://www.rijksoverheid.nl/onderwerpen/wegen/

Sagl, G., Resch, B., Hawelka, B., & Beinat, E. (2012). From social sensor data to

Collective human behaviour patterns: Analysing and visualising spatio-temporal dynamics in urban environments. *Proceedings of the GI-Forum* (pp. 54-63).
Salas-Olmedo, M. H., & Rojas Quezada, C. (2017). The use of public spaces in a medium-sized city: from Twitter data to mobility patterns. *Journal of Maps*, *13*(1), 40-45.
Salas-Olmedo, M. H., Wang, Y., & Alonso, A. (2017). Assessing transportation effects and needs with local coefficients for the LUTI model MARS. *Computers, Environment and Urban Systems*, *64*, 194-203.
Shi, Q., & Abdel-Aty, M. (2015). Big data applications in real-time traffic operation and safety monitoring and improvement on urban expressways. *Transportation Research Part C: Emerging Technologies*, *58*, 380-394.
Spoorwegwet 2003. (2003, April 23). Retrieved 12-1-2018, from http://wetten.overheid.nl/BWBR0015007/
Sterzer, L. (2017). Does competition in the housing market cause transport poverty? Interrelations of residential location choice and mobility. *European transport research review*, *9*(3), 45.
Suparmono, Darsono, Surungu, J. Riyanto, G. (2017). Land Transportation effects and needs : The Effects of Distance Versus Traveling Time to CBD and Facility Attributes on Residential Land Price. *International Journal of Applied Business and Economic Research, 27-39*
Ta, N. & Chai, Y. (2017). Spatial dilemma of suburban low-income residents: An analysis of behavior space among different income groups. *Dili Xuebao/ Acta Geographica Sinica, 1776-1786*
Thomas, T., & Tutert, B. (2015). Route choice behaviour in a radial structured urban network: Do people choose the orbital or the route through the city center?. *Journal of transport geography*, *48*, 85-95.
United Nations. (2014). World Urbanization Prospects. Retrieved, 22-11-2017, from https://esa.un.org/unpd/wup/publications/
Vakmedianet Bouwdata. (2018). *(Her)bouwkosten bedrijfspanden*. Johan Schot.
Van der Burg, E. (2017). Amsterdam bouwt 40.000 tot 70.000 woningen in nieuwe wijk Haven-Stad. Retrieved 23-11-2017, from https://www.amsterdam.nl/bestuur-organisatie/college/individuele-paginas/eric-van-der-burg/persberichten/
Van den Dool, P. (2012). Doorgang onder Rijksmuseum blijft open voor fietsers. Retrieved 6- 1-2017, from https://www.nrc.nl/nieuws/
Van der Horst, A. R. A., de Goede, M., de Hair-Buijssen, S., & Methorst, R. (2014). Traffic conflicts on bicycle paths: A systematic observation of behaviour from video. *Accident Analysis & Prevention*, *62*, 358-368.
Veeneman, W. (2016). Public transport governance in the Netherlands: More recent developments. *Research in Transportation Economics*, *59*, 116-122
Verheul, W.J. (2016). Embedded developments: the connection between buildings and a place. D. Broekhuizen (ed) Maison d'artiste: an unfinished De Stijl icon, pp. 99-106.
Vervoerregio Amsterdam. (2017). Wie zijn we en wat doen we? Retrieved 12-1-2018, from https://vervoerregio.nl/artikel/2017
Verwey Vastgoed. (n.d.). 900 Mahler. Retrieved 18-2-2018 from https://verweyvastgoed.nl/Project/14439/900

Vorel, J. (2014). Residential location choice modelling: a micro-simulation approach. *AUC GEOGRAPHICA*, *49*(1).

Walk Score. (n.d.) . Data Services. Retrieved 18-6-2018, from https://www.walkscore.com

Wang, X., & Yan, J. (2011). Analysis on public transportation influences on real estate development in East Lansing. *Geo-spatial Information Science*, *14*(1), 73-78.

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., Bouwman, J. 't Hoen, P., Hooft, R., Kuhn, T., Kok, R., Kok, J., Lusher, S., Martone, M., Mons, A., Mons, B. Packer, A., Persson, B., Rocca-Serra, P., Roos, M., Van Schaik, R., Sansone, S., Schultes, E., Sengstag, T., Slater, T., Strawn, G., Swertz, M., Thompson, M., Van der Lei, J., Van Mulligen, E., Velterop, J., Waagmeester, A., Wittenburg, P., Wolstencroft, K. & Zhao, J. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data*, *3*, 160018.

Winch, G. M. (2010). *Managing construction projects*. John Wiley & Sons.

Yin, R. (1994). Case study research: Design and methods . Beverly Hills.

Zondag, B., & Pieters, M. (2005). Influence of transportation effects and needs on Residential Location choice. *Transportation Research Record: Journal of the Transportation Research Board*, (1902), 63-70.

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Appendix

Appendix A: Interview Ger Baron, Municipality of Amsterdam

This interview is conducted with Ger Baron, Chief Technology Officer at the Municipality of Amsterdam
This interview is an explorative introduction into the research analysing transportation with BOLD
The interview is conducted in the Dutch language
The interview is conducted on 15-01-2018
The introduction and the concluding part of the interview are not recorded

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Interviewee: Ger Baron, Chief Technology Officer, Municipality of Amsterdam

Interviewer: Eva De Biase, Master student, Technical University Delft

Survey Section Used:

A: Mobiliteitsagenda's
B: Nieuwe ontwikkelingen
C: Samenwerkingsverbanden
D: Aanpassingsmogelijkheden
E: Openbare data
F: Schaalgrootte
G: Andere analyse technieken
H: Fouten en voorspellingen
I: Politiek

Introduction (not recorded)

Als u het goed vindt zou ik graag notities willen maken tijdens dit interview en zou ik graag het interview willen opnemen zodat ik deze kan transcriberen en gebruiken voor mijn Master scriptie. Bedankt voor uw toestemming om deel te nemen aan dit interview.

Na aanleiding van uw presentatie bij de big data dag in Amsterdam leek het mij een goed idee om dit interview bij u af te leggen. Zoals u in uw presentatie heeft uitgelegd werkt u veel met big data in Amsterdam, en staat het onderwerp transport hoog op de agenda. Via de e-mail heb ik al kort het onderwerp van mijn scriptie uitgelegd, dit kan ik kort herhalen. Hierna start ik de opname en het interview.

_____

A: Mobiliteitsagenda's

Eva De Biase: Ik ben begonnen vanuit de agenda's van de gemeente Amsterdam. En daarbij is gelijk de eerste vraag of er een punt het belangrijkst is, want er staan super veel punten in. En letten jullie dan ergens het meest op?

Ger Baron: De mobiliteits-agenda, nou eigenlijk ja en nee. Nee want het is bijvoorbeeld heel moeilijk om kwaliteit met tijdsverlies naar je werk te vergelijken. Het is gek om het ene belangrijker te vinden dan het ander, maar ik denk dat *luchtkwaliteit* absoluut een vrij hoge prioriteit heeft. En het tweede is toch wel in bredere zin de *bereikbaarheid*. Als je alleen al kijkt naar de Zuid-as dan gaan het aantal auto's in de komende 10 – 15 jaar omhoog met 300.000 als we niet iets doen. Dus er is een soort van urgentie dat we daar iets in moeten doen. Dus *groei* eigenlijk van de groei. En het laatste is eigenlijk alles wat met *voetgangers* te maken heeft en met dat het te druk is in de binnenstad.

Eva De Biase: Maar het is dan per plek anders wat de prioriteit heeft?

Ger Baron: Ja, het heeft dan te maken met generieke dingen. Als je naar plekken gaat kijken, de Sluisbuurt heeft nu een soort prioriteit gekregen. Het stukje bij Noord, bij de Shell kantoren, hoe heet dat.

Eva De Biase: B'mine?

Ger Baron: B'mine precies. Daar komen nog twee torens dus een enorme hoeveelheid verkeer. En daar is een pondje en een weggetje.

Eva De Biase: Ja dus oplossingen bieden voor de bereikbaarheid?

Ger Baron: Ja, best lastig. En het is luchtkwaliteit met name in de westerlijke stad, dus bij de Overtoom, de Spardammerweg, dus dat stuk eigenlijk. Dan zie je dat dat per gebied verschilt.

B: Nieuwe ontwikkelingen

Eva De Biase: Ja, oke en wordt er dan bij nieuwe projecten naar mobiliteit gekeken? Dus ook vanuit jullie team dat er naar mobiliteit wordt gekeken.

Ger Baron: Nou wij doen eigenlijk alleen de vernieuwing en innovatie. Dus samen met mobiliteit kijken wij naar elk gebied. Dus naar elk gebied kijken we specifiek.

Eva De Biase: Ja, dus ook bij de nieuwe gebieden?

Ger Baron: Ja, dus als je kijkt naar plan 2025, dus de plaatsen waar we gaan bouwen de komende tijd, dan zit daar ook een onderlegger met mobiliteit onder. De grote uitdaging is een beetje we in de tabellen met de *klassieke mobiliteit*, wat we altijd al deden, daar zit *multi-mobiliteit en mobiliteit & services zit daar niet in*. Zit ook niet in de modellen. Het andere probleem is dat planners en stedenbouwkundigen nog altijd denken dat er een hek staat om een gebied. Er *gaan natuurlijk ook mensen doorheen vanuit andere gebieden*. Dus er gaan elke dag mensen in en uit maar er komen ook mensen uit Purmerend die naar Leiden gaan dus er moeten ook mensen doorheen. En zelfs die de binnenstad in en uit gaan en dat zit vaak niet in het model. Dat is best wel ingewikkeld.

Eva De Biase: Oké, en hoe wordt dat dan geanalyseerd van te voren?

Ger Baron: Ja nou op basis van op standaard verwerking, op basis van *profielen van mensen, gemiddelde reistijd voor werk.*

Eva De Biase: Dus inschatten hoeveel mensen er zullen komen en doe die zich gaan bewegen?

Ger Baron: En er zijn modellen voor. En er zijn verplichte modellen die we moeten gebruiken van Rijkswaterstaat om berekeningen te maken. Als je een wijk bouwt moet je ook uitrekenen van de Rijksoverheid wat de mobiliteitsimpact is. Dus hoeft niet bij 8 huizen, weet niet precies de grens maar als je een hele wijk bouwt is dat wel zo. Aan de ene kant. En aan de andere kant zit daar ook in dat we eigenlijk ook beter dat zelf ook willen weten omdat er ook binnenstedelijke mobiliteit is. En hoeveel fietsers en voetgangers komen daar nog bij. *Fietsers en voetgangers files* bestaan ook gewoon tegenwoordig dus. En de druk op de OV komt er ook nog eens een keer bij. Dus dat is best wel een dingetje.

Eva De Biase: Ja, ik heb nu als scope gebouwen met minimaal 100 nieuwe woningen. En is er ook achteraf, als iets er al staat een ontwikkeling. Wordt dan nog gecheckt van hebben we het wel goed gedaan?

Ger Baron: Ja, ik vind dat nog *te weinig gestructureerd*. Als het mis gaat roepen we al snel dat het niet mis gaat. Er zijn wel mensen nodig die dat monitoren en evalueren.

Eva: Oké, en als jullie dat zouden willen doorvoeren hoe zou dat dan in zijn werking gaan?

Ger Baron: *TNO* heeft een *urban strategy* model gemaakt waarin we eigenlijk gewoon gebouwen in kunnen proppen en dan zien we water er gebeurd. Ja de vraag is of het klopt. Ik bedoel en locatie dat is vol met aannamen. En je kunt nog als een verschil hebben in cafeetjes of ze wel vol zitten elke dag. Of er wel iemand is, dat maakt nogal uit, maar daarin kunnen wij vrij goed in modeleren. Of, het gaat steeds beter eigenlijk. Dat zijn wel interessante dingen om naar te kijken.

C: Samenwerkingsverbanden

Eva De Biase: TNO noemde je al. Wordt er dan vooral met private partijen samengewerkt?

Ger Baron: In termen van onderzoek doen en analyseren. Nou ja kijk wat we veel doen is van TNO en van de NS, veel praten ja. Maar de *data krijgen we gewoon van TomTom of van Google*.

Eva De Biase: En zij analyseren dan die data of jullie kopen die data.

Ger Baron: Dat doen we vaak zelf. Kijk die Google data kunnen we niet zo veel mee want dat is hele *rauwe data* eigenlijk. Dus dat doen we vaak met de TU Delft bijvoorbeeld. TomTom is vaak bruikbaarder voor ons.

Eva De Biase: Ja dan zie je een route die afgelegd wordt?

Ger Baron: Ja, dat zie je bij Google ook.

Eva De Biase: Ja precies. En ook klachten, ik heb bijvoorbeeld de fietsersbond meldpunt gezien of Twitter bijvoorbeeld. Wordt daar ook echt naar gekeken? En komt dat dan ook bij u terecht? In grote lijnen dan.

Ger Baron: Social media, nou, nee, nou ja zeker daar kijken we wel echt naar. En we zorgen dat dat ge-channelled wordt naar de mensen die daar verantwoordelijk voor zijn. Dus *we kijken er niet zelf naar*.

Eva De Biase: En een Airbnb of een Uber wordt daar dan ook mee samengewerkt?

Ger Baron: Ja zeker, ja.

Eva De Biase: Dus er wordt gewerkt met heel veel partijen?

Ger Baron: We werken met heel veel partijen samen. *Mastercard* bijvoorbeeld ook op basis van economie. Uber bijvoorbeeld wat minder, dat heeft meer te maken met dat we ook af en toe wat ruzie met ze hebben en eigenlijk niet teveel met ze willen samenwerken. Tot ze zich aan de regels gaan houden. En we vertrouwen hun eigenlijk ook niet zo met hun data gek genoeg. Want blijkt dat Uber ook eens *met zijn data gefraudeerd heeft*.

Eva De Biase: Daar wil je je handen niet aan vuil maken?

Ger Baron: Nee dat vinden wij nogal ingewikkeld. *Airbnb* werken we dan wel mee samen maar nog wel te weinig. Maar wel meer, ja. Maar denk ook aan *KPN, Vodafone, Mastercard, GVB, NS*.

Eva De Biase: Ja, iedereen die nuttige data heeft?

Ger Baron: Ja die data die noodzakelijk is.

Eva De Biase: Oké, even kijken wat ik nog wilde vragen. Worden er ook nog onderzoeken uitbesteed? Of proberen jullie het altijd zelf te doen?

Ger Baron: Ja kijk, nou zeker, we werken met allerlei onderzoeksbureaus samen. Je moet je voorstellen zo'n havenstad ontwikkeling dat is… Maar NS doet heel veel onderzoek voor ons. Ik vind het allerleukst dat er voor het eerst ook echt naar fietsers en voetgangers wordt gekeken. Ondergeschoven kindje geweest altijd, we hadden het natuurlijk altijd over auto's. Maar hoe je je met de fiets door de stad beweegt dat wisten wij eigenlijk niet, of lopend. Ja, hoe gaat iemand van de Nieuw Markt naar de Hallen. Gewoon geen idee. Kijk we kunnen het wel verzinnen maar dat is natuurlijk best wel ingewikkeld met al die…

Eva De Biase: Ja, kan natuurlijk op allerlei manieren.

Ger Baron: Ja precies, maar wat preferred en wat niet, ja daar doen we nu voor het eerst onderzoek naar dat vind ik heel leuk. En ja we werken natuurlijk met Hans Koning en Arcadis en bij ontwikkelen van hoe ga je met je voorzieningen om.

Eva De Biase: En zo'n onderzoek is dat dan via mensen hun Apps met navigatie? Of hoe gaat dat?

Ger Baron: Nee dan gebruiken we echt wel gewoon data van, ja weet niet of we dat afgelopen jaar hebben gedaan met handmatig tellen maar, in de praktijk doen we dat met camera's met software zodat het *telcamera's* worden. Of lussen in de weg. Maar ook data van TomTom's of de Google's. Kenteken registratie doen we heel veel om de auto's te kunnen volgen ook. Mooi voorbeeld is, ik ga er vanuit dat je een beetje bekend bent in Amsterdam?

Eva De Biase: Ja, wat je tot nu toe hebt genoemd ken ik wel.

Ger Baron: Ja bijvoorbeeld Muntplein bij de Munttoren is nu afgezet bij de Amstel, dus alleen fietsen kunnen er nog langs. Want we hebben dus even kentekens gevolgd en gekeken van hoeveel bestemmingsverkeer is er nu eigenlijk en hoeveel auto's rijden er langs en 98% reed er gewoon langs en was geen bestemmingsverkeer. Dus op die manier proberen we steeds te kijken naar plekken waar, ja Zuid As is volgens mij ook maar 30% bestemmingsverkeer of 30% niet weer de quote niet, dat zou ik moeten opzoeken maar ja daardoor, ja als ze dat op de schop gaan nemen, als ze dat gaan onder-tunnelen, of nou net niet onder-tunnelen, dat vinden Nederlanders dan een compromis, als de die bak-rand gaan maken dan, ja die 70% die er niet hoort die wil je er eigenlijk ook niet hebben dus ja die kunnen gewoon over de A9 of de A10 of whatever.

Eva De Biase: Ja precies, in plaats van een hele bak voor ze te maken?

Ger Baron: Ja die moeten er gewoon helemaal niet zijn. Ja kijk sommige hebben niet echt de keuze om op een andere manier te gaan dan met de auto, ja ik bedoel je kunt leuk roepen dat er openbaar vervoer is maar als je echt in de provincie woont dan anderhalf uur met de bus 's ochtend dat wil niemand. Gaat gewoon niet gebeuren. Dus op die manier proberen we er de hele tijd naar te kijken.

D: Aanpassingsmogelijkheden

Eva De Biase: En hoe gemakkelijk zou het zijn om aanpassingen te maken?

Ger Baron: Kijk we moeten er steeds meer heen, kijk de grap is, we moeten steeds *adaptiever met verkeer omgaan*. Dus continu meten en continu aanpassen etc. Aan de andere kant zien we dat een brug bouwen 15 jaar kost. Dan zie je dat een weg opbreken ook twee jaar van te voren gepland wordt. Een gekke wereld eigenlijk als je vanuit Software land komt zoals ik, waarin je eigenlijk continu updates wil doen en uittesten.

Eva De Biase: Ja, en dat kan eigenlijk niet?

Ger Baron: Nou uiteindelijk kan dat wel denk ik, maar nu nog niet. Dus het is wel *process innovatie* in dat opzicht. Waarom kunnen we niet even een weg afsluiten? Dan moet je naar de gemeente raad en vergunningen aanvragen etc.

Eva De Biase: Ja, dat zou allemaal minder lang moeten duren?

Ger Baron: Ja, dat kost tonnen en weken. En het slaat nergens op je wil gewoon een spoed reparatie en even kijken wat er gebeurd en dan merk je dat we daar eigenlijk veel meer heen willen. En dan kun je ook naar *dynamische verkeersmodellen* gaan. En aan de andere kant is dat wij nog maar een beperkt deel van de navigatie doen nog tegenwoordig. Dus dat de TomTom's en de Google's enorm veel impact hebben over waar mensen langs rijden. Misschien wel meer dan wij. Als er op een bord staat naar recht 0,6 de Baarsjes, en je moet naar de Baarsjes maar je TomTom zegt rechtdoor, dan ga je rechtdoor via Bos en Lommer, dan ga je geen borden meer volgen.

Eva De Biase: Dus daar hebben jullie geen invloed meer op?

Ger Baron: Ja, minder en minder, dus we proberen heel erg om *met dat soort partijen afspraken te maken*. Van goh, joh, houd nou rekening met het schooltje, of houd nou rekening met de luchtkwaliteit. Volg toch onze routes af en toe want wij hebben er werkelijk over nagedacht en daarvan wordt de luchtkwaliteit echt beter.

Eva De Biase: Dus een goede samenwerking met die partijen is nodig?

Ger Baron: Ja, het was even zoeken, maar steeds meer en meer. En dat is nu nog vrij statisch. Van hier staat een schooltje denk aan de luchtkwaliteit. Maar willen dat eigenlijk veel *dynamischer* maken. Dus *vandaag of morgen met dit weer, doe dit niet doe dit wel*. En daar zijn we heel erg in bezig.

Eva De Biase: Zijn er ook pilots waarin dit al wordt toegepast?

Ger Baron: Ja, ja

E: Openbare data

Eva De Biase: Welke data is openbaar?

Ger Baron: Dat staat op de website. Gegevens als waar zijn de parkeerplaatsen, een hele lijst.

Eva De Biase: En zijn er dan ook dingen die echt niet openbaar zijn?

Ger Baron: Kentekens en persoonsgegevens natuurlijk. En in principe proberen we het meer en meer te delen. In samenwerkingsverband delen we veel meer. Daar kun je natuurlijk om vragen maar heel veel dingen kunnen je er wel op plotten, dan heb je wel heel veel data maar dan heb je er niet zo veel aan. En de samen werking met Google, met TomTom, gewoon elke partij die een samenwerking met ons wil, dan kunnen we natuurlijk nog veel meer data op onze site zetten. En dan is het dat *de data die we van commerciële partijen krijgen vaak wel niet voor publieke doeleinden gebruikt mag worden*. Voor onderzoek gaat dat nog wel goed, maar dat mag niet voor commerciële doeleinden gebruiken.

F: Schaalgrootte

Eva De Biase: Op een kleine schaal, hoe kan je dan de ambities echt doorvoeren? Bijvoorbeeld het omlaag brengen van CO2 uitstoot, dat is echt voor een stad als geheel zou je denken.

Ger Baron: Ja en een heel groot deel komt gewoon binnen waaien, uit bijvoorbeeld Londen. Aan de andere kant, die 20 – 25% die je er gewoon extra op plopt, dat is een verschil dat je echt merkt. En daar doen we heel veel modelleren voor. Het urban strategy model bijvoorbeeld, we *meten op allerlei plekken in de stad*. Dus dat gaat eigenlijk vrij goed ja. En daar proberen we de verkeersstromen op aan te passen. Niet alleen maar incidenteel maar vooral structureel. Sommige delen proberen we dan gewoon *minder aantrekkelijk te maken*.

Eva De Biase: En dat doen jullie dan ook met evenementen en dat soort dingen?

Ger Baron: Zeker, zeker. Nog te weinig dynamisch maar het is wel zeker de bedoeling ja.

Eva De Biase: Oké, dus dat gaat nog komen?

Ger Baron: Het is een *experiment*, ja.

Eva De Biase: Oké. Ik gebruik dus die gebouwen om een locatie te hebben om te onderzoeken. En er is nogal een verschil in de gebruiker van die gebouwen. Een student tot van alles, middenklasse, yuppen etc. Heeft de gemeente zelf ook zo een insteek? Doet die zelf zoiets? Dus echt op gebouw niveau?

Ger Baron: Ja, het leuke is, wat ik er zo leuk aan vind is dat het zo werkt. Kijk die doorberekening doen we wel, maar gewoon interviews met mensen bijvoorbeeld. Van goh kijk waarom kies je voor deze mobiliteit, vaak maar amper. We voorspellen het van te voren, maar daarna laten we het wel weer een beetje lopen denk ik. Tenzij het helemaal fout gaat maar dan doen we nog steeds niet van hé vertel een hoe en wat. Dus het *kwalitatieve deel doen we denk ik niet*. We zitten heel erg aan de data kant. Het sociale deel, net noemde je hem al, misschien niet helemaal Delft eigen, maar de sociale kant van waarom kiezen mensen voor wat ze doen. Dat niet.

Eva De Biase: Ja, ik heb nu dus een hoofdstuk geschreven over of je mensen kan beïnvloeden. En daar vind je eigenlijk nog redelijk weinig over. De een zegt, ja je kunt een beetje promoten, of je kunt parkeren duurder maken. Dit zijn kleine dingen en die worden niet echt doorgevoerd. Maar dat zijn natuurlijk ook de klachten die mensen kunnen hebben.

Ger Baron: Ja, kijk *gebieden waar een heel specifiek probleem is daar gaat het eigenlijk best goed*. Iedereen heeft het over de A1 en de Ziggo Dome en de Music Hall, en dat gaat eigenlijk best goed. Ja als je pech hebt sta je 10 minuten stil. Dat snapt iedereen zeg maar. En dat is niet zo erg. Maar het zit veel meer in bijvoorbeeld de Overtoom die staat altijd vast, weet je, is een drama elke dag. In de binnen ring, ja binnen ring staat natuurlijk altijd vast. Maar omdat het ook wel vrij maziger wordt ergens. Op de gracht is het altijd leeg. Grappige is dat, hebt een probleem, maar nu met *de verdichting, dat is nog eigenlijk de grootste opgave*. Er komen 70.000 nog binnen de ring bij. Op zich geen gekkenhuis, in Parijs is het natuurlijk nog veel dichter en Londen is veel dichter, maar goed smalle straatjes in Amsterdam he, wij zijn niet helemaal op de auto's ingericht. Dus dat wordt nog wel de grootste uitdaging. En de een zegt je moet per gebied kijken maar eigenlijk binnen de ring, dat je ook even iets verder kijkt. Die auto's, ja je kunt wel naar Overhoeks kijken met die B'mine Toren maar goed die vierkante 100 meter, ja God, dat is een ding,/ maar die *auto's moeten allemaal de wijk door* naar boven, die moeten allemaal naar de S100 of waar ze ergens heen moeten. Als je naar Den Haag wil dan moet je toch wel een tunnel door ofwel de ring op. Ja dan moet je echt de halve wijk door. *En welke schaal ga je nou naar kijken. Ja, dat is best wel ingewikkeld*. Want die modellen houden vaak op, ja of bij de ring of ja die houden ergens op. Terwijl *je hebt impact tot en met Den Haag*.

Eva De Biase: Denk je dat dat dan wel in de toekomst lukt? Dat de hele stad daarin komt?

Ger Baron: Ja, die modellen worden steeds geavanceerder. Ja tuurlijk, maar daar is enorm veel computing voor nodig. Maar ik denk dat dat we het model is waar je naar zou moeten kijken.

Eva De Biase: En dan kan je daarmee ook op kleinere schaal in de stad oplossingen vinden denkt u? Want een straat afzetten kan, maar er zijn nou eenmaal heel veel auto's en er zijn nou eenmaal kleine straatjes, dus is er dan eigenlijk wel echt een oplossing?

Ger Baron: Ja, ja, zeker ja dat is de vraag. Dus misschien dat er dus ook gewoon niet en *dan is de oplossing dus geen auto's maar voetgangers, fietsers, openbaar vervoer*.

Eva De Biase: Ja en dan alleen rijden rondom de stad?

Ger Baron: Ja precies, en daarom geloven wij ook heel erg in denken aan *mobility als een service*. Ook al hebben mensen eigen voertuigen, maar denken dat je A een multi-model, en dat je moet overstappen en dat dat zo makkelijk mogelijk gemaakt moet worden. Kijk overstappen is gewoon heel kut altijd. Ja, kijk als je van Zandvoort hierheen moet met de bus, of ov, ja.

Eva De Biase: Ja altijd.

Ger Baron: Ja, kijk dat vind niemand leuk eigenlijk. Terwijl je eigenlijk gewoon ergens in zou moeten kunnen rijden en dan schuift het je auto bij wijze van weer in een ander karretje en dan gaat het weer verder, nobody cares. Maar dat is gewoon de hassle dat je eerst moet overstappen, dat je moet lopen, en wachten, en denken.

G: Andere analyse technieken

Eva De Biase: Zijn er ook dingen waarbij je denkt hierbij is Big data helemaal niet de oplossing? Dat bijvoorbeeld een Survey een betere methode is. Ik heb bijvoorbeeld iets gezien als Onderzoek Verplaatsing Nederland dat een paar keer wordt genoemd in agenda's. Dus survey onderzoeken worden nog wel echt gedaan.

Ger Baron: Ja, wat we wel doen, als je kijkt naar de luchtkwaliteit, bij de Eza bijvoorbeeld die satellieten gebruiken om te zien wat de luchtkwaliteit is. En dat werkt eigenlijk best aardig want dat kun je zien tot op de 100 meter kun je dat toespitsen tegenwoordig. Nou het is best aardig om daar je modellen mee te fuel-en als je daar een paar lokale dingen hebt. Waar je het echt 100% goed en nauwkeurig meet. Dan kun je dat soort ruwe data best goed gebruiken voor je modeleringen en daarmee voor je stad. Dus meer en meer verschillende soorten data bronnen van satellieten tot kastjes tot etc. Maar *daar direct op handelen dat is nog echt wel ingewikkeld*. Want je wil eigenlijk wegen afzetten af en toe.

Eva De Biase: Ja dat is dus eigenlijk de enige oplossing als de luchtkwaliteit niet goed is?

Ger Baron: Zo simpel is het wel. En je zit natuurlijk met elektrische auto's nog. Het klinkt wel heel chique maar een Tesla maakt meer particles dan een gewone auto. Omdat die banden met die rem schijven dat is dramatisch hoeveel fijnstof daaruit komt.

Eva De Biase: Oké, dat wist ik niet.

Ger Baron: Ja, dat is wel een leuk wist-je-datje, maar ja het klinkt heel leuk maar ondertussen is het erger voor je dan wat dan ook. Wat we bijvoorbeeld wel gedaan hebben. Die data die je net noemde. Is dat we nu ook een App, of een applicatie gemaakt hebben. *We kunnen voorspellen hoe druk het gaat worden*. Dus weer is de grootste variabele. We gebruiken al die gegevens, ook voor morgen en de dag daarna zodat we ook proactief zeg maar met de management van verkeer en de drukte in de stad kunnen gaan handelen. Niet meer van goh is het druk? Jeetje wat druk. Maar hé morgen wordt het om 3 uur zo druk. *Op basis van weer, boekingen van hotels, openbaar vervoer informatie, evenementen* dat soort dingen.

Eva De Biase: En alles komt samen in die applicatie?

Ger Baron: Ja, dat is een enorme data acquisitie die *best lastig is nog om dat perfect te krijgen*, maar daar maken wij goede stappen in.

Eva De Biase: Oké, en daar zit dan een heel groot team?

Ger Baron: Nee een team van developers, een man of 15 die daar mee bezig is. En die werken samen met de afdeling die daar iets mee moet. Dus *de schoonmakers, de handhavers*.

H: Fouten en voorspellingen

Eva De Biase: Heeft u een voorbeeld dat verandering achteraf echt nodig was? Of iets dat heel verkeerd is ingeschat. Of juist iets dat heel goed is gegaan.

Ger Baron: Goede vraag, ja, we hebben een aantal P+R voorzieningen aangelegd die niet zo goed werkte. Bijvoorbeeld, waarom in Rotterdam wel en hier niet, weet je. Is dat een verkeerde plek waar we dat hebben gedaan? Verkeerde marketing misschien? Ik weet het allemaal niet. En anders dan in West met het food centre wat er zit hebben we wel een paar heel onhandige routes bedacht waarbij we zijn vergeten dat taxi's dat moeten rijden elke dag. Dat is toch vrij specifiek verkeer. En ja, een hele lijst, ik bedoel, in Sloterdijk zijn we vergeten trottoirs aan te leggen bijvoorbeeld, dat werkt ook niet echt voor voetgangersstromen. En we doen nu een hele reeks experimenten, ken je ons mobility programma, ik zal het even naar je sturen, daar zit gewoon een hele reeks experimenten in.

Eva De Biase: Ja denk het wel, denk dat ik dat wel voorbij heb zien komen. Ik heb wel over een paar pilots gelezen.

Ger Baron: Ja, bijvoorbeeld we hebben het gedaan met €1000,- per maand, mensen die hun auto mochten laten staan op de Zuid As, en dan voor €1000,- per maand een mobility budget krijgen om eerste klas te reizen en dat soort dingen. Nou is dat een succes, nou denk het niet, iedereen is weer in de auto gestapt de volgende dag zeg maar dus voor veel mensen is dat een grote stap. En voor ons is dat wel weer geleerd dat blijkbaar is de drempel te hoog voor mensen om toch dit te gaan doen. Je kon auto's huren van dat geld en fietsen, gewoon alles, en dan toch liever de auto.

Eva De Biase: En wat is dan volgens u de belangrijkste reden dat mensen toch kiezen voor bepaalde vormen van transport? Is dat het snelst, het makkelijkst? In Amsterdam dan. Wat mensen het liefst willen. Fietsen, lopen, met de auto.

Ger Baron: Kijk, op papier zeggen mensen toch altijd dat ze graag willen fietsen. Maar bij rot weer zoals vandaag zeg maar dan werkt het niet zo dus dat is best wel heel lastig om dit echt helder te krijgen. Wat je ziet is dat we wel elk jaar dit soort onderzoek doen. Heel wijk gericht, dus als er iets veranderd in de wijk. Van Joh wat is de behoefte en etc. Nou als je een meter voor de deur hebt dan is dat een heel handig alternatief voor mensen. Maar heel veel andere mensen die roepen dan wel fietsen maar als het slecht weer is dan doen ze het toch niet. En dat is het meestal niet eigenlijk. Als het maar niet regent.

I: Politiek

Eva De Biase: En politiek gezien, veranderen de ambities om de vier jaar dan geheel?

Ger Baron: Nee, dat valt op zich wel mee. Kijk in Amsterdam geldt, we proberen het steeds meer data-driven te doen. Dus je kunt zeggen, goh, het staat gewoon vol. Ja, roept u maar. Dat helpt wel enorm. Onze wethouder is nu een VVD wethouder, dus die is op zich pro auto, punt coma, ik bedoel we zijn niet dat de stad ramp vol staat en vies wordt. Ondernemers verdienen eigenlijk wel meer geld als je wel voor de deur kan parkeren maar niet de hele dag, en weet je gaat ook om in en uit rijden en logistiek dus er zit wel dus er zit wel redelijk… maar met een hele hoop vraagstukken zijn wij het wel eens. De vraag is hoe snel de binnenstad auto vrij wordt of auto luw. Waar de discussie in zit is *moeten we belasting gaan hebben op alle geparkeerde auto's of op alle rijdende auto's*. Terwijl rijdende auto's gebruiken zo'n 140 vierkante meter. Dus als je het hebt over ruimte gebrek moet je dan niet ook de rijdende auto belasten.

Eva De Biase: Hoe werken verschillende afdelingen binnen de gemeente samen?

Ger Baron: Ja, wel grappig dat je dat zegt, wij zitten er natuurlijk precies tussen in dus leuk om te zien. En mobiliteit is natuurlijk enerzijds de euro die voor mobiliteit wordt uitgetrokken maar uiteindelijk gaat het natuurlijk ook om wonen en gebiedsontwikkeling, en economie en ook om veiligheid, duurzaamheid en milieu en dat soort dingen. Dus *nou matig zou ik zeggen*, ik bedoel de gebiedsontwikkeling van 2025, dan hadden we soms wel van hé, heeft iemand nog wel een mobiliteitsdoorrekening gemaakt hiervoor. Dus laten we nou gewoon modellen hiervoor maken zodat gebiedsontwikkelaars hier zelf gewoon mee bezig kunnen.

Eva De Biase: Hier heb ik een klein opzetje gemaakt. Je ziet je hebt registration data, social data en sensor data. Hoe verdelen jullie je data?

Ger Baron: Ja het leuke is ook je ziet social data. Ken je social glass? Ja, daar zitten hele leuke dingen in. Grappig, we hebben net twee mensen aangenomen die zich gaan bezighouden met data en mobiliteit. Voorheen deed de afdeling verkeersmanagement verkeer, de afdeling communicatie doet social, lucht kwaliteit met lucht kwaliteit, en de GGD had ook gewoon een ander luchtkwaliteitsmodel, want voor een deel moet je dat toch moduleren, dan de verkeersafdeling. En ze zijn nu eindelijk voor het eerst aan het samenvoegen eigenlijk zeg maar. Mijn stelling is bijvoorbeeld dat files eigenlijk niet erg zijn. Als de auto's maar geen uitstoot hebben en mensen het maar niet vervelend vinden. Als mensen het niet erg vinden om in de file te staan. Sterker nog, voor veel mensen is het een soort ontspanningsmoment. Ik denk dat we dus veel meer op social moeten meten, *hoe voelen mensen zich* in de tram, in de trein, op de fiets. En als je dat weet dan kan je ook kijken wat vinden ze nou fijn. Dat is relevanter dan kijken is er file in de veronderstelling dat mensen niet in de file willen staan.

Eva De Biase: En die applicatie waar je het eerder over had kunnen dit soort dingen daar dan ook in worden verwerkt?

Ger Baron: Bij social is het heel lastig want meestal zit er geen geo tag aan. Bij een ongeluk heb je 500 tweets over de A6 maar anders niet. Bovendien mag je eigenlijk niet tweeten, instagrammen of facebook'en in de auto. Dus dat is best ingewikkeld. Maar we proberen wel steeds meer naar moods te kijken eigenlijk en met name vanuit mobility services. Van de NS krijgen we die data bijvoorbeeld niet, ze vinden zichzelf een marktpartij natuurlijk. Dus die vinden het concurrentie gevoelige informatie.

Important findings

The most important issues in the mobility agendas are how to deal with growth and accessibility in terms of car use and more importantly walkability in the city centre. It is the first time that pedestrians and cyclist are in a mobility model. There are certain problem areas, due to the amount of car use, that have a priority. Mobility should be analysed on multiple levels, types of transport, multiple scales. A mobility impact analysis obligated by Rijkswaterstaat, on the basis of profiles of people and travel time to work., but the analysis after completion is not well structured. The Urban Strategy model TNO is useful, but not certain is it is accurate due to the many assumptions in the model. Data from data providers like TomTom, Google, MasterCard, KPN, Vodafone, GVB, NS is useful. Sometimes, like Google data, the data is to raw for the municipality to work with. NS keeps their data private. Uber and Airbnb are not trustworthy enough. A lot of data is not public due to privacy issues and the fact that the data owners do not want others to use their data for commercial reasons. Social data is difficult to use because there is not always a geo tag on social data. Counting the amount of people is done with camera's (sensor data). It is important to check whether there is traffic in a location because it is a destination or merely because people are passing through this location. A detour could be an option for the second group if the area is to crowded. It is currently still difficult to be adaptive when dealing with transport. Models should be dynamic but rules in the process of making changes (such as the need for permits) make it difficult to act fast. Due to for example TomTom people always take the fastest route, which is not necessarily the best route for the city. Think of many cars passing a school.

The municipality does not work with the qualitive side of the analysis, they do not do any interviews. And does not check afterwards if their decisions where correct. Only when their decision where terribly wrong changes are made afterwards. It is difficult to put the impact on a larger scale in a model. It is also helpful to check models on different times of the day on the basis of the weather, hotel bookings, public transport information, events etc. to predict how busy it will be. In politics, parties want the same things. The only question is who pays.

Appendix B: Interview Kasper Hesp, G&S vastgoed

This interview is conducted with Kasper Hesp Project developer at G&S Vastgoed
The interview is conducted in the Dutch language
The interview is conducted on 20-08-2018
The introduction and the concluding part of the interview are not recorded

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Interviewee: Kasper Hesp, Development manager, G&S Vastgoed
Interviewer: Eva De Biase, Master student Technical University Delft
Survey Section Used:

- A: Bedrijfsperspectief
- B: Transport
- C: Locatie
- D: Data
- E:900 Mahler
- F: Overig

Introduction (not recorded)

Als u het goed vindt zou ik graag notities willen maken tijdens dit interview en zou ik graag het interview willen opnemen zodat ik deze kan transcriberen en gebruiken voor mijn Master scriptie. Bedankt voor uw toestemming om deel te nemen aan dit interview. Het interview bestaat uit open vragen en ik stuur niet op bepaalde antwoorden en hoor graag uw eerlijke mening. Via de e-mail heb ik al kort het onderwerp van mijn scriptie uitgelegd, dit kan ik kort herhalen. Hierna start ik de opname en het interview.

A: Bedrijfsperspectief

Eva De Biase: Hoe groot is het bedrijf G&S vastgoed? In de vorm van hoeveelheid werknemers.

Kasper Hesp: We zijn met ongeveer 25 mensen. Variërend van directie tot ontwikkelmanagers tot ondersteunend personeel. Alles bij elkaar.

Eva De Biase: Kunt u de grootte van uw bedrijf omschrijven in hoeveelheid grootte van de ontwikkelingen die per jaar worden gedaan?

Kasper Hesp: G&S kenmerkt zich eigenlijk door veelal complexe en grote projecten.

Eva De Biase: Met een lange looptijd?

Kasper Hesp: Ja, met een lange looptijd, ja in ontwikkeling wat is een lange looptijd, komt vaker voor natuurlijk ook al heb je kleinere projecten, maar over het algemeen zit je toch wel aan een looptijd van ongeveer vijf jaar. En die projecten die onderscheiden zich op allerlei manieren in functie. Dus wij ontwikkelen van oudsher voornamelijk kantoor gebouwen. Laatste paar jaren zijn dat ook woongebouwen geworden of mixed use gebouwen steeds meer en zelfs transformatie dus wij hebben onze blik ook enigszins verbreedt. Omdat we het leuk vinden maar ook deels uit noodzaak.

Eva De Biase: Ook omdat er veel hier in de buurt wordt gebouwd dat er meer woningbouw bij is gekomen?

Kasper Hesp: Ja dat ook natuurlijk dit is een beetje onze achtertuin, maar ook omdat er niet zo veel ruimte meer is voor monofunctionele gebouwen, van kantoorgebouwen. Dus je bent min of meer genoodzaakt om op een andere manier na te denken over ontwikkelen dus vaak ik gecombineerde projecten. Dus dat je woningbouw combineert met kantoor gebouwen of andere functies of naar transformatie projecten gaat kijken. En dat hebben wij ook gedaan de laatste paar jaar. En dan doe je als een bedrijf als G&S zijnde niet heel veel projecten maar wel een aantal zeer complexe projecten.

Eva De Biase: Ja, is dat dan één oplevering per jaar? of…

Kasper Hesp: Dat ligt er een beetje aan maar ik denk één a twee opleveringen per jaar. En soms heb je een wat drukker jaar. Soms heb je een jaar waarin je alleen maar projecten in uitvoering hebt en helemaal geen opleveringen.

B: Transport

Eva De Biase: Wat zijn volgens u de factoren die transport belangrijk kunnen maken voor een ontwikkelaar?

Kasper Hesp: uhmmm

Eva De Biase: Is dat puur locatie of wat er in de buurt is?

Kasper Hesp: Ja, ik denk dat wij vanwege de type projecten die wij doen vaak op locaties zitten die goed bereikbaar zijn. Niet alleen met de auto maar ook het publieke transport. Bijvoorbeeld hier ben je vlakbij het Amsterdam Zuid station. In Utrecht hebben wij een zorg project zitten wij ook vlakbij centraal. In Zuid-Oost zitten wij ook weer vlakbij andere stations. Dus dat is over het algemeen wel aan de orde. Wij zijn geen bedrijf dat in buiten gebieden ontwikkeld. En dat betekent vaak ook dat je dus goed bereikbaar bent met de fiets. Of op andere manieren. De auto begint ondertussen een beetje het onderspit te delven in al die situaties. Enerzijds omdat dat dat vanuit de gemeente wordt opgelegd. Eigenlijk in de norm wordt opgelegd de laatste paar jaren. Dus het gaat steeds verder terug. Waar je misschien vroeger nog 1/100 kon halen op kantoren gaat dat steeds verder terug richting de 1/250 en dat gaat misschien ook extremer worden. In Utrecht hebben we de situatie dat ze eigenlijk hebben gezegd op een stationslocatie, probeer is helemaal geen parkeerplekken meer te maken op 60.000m2 met kantoor en woonruimte. Dat is een vrij hoog ambitie niveau. En dan wordt gezegd zoek je oplossing dan elders zoek die dan in reeds bestaande kantoor velden of garages. Of ga op de een of andere manier mensen bewegen om niet met de auto maar met het openbaar vervoer te gaan en dat is op zich een goede beweging. Er is niks verkeerds aan om ambities te leggen bij marktpartijen maar ik denk wel dat we in een transitie fase zitten en nog niet in een definitieve eindsituatie zitten als die er wel is. En ik denk dat transport nu een hot topic is, het is niet voor niets dat jij daar onderzoek naar doet. Ik denk dat partijen daar zoekende in zijn. Ik denk dat partijen nu zoekende zijn van hoe kunnen we dat nou oplossen, alles wat nu komen gaat. En hoe kunnen we daar marktpartijen toe bewegen en zich daaraan binden. En dat ik natuurlijk een gevecht want vaak willen eind beleggers vaak meer parkeerplaatsen in een gebouw. Het levert voor ons natuurlijk wat op. Parkeergarages zijn vaak onrendabel dus dat wil je natuurlijk het liefst zo veel mogelijk parkeerplaatsen hebben om nog enigszins een leuk getal te krijgen. Dus daar zit wel een spanningsveld tussen de partijen. Maar het is wel iets wat opgelost moet worden want je ziet wel op de Zuidas, het slipt maar dicht, we blijven hier maar bouwen, en we blijven ook hoogstedelijk bouwen. En ik denk dat dat heel mooi is, ik denk ook zeker dat Nederland hier aan toe is. En dat we dat door moeten zetten, maar dat betekent iets voor je vervoersbewegingen. En als je dan niet of iets aan het verkeersnet oplost of openbaar vervoer beter maakt, dan kan je dat niet voor elkaar krijgen. Dan kan je wel tegen ontwikkelaar zeggen ja je mag niet meer parkeerplaatsen maken maar dan moet je wel met goede alternatieven komen. En dat zie je nu ook wel gebeuren, hier wordt de Zuidas dok gemaakt. Maar dat is pas over 10 jaar klaar als het mee zit. En dan krijg je ook hier meer verkeersbewegingen en wordt het makkelijker. Ook de toegangswegen van de ring moeten daardoor beter worden. Maar zolang mensen de nijging hebben om met de auto te komen en ook de mogelijkheden hebben om te parkeren zullen ze dat ook altijd doen.

Eva De Biase: Ja, dat sluit ook wel mooi aan op de volgende vraag. Vindt u transport enkel een taak van een gemeente of denkt u dat een ontwikkelaar ook actief invloed kan uitoefenen? Dus we krijgen het opgelegd dus we moeten wel of kan je actief invloed daarop uitoefenen?

Kasper Hesp: Ja dat is dus een methode. Het wordt opgelegd maar je kan natuurlijk zelf de ambitie uitspreken bij de belegger. Van we gaan minder parkeerplekken maken want wij weten een dusdanig concept te bedenken waarbij parkeerplaatsen niet meer nodig zijn. Dan moet je gaan nadenken over de mix in je gebouw. Als je bijvoorbeeld een hele kleine appartementjes maakt, van 50m2, wat de markt daar ook van mogen vinden dan zal de vraag naar parkeren minder groot zijn dan als je appartementen maakt van 200m2. Sterker ik denk dat dat soort mensen vaak misschien wel twee auto's neer willen zetten in plaats van één nog steeds. Maar daarmee kan je natuurlijk spelen. Door die mix in je gebouw, van hoeveel parkeerplekken heb ik eigenlijk nodig. Daarnaast kijken wij naar mobiliteitsconcepten, hoe kan ik er voor zorgen dat er optimaal gebruik wordt gemaakt van die parkeerplaatsen. Bijvoorbeeld dubbel parkeren maar ook het aanbieden van auto's die ze kunnen huren, zodat ze dus de keuze kunnen maken om hun auto weg te doen. Dat is een ingrijpende keuze.

Eva De Biase: Ja, je kunt mensen niet dwingen maar je kunt wel de optie in ieder geval op tafel leggen.

Kasper Hesp: Ja, ik heb altijd geleerd dat mensen maar op bepaalde momenten bereid zijn om iets te veranderen en een daarvan is als ze verhuizen. Dus dan verander je al heel veel want je gaat van A naar B. Tegelijkertijd zou je ook de keuze kunnen maken bij die verhuisbeweging om dan je auto weg te doen als je die zou hebben. En ik denk dat dat zo'n moment is om dat te doen als je maar een goed voldoende concept neerzet. Dan wil ik dat misschien doen. Dan moet je niet alleen maar kijken naar transport of vervoer maar ook naar andere concepten in het gebouw dus hoe ga ik om met energie in het gebouw en hoe ga ik om met andere elementen. Dus mensen uit

hun vaste patroon trekken. Normaal heb je een woninkje met een parkeerplaatje er voor en sluit je zelf een contract af met een energie maatschappij maar wat nou als je dat soort elementen er veel meer uit gaat halen en meer als een dienst gaat aanbieden bijvoorbeeld. Dan ga je mensen dwingen om op een andere manier over dingen na te gaan denken. Zijn ze misschien ook bereid om hun auto te laten staan. En dat heeft dan weer effect op transport.

Eva De Biase: En is het dan na oplevering, ja meer kunnen wij niet doen? Of blijven jullie dan echt actief in relatie met zo'n gebouw? Want op een gegeven moment, normaal verkoop je het en dan ben je klaar.

Kasper Hesp: Wij hebben geen gebouwen in bezit nee, klopt. Dus wij proberen de basis te leggen voor toekomstige beleggers over hoe je nou met zo'n gebouw om moeten gaan. En of dit nou een belegger is of een particulier of wie dan ook. Dat proberen we wel te doen. En dat kan bijvoorbeeld door aan de voorkant dat te regelen in je VVE contracten, of in je splitsingsaktes etc. het kan ook door contracten af te leggen met bepaalde partijen voor langere duur. In Utrecht hebben we een project waarbij heel veel groen op het gebouw zit, Wonderwoods, en dat willen we graag in stand houden. Dat niemand denkt over een paar jaar, nou laat maar zitten als dat groen. En datzelfde kan je extrapoleren naar hoe ga ik om met vervoer of transport. En daar probeer je dus op een bepaalde manier dingen vast te leggen. En daar ook commitment op te krijgen bij beleggers om daar langdurig gevolg aan te geven. En ik denk dat dat met vervoer ook kan. Ja als er niet meer dan 50 parkeerplaatsen zijn dan zal je wel moeten. Tenzij er allemaal nieuwe bewegingen op gang komen waarbij niet alleen wij maar ook de markt, want die ontwikkelt zich ook, dat die met nieuwe oplossingen komt. Waardoor wij ook weer geholpen worden. Ik bedoel als er een partij komt en die gaat zelfrijdende elektrische auto's aanbieden die op het moment dat jij wil voor jouw deur staan om je op te halen, ja dan kan ik mij voorstellen dat dat betekent dat je daardoor ook zelf minder parkeerplaatsen gaat bouwen. Maar ergens houdt natuurlijk onze verantwoordelijkheid op en dat is bij het opleveren van het gebouw maar het is wel dat wij een ontwikkelaar zijn die, ja het onderschrift van onze naam dat is ''serving the city'', dat wij wel op de een of andere manier meer willen doen dan alleen maar een gebouwtje te ontwikkelen. We proberen wel te denken wat kunnen wij nou bieden aan de stad. Dus wij proberen ook allerlei maatschappelijke zaken een plek te bieden in het gebouw. Denk bijvoorbeeld aan een kunsthal of denk aan bepaalde woonoplossingen voor partijen in de stad die al moeite genoeg hebben bijvoorbeeld een dansacademie die zijn buitenlandse studenten moet huisvesten. Als je dat opneemt in je concept dat bied je ook ergens oplossingen voor dan alleen maar een gebouw neer te zetten met een woonfunctie of een kantoorfunctie. En ik denk dat we op die manier ook voor vervoer. Je moet verder gaan dan alleen maar een bak te maken met parkeerplaatsen erin en ik denk dat wij dat wel doen.

C: Locatie analyse

Eva De Biase: Oke, ik heb ook onderzoek gedaan naar de Walk Score, ik weet niet of u dat toevallig kent? Dit is een score in Amerika, Canada, Australië en Nieuw Zeeland die geeft gebouwen punten voor locatie, op basis van afstanden naar Supermarkten, scholen, parken, restaurants, en winkels. En er worden voor deze landen ook onderzoeken gedaan over in welke mate deze Walk Score invloed heeft op de waarde van een woning. Welke voorzieningen zijn voor G&S belangrijk in een locatie keuze? Kijken jullie ook bijvoorbeeld naar supermarkten, scholen, parken, restaurants en winkels? Of OV?

Kasper Hesp: Nou wij kijken niet specifiek naar bepaalde functies. Wij kijken meer naar locaties zoals die zich manifesteert in het geheel. Dus we komen al heel snel uit op plekken die goed gelegen zijn. En dat zijn dan vaak plekken in de buurt van stations. Of het moet zo zijn, maar dat is een andere motivatie, is dat er een klant komt en die zegt ik wil graag nieuwe huisvesting hebben of ik wil op die plek uitbreiden, dan heb je een heel ander uitganspunt. Dan heb je ook een hele andere motivatie om ergens iets te gaan ontwikkelen of om je werkzaamheden te doen. Maar als het uit eigen initiatief komt dan zullen het altijd wel locaties zijn die op de een of andere manier goed gelegen zijn maar dan met name station. En die functies zitten er dan automatisch al bij, wij kijken niet zo zeer specifiek naar functies nee.

Eva De Biase: Hoe gaat u om bij een gebrek van een bepaalde voorziening in een locatie? Actief of acceptatie? Zoekt u dan een nieuwe locatie, eist u bij de gemeente dat er iets aan het probleem (bijvoorbeeld bereikbaarheid) wordt gedaan, of doet u niks met het probleem? Is er in het verleden weleens een wisselwerking met de gemeente geweest hierover?

Kasper Hesp: Nee niet dat ik weet. Wij doen nu een project in de Houthavens, dat is niet per definitie een goed bereikbare locatie als het over openbaar vervoer gaat. Maar de locatie is heel mooi omdat die aan het water ligt. En dat het een gebied is dat enorm in ontwikkeling is. Dus wij hebben niet soort eisen neergelegd bij de gemeente van ga maar zorgen dat het openbaar vervoer daar beter wordt maar ik denk, naarmate het gebied zich ontwikkeld, dat dat vanzelf gaat. Of nou niks gaat vanzelf maar dat de gemeente dat gaat organiseren. Wij hebben nooit, of niet dat ik weet ik die zin, bij de gemeente afgedwongen of gevraagd van je je dit oppakken. We doen overigens wel voorstellen, als wij denken dat een plot op de een of andere manier niet goed ontsloten wordt, als wij denken

waarom heb je dat nou niet anders gedaan, dan hebben we het daar wel met ze over. Maar dat wil niet per se betekenen dat wij onze zin krijgen of dat de gemeente het met ons eens is, maar dat gebeurt natuurlijk wel ja.

Eva De Biase: Hoe wordt de locatie keuze voor nieuwe ontwikkelingen gemaakt? Is dat een tender?

Kasper Hesp: In het verleden hebben wij nog weleens grond aangekocht om er vervolgens op te ontwikkelen. En dan was de locatie, ja op de zuidas omdat dit in ontwikkeling was. Of omdat partijen beoogde om daar naartoe te gaan. Het is ook veelal op basis van een klant. Dus als een klant zegt ik wil graag hier huisvesting hebben dan gaan we dat verzorgen. Of het is een tender dus het is een veelvoud. En wat we wel merken is dat het steeds moeilijker wordt om bij een gemeente, met name in Amsterdam, aan te zetten van het lijkt ons een geschikte locatie om dit en dit te doen. Maar dat de gemeente zelf daar graag de lead in wil houden en dan zelf met tenders locaties beschikbaar gaat stellen. Ja dat merken wij wel steeds vaker, en dat is dan de manier om aan je ontwikkelingen te komen. Zeker als ze zo grootschalig zijn als deze. Of er moet een situatie zijn dat het anders is. Bijvoorbeeld het nieuwe ING kantoor, dat ontwikkelen wij, maar een voorwaarde van ING was dat wij hun oude hoofdkantoor zouden kopen en her ontwikkelen. En dat doen we dus nu dat wordt getransformeerd naar woningen. En daarom krijgen wij ook daar dus de mogelijkheid. Maar de aanleiding was dus de klant, die heeft er voor gezorgd dat wij het nieuwe hoofdkantoor ontwikkelen en het oude ook.

Eva De Biase: Doen jullie zelf locatie onderzoeken en pp welke schaalgrootte worden locatie onderzoeken gedaan? Is dat stads niveau, wijkniveau, plot niveau?

Kasper Hesp: Nee, we doen niet echt locatie onderzoeken nee. Ik denk dat wij een enorm netwerk hebben, van makelaars maar ook van andere partijen die wij voldoende spreken zeg maar om te weten wat er in de markt speelt en wat interessante locaties zijn. En dan doen wij niet specifieke locatie onderzoeken.

Eva De Biase: Voor mijn master moet ik natuurlijk literair onderzoek doen. En hierin heb ik onderwerpen gevonden die belangrijk zijn voor de gebouwde omgeving en transport. Dit zijn Identiteit en levensstijl, Mobiliteit, Natuurlijke elementen, Dichtheid, Economische activiteit en Functies. In hoeverre kunt u zich vinden in dit lijstje? En zouden dit onderwerpen zijn die houvast kunnen geven bij een locatie onderzoek?

Kasper Hesp: Ik denk dat dat altijd ergens onderhuids wel meespelen. Dus dat je altijd dat soort afwegingen wel mee neemt. Maar we gaan ze niet speciaal benoemen en een score geven, we doen over het algemeen ook geen doelgroepen onderzoek. Wij geloven gewoon op een gegeven moment in een locatie en dat de laat de markt ook zien. En dan ga we nadenken over het product dat wij daar gaan maken. En dat is samen met een paar partijen die ook in die locatie geloven en zich graag willen vestigen. Of als het over een product als wonen gaat waarvan die aansluit bij de markt. En vaak is dat omdat een woonbelegger om een product vraagt of omdat de markt aanslaat. Maar wij willen wel vaak voorop lopen, wij zitten ook als het om wonen gaat in een hoger segment. Dus dat is sowieso iets wat vaak minder goed is om een gemiddelde over te trekken. Dan ben je toch met iets bezig wat bijzonder is.

Eva De Biase: Ja, en zou het dan wel handig zijn als de gemeente zulke onderzoeken doet, dat het wat duidelijker op papier staat, of denkt je dat jullie dan toch onze eigen lijn trekken?

Kasper Hesp: Ja, zij zouden dan zeggen ik denk wel dat het goed is om dit of dit. Ja dat doen ze natuurlijk eigenlijk al. Bijvoorbeeld de 40/20 regel neergelegd in Amsterdam

Eva De Biase: En zijn jullie het daar dan mee eens?

Kasper Hesp: Nee daar zijn wij het niet meer eens. Ten eerste is het heel lastig om dat financieel rond te rekenen en ten tweede is het heel vreemd dat de gemeente gaat opleggen wat de markt dat zou willen. Volgens mij kan die markt dat heel goed zelf bepalen. Maar die ruimte krijg je daardoor niet. Ik snap wel dat vanuit een bepaalde planologische en stedenbouwkundige visie dat ze dat willen. Maar de vraag is of dat iets is dat de markt nodig heeft.

D: Data

Eva De Biase: Onderzoekt u zelf parkeernormen of hoeveelheid fietsenstallingen die nodig zijn of vindt u dit echt een taak van de gemeente?

Kasper Hesp: Nou de gemeente die eigent zich die taak toe, die leggen normen neer. In een bestemmingsplan of een beleidsnota. Maar wij hebben wel vaak een andere mening of visie daarop.

Eva De Biase: Ja, en dan moet je luisteren of valt daar over te praten?

Kasper Hesp: Ja, het is beleid dus het is een verplichting. Maar wij kunnen wel een tegengeluid kunnen laten horen en kunnen zeggen ja jongens zouden wij het niet beter zus en zo kunnen doen. En dan wordt er best wel naar geluisterd. Als het om fietsen gaat, daarin kijken naar dubbel gebruik in aantallen. Of dat het op een andere manier opgelost kan worden in de omgeving.

Eva De Biase: Dus daar denken jullie wel actief over na?

Kasper Hesp: Ja natuurlijk, als wij naar onze functies in het gebouw kijken. Bijvoorbeeld een school die heeft een normering over fietsenstallingen. Maar als dat nou een school is die alleen maar avond onderwijs heeft en in hetzelfde gebouw zit ook een kantoor. Heb je dan niet minder fietsenstallingen nodig. Als wij dat nou slim berekenen dan komen wij wel op een hele andere normering uit.

Eva De Biase: Gebruikt u momenteel big data bij nieuwe ontwikkelingen? Zo ja, welke en hoe? Zo nee, welke informatie gebruikt u wel?

Kasper Hesp: Ja wat wij proberen te doen, wij hebben een sales tool zelf ontwikkeld. Die kunnen wij gebruiken als we aan klanten iets presenteren. Vroeger gaf je een powerpoint presentatie of liet je op een andere manier je project of propositie zien maar wij hebben dus een salestool waarbij wij real time een plek onder de aandacht kunnen brengen. Stel er komt een vraag van de klant van nou hoeveel vervoersbewegingen zijn er nou eigenlijk dus dan kunnen wij in die tool. Dus een groot scherm met daarachter een hele grote database. Kunnen wij op dat moment ophalen van kijk er zijn zo en zoveel vervoersbewegingen of er zijn zo en zo veel scholen in de buurt. We maken daarbij gebruik van allerlei bronnen en dat maakt het heel interactief en gewoon leuk. Up to date inzicht voor de klant van wat speelt er nou eigenlijk. Ook voor ons zelf. Als wij natuurlijk zelf iets voorbereiden dan willen wij dat zelf natuurlijk ook weten. Op die manier is het heel makkelijk toegankelijk. Dus je hoeft niet meer alles van te voren helemaal vast te pinnen in een presentatie. Maar je kan het op dat moment erbij halen. Dat maakt het voor de klant heel geloofwaardig. Omdat je met die klant samen als het ware ernaar toe gaat.

Eva De Biase: Welke rol moet de gemeente spelen in het zichtbaar maken van deze data? Jullie doen het dus zelf, heb je de gemeente dan niet meer nodig? Merkt u bijvoorbeeld dat u bepaalde informatie soms mist?

Kasper Hesp: Ja, die big data, nou het is natuurlijk heel mooi als wij gebruik kunnen maken van de data die de gemeentes ook hebben daarover en ik weet niet in hoeverre dat nu ook gebeurt in die tool maar dat zou natuurlijk heel mooi zijn. Het zou natuurlijk mooi zijn als er nog veel meer data beschikbaar zou komen vanuit de gemeente. Ik weet niet of wij dat mogen verwachten van ze of dat ze dat als hun taak zien. I don't know.

Eva De Biase: In hoeverre denk u dat type bewoners invloed hebben op transport? Dus auto ov fiets, maar ook afstanden en voorzieningen? Oftewel gaat G&S in verschillende projecten anders om met transport door een bewoners analyse?

Kasper Hesp: Ja het segment waarvoor je bouwt is heel bepalend in wat de vraag is naar bijvoorbeeld auto parkeerplekken, en dus het aantal vervoerbewegingen.

Eva De Biase: Merkt u dan ook dat omdat jullie altijd in een hoger segment bouwen dat het altijd wel op dezelfde manier aangepakt kan worden.

Kasper Hesp: Ja een bepaald uitganspunt hanteer je maar dat hangt ook weer samen met welk mobiliteitsconcept bied je aan in dat gebouw en wat voor functies zitten er nog meer in dat gebouw om daar gebruik van te kunnen maken. Dus het is een beetje een samenspel van allerlei factoren. Maar ook het inzicht bij beleggers veranderen in de loop der tijd. Of dat nou komt door normeringen die strenger worden of dat ze zelf dat inzicht krijgen omdat de maatschappij gewoon veranderd. Maar ze nemen er dus genoegen mee dat er dus minder parkeerplekken beschikbaar zijn. En beleggers merken ook dat voor woningen van 90m2, een soort gemiddelde, dat die dus ook minder parkeerplaatsen vragen dan voorheen. Dus hun eisen worden lager want de wensen van de huurder wordt anders. En dat heeft de maken met een stroming van mensen die in hun algemeenheid minder behoefte hebben aan een eigen auto. Het wordt natuurlijk heel vaak geroepen maar ik denk ook dat de statistieken het dan wel uit zullen wijzen dat er onder jongeren minder behoefte is om een eigen auto te hebben. En dan denk ik altijd van ja dat geloof ik ook wel maar de vraag is dan tot wanneer. Kijk als je dan toch een gezin krijgt dan gaan dingen toch weer anders worden. Dus ik denk dat er wel een verschil is maar hoe snel en hoe dat moet zich nog uitwijzen. En misschien zeggen we over een paar jaar met zijn alle, ja die ontwikkeling van die zelfrijdende auto die is toch niet helemaal geworden wat we dachten en wij dachten bij wijze van spreken autoloze steden te krijgen maar het gaat gewoon niet werken. Dat merk je vanzelf.

Eva De Biase: Heeft u er als ontwikkelaar iets aan om te weten hoe mensen zich door de stad bewegen?

Kasper Hesp: Ik denk het wel ja. Ik denk dat dat wel hele waardevolle informatie is om op de ontwikkelen of op de ontwerpen. Als je weet in deze stad wordt 20% meer gebruik gemaakt van de fiets dan in een andere stad. Ja dat kan natuurlijk wel invloed hebben op je ontwikkelvisie maar ook richting afnemers. Hier is gewoon meer sprake van fietsverkeer dan auto verkeer dus dan kunnen we daar ook beter op in te spelen. Ik weet bijvoorbeeld in Utrecht dan proberen ze het vervoer per auto enorm te ontmoedigen door stoplichten langer op rood te staan. Volgens mij is dat bewust beleid. Daarmee heb je eigenlijk al enorm veel tegenzin om je met de auto de stad in te bewegen. Dat duurt allemaal zo lang, laat maar. Ik parkeer wel of aan de rand van de stad of ik ga met openbaar vervoer omdat ik veel eerder op plaats van bestemming ben.

Eva De Biase: Heeft u er als ontwikkelaar iets aan om te weten hoe het gesteld is met de veiligheid en tevredenheid van transport in de omgeving?

Kasper Hesp: Ik moet je zeggen dat wij nooit echt op die manier er over nagedacht hebben. Maar dat zou natuurlijk wel heel kwalijk zijn als het zo is dat de veiligheid van het vervoer niet goed geregeld is. Dat is bijna gevaarlijk voor je ontwikkeling dat betekent natuurlijk dat er iets helemaal niet goed is. Dat betekent ook dat je niet het maximale uit je ontwikkeling kan halen. Als mensen zich er niet naar toe durven te bewegen. Dat zal niet zo snel zijn maar als je dat zo scherp stelt zou ik denken, ja dat is niet goed nee. Wij gaan er maar vanuit gemakshalve dat het gewoon veilig is en goed geregeld is. Ik denk dat het met name wel zo is als je in een omgeving zit waar wel gebouwd wordt nog, of regelmatig gebouwd wordt, dat je hinder ondervindt hiervan. En dat kan natuurlijk wel de veiligheid in het geding brengen. Maar dat is natuurlijk wel aan de bouwende partij om daar goed mee om te gaan. Dat kan natuurlijk tijdelijk wel tot verslechtering leiden, ten nadele van jouw pand. Dat zal met de Zuidas dok straks niet anders zijn. Dan zitten we 10 jaar in een bouwput, ja dat zal gevolgen hebben voor de toegankelijkheid. Auto's zullen hinder ondervinden, misschien trein reizigers ook wel dat er vaker storingen zijn. En fietsen omdat ze om moeten rijden, dat zal zeker gaan gebeuren.

E:900 Mahler

Eva De Biase: Dan nu over 900 Mahler. Hoe zijn jullie aan het plot gekomen? Tender of zelf geselecteerd?

Kasper Hesp: Ja dat is ook een soort tender geweest ja. Maar vooral op prijs. Dus dat was niet een tender in de zin van leg eens een mooi ontwerp neer en dan maken we een keuze. Maar dat is op prijs gegaan.

Eva De Biase: Wat vindt u van het voorzieningen niveau op de zuidas?

Kasper Hesp: Dat wordt steeds beter. Ja een paar jaar geleden als je hier in het weekend kwam omdat het vooral gericht was op kantoren en er maar sporadisch een woongebouw stond. Hiernaast zit er eentje New Amsterdam en aan de overkant zit nog een stuk wonen dus die voorzieningen die zaten hier voor de werkende mensen en zodra het vrijdag middag was dan was het klaar. Dan kon je een bom afschieten in het weekend. En dat is echt aan het veranderen. Vooral de laatste paar jaar er komen steeds meer woningen bij in allerlei richtingen dus de Gustav Mahlerlaan die aan beide richtingen uitbreid dus dat zal steeds meer worden. En mensen die kiezen dus ook niet meer per se om vanaf hier onder de ring door te gaan naar Oud Zuid maar die blijven gewoon hier om naar een winkel te gaan. Ja het zijn natuurlijk wel een beperkt aantal voorzieningen, je hebt een supermarkt en je hebt een kapper. Het is nog geen Beethovenstraat zeg maar. En horeca is er inderdaad veel.

Eva De Biase: Verwacht je dat dat wel meer wordt dan?

Kasper Hesp: Ik denk op termijn wel ja maar dan moet er nog wel een stuk bijgebouwd worden. En ook vanuit de gemeente is er hier een plinten management. Om echt na te denken over wat gaan wij nou in die plinten stoppen wat moet hier nou in. Hoe kunnen ontwikkelaars helpen of sturen daarin om dat op een bepaald niveau gaat komen. Ik denk dat het ook deels te maken heeft met hoe is de vraag is. Je zag hier, dat is gelukkig wel steeds minder, maar dat er een snelle doorloop was van partijen met name horeca partijen die het dan net niet redden. Je moet toch een concept hebben dat aanslaat en je moet het vooral hebben van mensen die hier werken door de weeks. Daar moet je het meer doen, en als je dan een concept hebt dat niet aanslaat…

Eva De Biase: In relatie tot de bereikbaarheid, transport en de voorzieningen in en rondom het gebouw, wat zouden mogelijke verbeteringen zijn volgens u?

Kapser Hesp: Er zijn natuurlijk een aantal ontwikkelingen die nog afgemaakt moeten worden. De Gustav Mahlerlaan wordt doorgetrokken dus de trambaan die hier nog ligt op de Parnassusweg die wordt verlegd, je kan hier niet oversteken door een trambaan dus je moet omlopen en dan kom je aan de andere kant. Het is natuurlijk als je straks gelijkvloers kan oversteken en dat je van de ene kant naar de andere kant kan gaan. Dan krijg je natuurlijk veel meer aanloop. Ook vanaf de andere kant. Er is niet alleen een visuele barrière maar ook een fysieke barrière tussen de ene en de andere kant. En dat is jammer want die twee gebieden moeten verbonden worden. Daar ligt

ook de universiteit en het ziekenhuis. Als dat beter verbonden is gaan mensen makkelijker naar deze plek toe komen.

Eva De Biase: Hoe bent u bij deze ontwikkeling omgegaan met de verhouding tussen auto, openbaar vervoer en fiets gebruik?

Kasper Hesp: Hier gold nog een vrij oude norm. Dus daarmee konden wij prima de vraag van de belegger invullen dus er zijn voldoende parkeerplaatsen gemaakt. Het is een gecombineerde parkeergarage van 900 Mahler en 100 Mahlerlaan het kleine portiek gebouwtje wat nu in handen in van Chanel international. Er zitten 217 parkeerplekken waarvan 60 voor kantoor en de rest voor woongebouw. En dat zijn dan particuliere woningen en woningen van een belegger. Dit zijn 80 huurwoningen en 47 koopwoningen dus dat betekent dat je 127 woningen hebt. Dus er zitten iets meer dan 1 parkeerplek per woning in, volgens mij nog ietsje meer zelfs.

Eva De Biase: En fiets parkeren?

Kasper Hesp: Fiets parkeren dat is geregeld door een gezamenlijke inpandige fietsparkeergarage. Daar kunnen mensen hun fiets in zetten of hun scooter, ook aparte scooter ruimtes gemaakt in het gebouw.

Eva De Biase: Weet u toevallig of die goed gebruikt wordt?

Kasper Hesp: Wordt gebruikt, maar het is eigenlijk te klein. Als je kijkt naar hoeveel mensen wonen er en hoeveel fietsen zijn er is het eigenlijk te klein ontworpen. Maar dit is ontworpen, nou ik denk 10 jaar geleden inmiddels, dan zou je dat anders doen dan zou je een grotere parkeergarage maken voor fietsen. Tuurlijk hebben mensen ook de mogelijkheid om hun fietsen in hun eigen berging te zetten. Maar die bergingen te zetten maar die zitten weer op de eerste verdieping dus dan moet je weer met een liftje om hoog. Het maakt het allemaal niet makkelijk. Dus om mensen min of meer te dwingen om gebruik te maken van een fietsenstalling, dan moet je die fietsenstalling zo goed mogelijk benutten. Als er teveel hobbels in zitten dan denken ze laat maar ik zet hem buiten neer en dat is dus iets wat ze dus absoluut niet willen hier. Dat er fietsen tegen de gevel worden aangezet. Als je hier rondloopt dan staan er eigenlijk ook niet echt fietsen. Het gebeurt dus wel netjes, maar dat heeft niet alleen te maken met het feit dat er een fietsen berging is maar ook omdat fietsen vaak gejat worden. Dus mensen die zetten hem wel binnen neer, want er wordt onwijs veel gestolen. De gemeente heeft wel een aantal fietsenrekken neergezet.

Eva De Biase: Ik zag vooral bij de fitness ruimte dat iedereen daar die fietsen aan de kans gooit.

Kasper Hesp: Ja, het is dus, ja de fitness dat is dan ook weer een hiaat in het ontwerp zou je kunnen zeggen. Die fietsenberging is alleen voor de bewoners. Die plint, die commerciële plint die mag daar geen gebruik van maken. Dus iedereen die met de fiets komt die zet hem voor de deur neer. Dat zou je misschien ook anders doen, hoe zou je dat mee kunnen ontwerpen. En dan een fietsenstalling die makkelijk bereikbaar is, als mensen om moeten lopen gaat het ook niet werken. En op zich vind ik fietsen in het straatbeeld helemaal niet erg als het maar te handle'en is.

F: Overig

Eva De Biase: Zijn er nog andere analyse technieken die gebruikt worden (of die de gemeente of ontwikkelaars) in uw ogen zouden moeten gebruiken bij het onderzoeken van een potentiele ontwikkellocatie? Oftewel is er nog informatie die mist bij het ontwikkelproces?

Kasper Hesp: Nou ik weet wel dat bij Volker Wessels, want wij zijn een dochter van Volker Wessels, niet 100% maar wel voor een deel. Binnen Volker Wessels zijn ze nu bezig, een innovatie centrum in Nieuwegein, waarbij ze ook met behulp van data snel beslissingen kunnen nemen over locaties. Dus allerlei data wordt gebruikt om te kijken wat een geschikte locatie zou kunnen zijn. Met bepaalde tekentechnieken kunnen heel snel gebruik maken van de input van bestemmingsplannen bijvoorbeeld, hoe hoog mag je maximaal bouwen, wat is de parkeernorm die geldt. Dan kunnen zij heel snel intekenen of bepalen wat is er nou mogelijk op die plek. Dus in die zin is er wel een ontwikkeling gaande. Of bijvoorbeeld liggen er ook kabels op leidingen, ook die data wordt gebruikt. Om snel een analyse te kunnen maken van een locatie. Daar zal ongetwijfeld ook data in zitten van de gemeente. Het is geïnitieerd door Volker Wessels, en alle ondernemingen van Volker Wessels kunnen daar gebruik van maken. Om beter te ontwikkelen. En wij kunnen ook in gebouwen tools inbouwen waarmee data te genereren is die handig is voor onze onderneming. Zodat we inzicht hebben en de volgende ontwikkeling beter kunnen maken maar ook zodat wij deze kunnen verkopen, bijvoorbeeld aan een gemeente. Hoeveel mensen gaan er jouw gebouw in, gebeuren dingen rondom jouw gebouw die de veiligheid in het geding brengen. De vraag is dan wie wordt de eigenaar van die data. Blijft dat bij ons liggen als ontwikkelaar of gaat die naar de belegger toe, blijft het bij de gebruiker. Of zit de data van het gebruik van het kantoor bij de huurder, de eigenaar of de beheerder. Dat zijn wel vragen die spelen en welke rol spelen wij daar een rol in als ontwikkelaar. Blijven wij eigenaar van die data. Denk aan de BIM modellen

die wij maken, van wie zijn die nou eigenlijk, de architect de aannemer wij. Of gaat het over van eigenaar. Wat dat betreft willen wij wel eigenaar zijn van het BIM model dan kunnen wij die mee verkopen aan de belegger maar ook zelf iets leren van de data. Maar de data die er in de toekomst uit kan komen is natuurlijk ook interessant. Ongeveer 3 a 4 jaar geleden zijn wij begonnen met BIM en nu wordt BIM vanaf het begin ingezet maar wij hebben nog geen antwoord op wat er moet gebeuren met die data.

Appendix C: Interview Fons Kurvers, Van Wijnen West

This interview is conducted with Fons Kurvers Commercial director at Van Wijnen Projectontwikkeling West
The interview is conducted in the Dutch language
The interview is conducted on 31-08-2018
The introduction and the concluding part of the interview are not recorded

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Interviewee: Fons Kurvens, Commercieel directeur, Van Wijnen Projectontwikkeling West
Interviewer: Eva De Biase, Master student Technical University Delft

Survey Section Used:

A: Bedrijfsperspectief
B: Transport
C: Locatie
D: Data
E: Kwintijn
F: Overig

Introduction (not recorded)

Als u het goed vindt zou ik graag notities willen maken tijdens dit interview en zou ik graag het interview willen opnemen zodat ik deze kan transcriberen en gebruiken voor mijn Master scriptie. Bedankt voor uw toestemming om deel te nemen aan dit interview. Het interview bestaat uit open vragen en ik stuur niet op bepaalde antwoorden en hoor graag uw eerlijke mening.

Via de e-mail heb ik al kort het onderwerp van mijn scriptie uitgelegd, dit kan ik kort herhalen. Hierna start ik de opname en het interview.

A: Bedrijfsperspectief

Eva De Biase: Hoe groot is het bedrijf van Wijnen? In hoeveelheid werknemers bijvoorbeeld.

Fons Kurvers: Van Wijnen is van origine een familie bedrijf, bestaat 15 jaar en ongeveer 2/3^{e} van de aandelen zijn nog bij de familie, familie de Leeuw, meneer Klaas de Leeuw met zijn kinderen en 1/3^{e} is van de Rabobank, eerst was dit Friensland bank maar de Rabo heeft dit over genomen. Dat is het bedrijf al 115 jaar. We hebben 1700 medewerkers, en wij maken ongeveer 17 miljoen omzet. En dan moet je denken in de ontwikkelingswereld zijn wij niet de top maar zitten wij in de top 5 of 6 a 7. Je ziet ons net wat minder omdat wij doen alleen maar bouwen, wij doen geen wegenbouw, bruggen. Vandaar dat mensen Van Wijnen iets minder vaak kennen, Heijmans is dan 2 a 3 keer zo groot en de BAM is 10 keer zo groot.

Eva De Biase : En regio west bestaat uit hoeveel mensen?

Fors Kurvers: Dit bedrijf heeft het hoofdkantoor in Baren. Van wijnen heeft 5 regio's, en in principe moet elke regio zelf zijn broek ophouden, zelf regelen. Die heeft een grote autonomie en verantwoordelijkheid. Baren is klein maar zorgt wel dat het geld beschikbaar is. Regio West bestaat uit 300 a 400 mensen. In West is de laatste jaren het meest te doen, zowel regio midden en west zitten in het Amsterdamse dus meeste groei.

Eva De Biase: Wat voor type projecten zijn dit? Zijn dit woningen, kantoren, hele gebieden?

Fons Kurvens: Nou van origine is Van Wijnen een bouwbedrijf, dus dat noem ik maar even met alle respect het stapelen van de stenen. Tientallen jaren geleden is daar project ontwikkeling bijgekomen en dat doen wij dus ook. Als wij iets ontwikkelen dan geven we altijd de opdracht van het bouwen aan een collega bedrijf. Dus in dit eigen huis. En de bouwers bouwen voor ons maar ook voor anderen. Dus voor woningbouw verenigingen of voor Bouwfonds. Wij doen eigenlijk alleen woningbouw en utiliteitsbouw. Wij doen geen weg en waterbouw. In principe willen wij niks overhouden, dus wij doen geen beleggingen. Als wij een woning overhouden dan vinden wij dat lastig dus de bedoeling is dat wij alles verkopen. We ontwikkeling voor 3^{e}, particulieren of een

woningbouwverenigingen. We hebben weleens een onverkocht product en dan moet je afprijzen, en daar hebben we een hekel aan.

B: Transport

Eva De Biase : Wat zijn volgens u de factoren die transport belangrijk kunnen maken voor een ontwikkelaar?

Fons Kurvers: Ik kijk daar puur als ontwikkelaar naar. In principe doen wij ontwikkeling voor eigen rekening en risico. Tenzij het natuurlijk een woningbouw vereniging of gemeente is die het ons vraagt dan doen wij dat ook. Maar even als het gaat om eigen initiatief dan moeten wij goed weten waar wij mee bezig zijn. En dan kijken we als eerste naar wie is nou de eindgebruiker. Voor wie ontwikkelen we het, wie gaat daar wonen, werken wie gaat het kopen. In opdracht is het simpel. Voor eigen rekening en risico. Dan moeten we natuurlijk heel goed kijken, ja dan gaan we in de schoenen staan van de klant. En dat is met boeren verstand, het is natuurlijk geen rocket science wat wij doen. Daar neem je de locatie en de manier hoe je er kunt komen neem je sterk mee. In een uitbreidingswijk en er komen kinderen en dan moeten er ook scholen zijn en je kijkt hoe kom je er met de auto of ov. En in hoeverre kun je dat beïnvloeden, ik kan natuurlijk geen spoorlijn aanleggen. Ja als het grootschalig is dan kunnen we dat wel overleggen. Of over bus verbindingen. Maar heel vaak is de infra er al. En als ik er geen invloed op heb dan moet ik dat product dat ik daar maak er op aanpassen. Als er geen ov is geen scholen dan moet ik geen woningen voor gezinnen maken, maar misschien bedrijfshallen. Dus de randvoorwaarden beïnvloeden het eindproduct, dus daar moet je wel naar kijken.

Eva De Biase : Vindt u transport enkel een taak van een gemeente of denkt u dat een ontwikkelaar ook actief invloed kan uitoefenen? Denk aan invloed op parkeernormen, ov plekken, hoeveelheid fietsenstallingen, een goede match tussen nieuwe bewoners en transport.

Fons Kurvers: Maak ik een verschil. Bij grootschalige ontwikkeling, bijvoorbeeld Vathorst 10.000 woningen. Daar ben je met de gemeente bij betrokken want het een grote plek met weiland waar alles nog moet komen dus dan heb je het hele project samen in beheer. Dan doe e dat samen. Zowel de overheid als de ontwikkelaar wil dat je er kunt komen. Dus dan stel je ook eisen aan elkaar van dan moet je dat wel geregeld hebben. Anders is het eindproduct niet af. Als je er niet kunt komen dan werkt het niet. En de parkeernorm. In principe wil je dat de nieuwe bewoners ruim kunnen parkeren. Dus heb je er als ontwikkelaar meer belang bij om veel parkeerplekken te maken. Aan de andere kant als je meer parkeerplekken maakt maak je dus minder woningen en aan parkeerplekken openbaar verdien je natuurlijk geen donder. Dus dat is een afweging dat je dan samen doet. Nu een kleinschalige ontwikkeling. Dan liggen de kaders er al, dus dan is er niet zo veel te kiezen.

Eva De Biase: Ja, maar bijvoorbeeld Kwintijn, dan ligt er een parkeer garage onder.

Fons Kurvers: Ja, als je naar dat project kijkt. Dat noem ik een groot project. De eerste opgave was woningbouw, daar is de locatie geschikt voor. Automatisch hoort daar een parkeer norm bij. Als je goed beargumenteert kan je in Amsterdam daar wel van af wijken. De gemeente Amsterdam had een uitdaging. Dus daar was een parkeerprobleem. Er waren veel vergunninghouders maar weinig plekken. Dus heel veel auto's die lang rondreden opzoek naar een plekje. Nou dat wil je niet natuurlijk, krijg je veel opstoppingen en CO2 uitstoot. Niet goed voor de irritatie van de mensen. Dus de gemeente zei, wij willen dat jullie een parkeergarage maken voor ons, ondergronds. Dus toen zeiden wij, goh dat willen wij wel. Dus aan de ene kant zeiden wij dat is moeilijk ondergronds. En sterker nog ze wilden zoveel parkeerplekken, plus onze eigen parkeergarage, dus kwamen wij al vrij snel uit op een twee laags ondergrondse parkeergarage. Nou oei, dat is natuurlijk moeilijk in Amsterdam bij al die grachten. Wel even achter de oren gekrabd maar uiteindelijk hebben wij daar wel de deal op gesloten. Dus het was een win-win situatie. Dus een groot deel van de garage was in opdracht van de gemeente Amsterdam en daar hebben wij geld aan verdiend en daardoor kreeg het project ook een bepaalde omvang en dat is natuurlijk wel prettig. Je doet liever een wat groter project dat is wat lucratiever. Dus voor Kwintijn kwam de auto wel goed uit. Het tweede was natuurlijk het fiets parkeren. Dat was het moeilijke. Wij zijn natuurlijk altijd gericht op ja we weten hoeveel auto's er zijn en die auto kan je reguleren. Als je ergens een paaltje neer zet dan kan je daar gewoon niet parkeren. Maar een fiets ja iedereen zet die fiets in Amsterdam overal maar neer en dat wordt natuurlijk wel een puinhoop en dat is een wat moeilijkere. Wij hebben wel fietsenstallingen voor onszelf gemaakt, dus voor onze bewoners. Maar bezoekers, ja het kan wel in die fietsenstallingen maar daar zit wel een limiet. Dus je ziet in Amsterdam dat die fietsen, dat dat veel minder makkelijk te regulieren is dan auto's. De bereikbaarheid daar hadden we natuurlijk geen invloed op want die wegen lagen er nou eenmaal omheen daar moeten we het gewoon mee doen.

Eva De Biase : Op welke manier kan een ontwikkelaar volgens u transport implementeren in een ontwikkelproces?

Fons Kurvers: Wat ik net al zei, bij hele kleine projecten, als het om vier woningen gaat dan niet. Bij grootschalige projecten, bijvoorbeeld Leidsche Rijn, dan heb je deels een organisatie die dat doet. Soms ben je daar lid van. Stel je bent 1/6^{e} eigenaar van de grond dan ben je ook 1/6^{e} ontwikkelaar en in principe ook 1/6^{e} de bouwer van het geheeld dan ben je toch betrokken bij het geheel. Wij hebben die kennis niet in huis dus huur je externe adviseurs voor in, overheden, adviesbureaus, stedenbouwers en dan ga je daar samen naar kijken. Dan ga je de opgave invullen. De ontwikkelaars als van Wijnen die doen dat niet allemaal zelf. Want die mensen hebben daar gewoon veel meer verstand van. Wij hebben geen verkeersdeskundige, wij zijn alleen de regisseur.

C: Locatie analyse

Eva De Biase: Kent u toevallig de Walk Score, dit is een score in Amerika, Canada, Australië en Nieuw Zeeland die een locatie punten geeft op basis van afstanden naar Supermarkten, scholen, parken, restaurants, en winkels. En er worden voor deze landen ook onderzoeken gedaan over in welke mate deze Walk Score invloed heeft op de waarde van een woning. Welke voorzieningen zijn voor van Wijnen belangrijk in een locatie keuze?

Fons Kurvens: Als wij een locatie ontwikkelen. Als die heel veel vinkjes heeft dus goede ov, scholen in de buurt, supermarkt goede naam en faam van de buurt dat heeft gewoon invloed op het product dat je maakt. De waarde van de locatie en dus het eindproduct. Als de locatie beter is en dus meer vinkjes, de eindwaarde is dan hoger, kan ik er meer voor vragen, nu ook meer voor betalen, en risico profiel kan in inschatten. Wat de marge is van de kostprijs en de marktprijs dus een gezonde marge winst en de risico. Als er veel vinkjes of als alles goed is dan is de kans groter dat ik het kan verkopen. Dus daar zijn wij natuurlijk blij mee.

Eva De Biase: Maar als ik het goed begrijp, stel de vinkjes zijn niet allemaal aanwezig dan bouwt van Wijnen alsnog maar een ander product, dus goedkopere woningen.

Fons Kurvers: Wij, 90% bij van Wijnen, de locatie heeft een bepaalde kwaliteit. Dus het product moet daar op passen. Dus als ik in de omgeving geen openbaar vervoer heb of geen scholen, dan moeten we daar dus geen eengezinshuizen plaatsen. Geen gezinnen met kinderen, maar misschien een gated community of yuppen, die hoeven helemaal niet naar school die willen helemaal niet naar een supermarkt. Wij hebben niet gericht een bepaald product, wij doen alle soorten woningen. Hele goedkope huur maar ook een villa van een miljoen dus die villa doen we niet in een achterstandswijk in Rotterdam. Dus op de locatie maken we een ideaal product. En dan onderzoeken wij of er behoefte aan is. Dus of wij kijken waar vraag naar is, of wij kijken in het bestemmingsplan is iets mogelijk, een woontoren bijvoorbeeld, en dan kijken wij bij andere partijen en dan zien wij is dit afzetbaar. Zo simpel is het bij ons, en ik denk bij veel ontwikkelaars.

Eva De Biase: Hoe wordt de locatie keuze voor nieuwe ontwikkelingen gemaakt?

Fons Kurvers: De meest vreemde dingen komen voor. Iemand klopt aan en die heeft een locatie. Dus dat de klant, particulieren of een woningbouw vereniging of een gemeente, het kan grootschaliger zijn. Dit kan een op een zijn. Vaak zie je dat dit in een competitie zijn een tender een uitvraag, met vooraf spelregels. Dat is een mogelijkheid, dus extern. Of vanuit ons, wij zijn natuurlijk ook op pad. En van werk maak je werk, na Kwintijn 1 ka Kwintijn 2 kwam daardoor daarnaast. En tweede was het blijf van mijn lijf huis moest na Kwintijn ook een tweede komen in een andere locatie dus hebben we het zelfde kunstje ergens anders gedaan. Dus ja, als je thuis blijft gebeurt er niks, maar van werk maak je werk.

Eva De Biase: Op welke schaalgrootte worden locatie onderzoeken gedaan? *Is dat stads niveau, wijkniveau, plot niveau?*

Fons Kurvers: Allemaal, bij een ontwikkeling van onze omvang. Als de klant ons belt wil je een villa maken dat doen we ook. Als we zelf wat ontwikkelen of bouwen dan moet het een bepaalde omvang hebben, het liefst wat groter. Al snel is 20 a 30 woningen als minimum. Tegenwoordig niet meer in uitbreidingswijken van 1000 woningen maar in de binnenstad is honderd woningen al een juweeltje en dat komt natuurlijk tegenwoordig vaker voor. In het midden van het land zijn uitzonderingen. Dus van heel groot schalig tot kleinschalig. En bi grootschalig, doe je meestal met andere ontwikkelaars en dan is bereikbaarheid belangrijk huur je dan iemand voor in.

Eva De Biase*: Voor mijn master moet ik natuurlijk literair onderzoek doen. En hierin heb ik onderwerpen gevonden die belangrijk zijn voor de gebouwde omgeving en transport. Dit zijn Identiteit en levensstijl, Mobiliteit, Natuurlijke elementen, Dichtheid, Economische activiteit en Functies.* In hoeverre kunt u zich vinden in dit lijstje? En zouden dit onderwerpen zijn die houvast kunnen geven bij een locatie onderzoek?

Fons Kurvers: Een aantal aspecten zitten gewoon in de opgave daar doe je niks mee, maar een aantal hebben natuurlijk wel te maken met een onderscheidend vermogen, ja waarom kiest de klant wel voor van Wijnen en niet voor een collega. Dat kan zijn branding, goedkoper, slimmer product, ja het marketen op die manier is natuurlijk wel heel erg belangrijk. Dus dat is niet automatisme. Je moet zo zien, van nature zijn wij ook technisch georiënteerd dat mag je verwachten maar wij moeten ook innovatief zijn, de visie bij het begin.

D: Data

Eva De Biase: Onderzoekt u zelf parkeernormen of hoeveelheid fietsenstallingen die nodig zijn of vindt u dit echt een taak van de gemeente?

Fons Kurvers: Één, er is altijd, waar je ook ontwikkelt, er is altijd wel een norm daar houd je wel rekening mee. Daarnaast heb je een visie voor wat nodig is. Als daar discrepantie is, stel je wil een hogere norm moet je kijken of dat mag, bestemmingsplan of regelingen, of als je minder wil. Soms mag dat, soms mag dat niet, dan moet je daar goede argumenten voor hebben. Ja die regels, dat is ook niet statisch, stel er komt een station binnen 10 jaar dan is misschien niet nodig om er zo veel parkeer plekken te maken. En even functioneel, als we met de gemeente niet op een lijn komen dan hebben beide partijen een probleem. Of bijvoorbeeld je wil 10 woningen maken er moeten met een norm van 1,7 wel 17 parkeerplekken komen, misschien is er wel gewoon helemaal geen plek voor 17 parkeerplekken. En je wil toch samen 10 woningen maken. Dus dat moet je dat met de gemeente over hebben. Op een grotere schaal heb je ook zelfs met Rijkswaterstaat te maken etc. Voor parkeren en voor fietsen.

Eva De Biase: Zo ja, neemt u de parkeerdruk in een omgeving mee in de beslissing voor een parkeernorm?

Fons Kurvers: Als het klopt, in de meeste gevallen, is daar wel naar gekeken. Bij een gewijzigde omstandigheid komt het weleens voor dat je een onderzoek opnieuw moet doen. Ja, dan bel je iemand op. Vaak doe je dat dan wel in samenwerking met de gemeente. Dit zijn wel dingen waar de gemeente meer in thuis is. Die weten wel wat de parkeerbalans is in de wijk.

Eva De Biase: Gebruikt u momenteel big data voor de locatie of bereikbaarheid analyse van een nieuwe ontwikkeling? Zo ja, welke en hoe? Zo nee, welke informatie gebruikt u wel?

Fons Kurvers: Is maar net wat je big data noemt. Ja tuurlijk ik ben door mijn leeftijd een nadere generatie dus ik zit minder in die big data. Maar mijn collega's wel. Wij gebruiken de gebruikelijke wel. Het kadaster dagelijks bij wijze van spreken. Helemaal in de beginfase. Bestemminsplannen, Google'en, bereikbaarheid, marktonderzoeken, als die kaartjes die je dan over elkaar kan zetten die programma'tjes voor. Dat je kunt zien waar de scholen liggen. Dat wordt allemaal wel gebruikt.

Eva De Biase: Ik onderzoek Big Open Linked Data. Uitleg. Social data, Sensor data, Registration data. Welke van deze typen BOLD zijn een toevoeging voor uw analyse proces?

Fons Kurvers: Het ligt aan de omvang van de locatie. Een grote locatie met een groot risico profiel. Als we daar energie en tijd in steken dan willen wij daar natuurlijk wel goede informatie over hebben. Dan doe je dat wel. Als ik het even over wonen heb. Wij kijken natuurlijk wel of het prettig wonen is. Dat kan wel via big data. Maar wij hebben onze regio's wij worden wel geacht om onze regio goed te kennen. Elke steen uit de plaats. Als je een verkeerd product wil plaatsen zegt de directeur wel sukkel dat gaat daar niet landen. En wij kunnen natuurlijk ook een makelaar bellen of mijn collega's zitten ook te Google'en. Ja die zachtere kant dat social dat is wel belangrijk. Daar kijken wij wel naar hoor.

Eva De Biase: Welke rol moet de gemeente spelen in het zichtbaar maken van deze data? Merkt u bijvoorbeeld dat u bepaalde informatie soms mist?

Fons Kurvers: Ja ik geloof dat er inmiddels zo veel bekend is. De info is wel beschikbaar. Dus het is eerder aan mij als ontwikkelaar om er aan te komen. Het is eerder door mij dat ik er dan niet handig genoeg voor ben. Het is bijna zo veel dat je door de bomen het bos niet ziet. Er is wel genoeg beschikbaar. De kunst is dat ik zelf moet weten waar ik op zoek naar ben. En als ik het niet kan vinden dan kan ik gerichte vragen aan de gemeente stellen.

Eva De Biase: Heeft u er als ontwikkelaar iets aan om te weten hoe mensen zich door de stad bewegen?

Fons Kurvers: Ja tuurlijk. Dan kijk is als van Wijnen. Daar hebben wij pas behoefte aan als we daar gericht in een locatie gaan bouwen. Wij zijn geen verzamelaar van informatie omdat we dat leuk vinden. Geen bibliotheek, dus alleen die stromen waar wij mee bezig zijn. Als ik een winkel ontwikkel die van langslopend publiek moet

profiteren dan moeten er wel veel mensen langs lopen. Bezoekersstromen beïnvloeden dat lukt bijna niet. Dus dan kijk je naar onderzoeken van Locatis etc. Er zijn wel bedrijven die de hele dag lopen te tellen. Dus soms moet ik wel weten hoeveel mensen en wat voor soort mensen. Kan ik opzoeken of ik geef de opdracht aan een partij om dat te doen.

Eva De Biase: En heeft u op dit moment het idee dat het makkelijker zou kunnen?

Fons Kurvers: Ja wij komen er altijd wel achter. Ik denk meer er is zo veel. De kunst is dat ik zelf goed kan filteren. Dat ik weet wat ik wel en wat ik niet wil weten en weten waar ik precies rekening mee moet houden. Anders kom ik niet aan ontwikkelen toe. Wat ook vaak is je hebt een visie, en dan zoek je een onderbouwing of die wel goed is. Dus ik zoek een bevestiging aan de hand van rapporten. Mijn veronderstellingen of die kloppen dan dat ik de visie ergens vandaan haal.

E: Kwintijn

Eva De Biase: Hoe zijn jullie aan het plot gekomen? Tender of zelf geselecteerd?

Fons Kurvers: Ja, dat is een kleine tender geweest door de eigenaar van de grond Rochdale. Ik was daar op visite met een collega. En die plot wilde wij wel kopen, dat wilde ze wel maar helaas niet 1 op 1. Dus een tender tussen 3 ontwikkelaars. En wij waren de gelukkige. Na fase 1 lag fase 2 wel voor de hand. Dus het was eerst de goede contacten en daarna goed gewonnen. En dat was een goed project, een succesvol project het was in een slechte tijd. Dus sommige in het gebouw hebben wel heel goedkoop gekocht.

Eva De Biase: Hoe bent u bij deze ontwikkeling omgegaan met de verhouding tussen auto, openbaar vervoer en fiets gebruik? Parkeernorm, hoeveel fiets.

Fons Kurvers: Het was zo binnenstedelijk dus daar heb ik mij niet mee bezig gehouden. Er zat een parkeernorm bij die hebben wij aangehouden en er zaten al wegen om heen dus dat was appeltje eitje. Het was gewoon een gegeven. Alleen het parkeren wat ik zei, er was meer behoefte dan ruimte die ter beschikking was. En toen kwamen wij bij de oplossing om 2 laags ondergrond te gaan. Dat was wel lastig. Uiteindelijk ging dat wel goed.

Eva De Biase: Wat vindt u van het voorzieningen niveau in dat gebied?

Fons Kurvers: Top, top, ja is helemaal top.

Eva De Biase: In relatie tot de bereikbaarheid, transport en de voorzieningen in en rondom het gebouw, wat zouden mogelijke verbeteringen zijn volgens u?

Fons Kurvers: Ja sowieso is er genoeg parkeren. Voor onze eigen behoefte hebben wij genoeg gehad. Dat moeten we sowieso regelen volgens een bepaalde norm. Nou de gemeente wilde minder parkeerplekken en wilde 1,5^{e} parkeergarage onder de grond. Dat wilde wij niet. Of het zijn er 0 of een hele laag voor de gemeente. Dus daar zat puur praktisch de discussie. Heeft de gemeente wel genoeg geld. Ja de bereikbaarheid dat was er gewoon, je kunt er met de auto komen. Er moest wel iets aan de infra gedaan worden maar niks ingewikkelds. Deels was het eenrichting deels auto vrij. En de gemeente heeft alles genomen behalve die van de bewoners.

F: Overig

Eva De Biase: Zijn er nog andere analyse technieken die gebruikt worden (of die de gemeente of ontwikkelaars) in uw ogen zouden moeten gebruiken bij het onderzoeken van een potentiele ontwikkellocatie? Oftewel is er nog informatie die mist bij het ontwikkelproces?

Fons Kurvers: Ja als er iets mist, dat gebeurd wel dan laten we dat gewoon onderzoeken. En dat gebeurt veel soms denk je we zijn meer aan het onderzoeken dan aan het bouwen. Dat is vrij veel. Als wij beginnen als ontwikkelaar heeft nog niemand een pakketje neergezet. Dus aan het begin moet je weten wat wil ik, wat is de hoofdzaak en bijzaak. Dus dat je voorkomt dat je door de boen het bos niet meer ziet. En die ballast, daar heb je helemaal geen behoefte meer aan. En je moet een visie hebben. Wat ga ik doen, wat ga ik ontwikkelen, hoe ga ik daar komen, en dan moet ik mij niet laten afleiden door randverschijnselen. En big data kan dan belemmerend werken omdat er zo veel is. En allemaal wijsneuzen die het allemaal maar beter weten dat is ook een verhaal. Bij een groot bedrijf heb je dat dat heeft iedereen een mening, iedereen weet het beter. Je kunt natuurlijk niet iedereen tevreden houden. Je hebt zoveel partijen om je heen. Het is net regeren. Soms moet je onpopulaire beslissingen nemen.

Appendix D: Interview Marten Boerema, Van Wijnen Midden

This interview is conducted with Marten Boerema Commercial director at Van Wijnen Projectontwikkeling Midden
The interview is conducted in the Dutch language
The interview is conducted on 14-09-2018

The introduction and the concluding part of the interview are not recorded
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Interviewee: Marten Boerema, Commercieel directeur, Van Wijnen Projectontwikkeling Midden

Interviewer: Eva De Biase, Master student Technical University Delft

Survey Section Used:

A: Bedrijfsperspectief
B: Transport
C: Locatie
D: Data
E: Smiley
F: Overig

Introduction (not recorded)

Als u het goed vindt zou ik graag notities willen maken tijdens dit interview en zou ik graag het interview willen opnemen zodat ik deze kan transcriberen en gebruiken voor mijn Master scriptie. Bedankt voor uw toestemming om deel te nemen aan dit interview. Het interview bestaat uit open vragen en ik stuur niet op bepaalde antwoorden en hoor graag uw eerlijke mening.

Via de e-mail heb ik al kort het onderwerp van mijn scriptie uitgelegd, dit kan ik kort herhalen. Hierna start ik de opname en het interview.

A: Bedrijfsperspectief

Eva De Biase: Hoe groot is het bedrijf van Wijnen? In hoeveelheid werknemers bijvoorbeeld.

Marten Boerema: Wij hebben 4 vestigingen, Apeldoorn, Harderwijk, Utrecht en Weesp. Weesp is dan op de Amsterdamse regio gericht en wij hebben 260 edewerkers. Hier in Weesp zitten we op 60. *Wij zullen dit jaar 144 miljoen omzet draaien. Hier in Weesp 60 miljoen. De hoeveelheid opleveringen is afhankelijk van, als je studenten woningen hebt dan zijn dat al snel kleine woningen en heel veel units, en sommige jaren zijn dat er minder. Ik denk hier ongeveer op 400 woningen zit per aar.*

Eva De Biase: Wat voor type projecten zijn dit? Zijn dit woningen, kantoren, hele gebieden?

Marten Boerema: 95% is woningbouw. En dat is nieuwbouw en het renoveren van bestaande woningen. Dat doen we voor een aantal woningcorporaties in Amsterdam. Die zijn dan slecht geïsoleerd en dan gaan we dan verbeteren.

B: Transport

Eva De Biase : Wat zijn volgens u de factoren die transport belangrijk kunnen maken voor een ontwikkelaar?

Marten Boerema: Nou kijk, de Smiley in Asterdam, dat hebben wij natuurlijk gerealiseerd en dat is natuurlijk op Zeeburg eiland. Was midden in de crisis toen werd er weinig gebouwd. Toen hebben wij die locatie uiteindelijk gekregen van een woning corporatie, die wilde daar toen woningen organiseren. Toen zijn wij in gesprek geraakt met een andere studenten huisvesten. En die vond het heel erg spannend om op die locatie studenten huis te vesten. Omdat met name de verbinding tussen zeeburg eiland en het centrum. Dat dat gewoon lastig is. Want je kan eigenlijk alleen et de metro de tunnel door, maar je kunt niet met de fiets die tunnel door. Dus dat vonden ze in het begin heel erg spannend. En met name, hoe veilig is het om over te steken tijdens, eigenlijk, er lag niet zo veel infrastructuur. Daar hebben zij eerst gesprekken gehad et de gemeente over hoe zij dat zien. En uiteindelijk hebben ze er toch voor gekozen.

Eva De Biase: Dus uiteindelijk is dat buiten van Wijnen om?

Marten Boerema: Ja, want daar hadden wij eigenlijk geen invloed op. Ja er is een ontwikkellocatie van de gemeente. Als zij willen dat wij het doen dan doen wij dat. De uiteindelijke afnemer, DUWO, die heeft wel garanties gekregen dat de gemeente druk is met het fietsverkeer en fietsverbindingen van zeeburgereiland richting het centrum.

Eva De Biase: En merkt u dan ook dat dat is gebeurd?

Marten Boerema: Nee, helemaal niks. Het is natuurlijk sowieso een big issue he in Amsterdam. Hoe kom ik over het water heen hoe kom ik van Noord naar Zuid. Hoe gaat dat een beetje veilig met auto en ov en fiets. Als je nu met de fiets moet, dan moet je een heel stuk omrijden. Dat moet je volgens mij over de zeeburger brug of pad, helemaal om. Of je moet over de Schellingwoude brug, dus met de fiets is dat niet helemaal een feestje. En dan scheen het ook niet over de meest leuke plekken van Amsterdam te gaan, dus ja hoe veilig is het dan. Een ander probleem was, met de fiets kun je natuurlijk in de metro. Nee de tram maar die rijdt maar tot 12 uur. En de student komt toch weleens later thuis dan 12 uur. Dus wat daar precies over is afgesproken. GVB heeft aangegeven dat ze langer door rijden, ik weet niet of dat gebeurd is.

Eva De Biase : Vindt u transport enkel een taak van een gemeente of denkt u dat een ontwikkelaar ook actief invloed kan uitoefenen? Denk aan invloed op parkeernormen, ov plekken, hoeveelheid fietsenstallingen, een goede match tussen nieuwe bewoners en transport.

Ja daar kan je wel invloed op uitoefenen absoluut. Ja kijk uiteindelijk de aanleg van de infrastructuur is gewoon een overheidstaak. Maar de discussie over parkeernormen en dat kan je zeker doen.

Eva De Biase: En dat gebeurd ook?

Marten Boerema: Ja, en dan met name discussiëren wij altijd over parkeernormen. Want heel veel parkeerplaatsen maken kost veel geld. En daarin zijn in het verleden ook wel keuzes gemaakt door de gemeente dat er een parkeernorm moet zijn van 1 op 1 of 1 op 1,5 en dan moesten er hele parkeergarages worden gerealiseerd en die staan nu leeg. Dat is toch wel zonde.

Eva De Biase: Ja, vanuit Van Wijnen dus liever minder plekken?

Marten Boerema: a dat ligt aan het project. Je ziet, de gemeente Amsterdam is nu wel daar wel aardig actief mee bezig ten opzichte van andere gemeentes, dat er soms een parkeernorm van 0 is. Dat vind ik wel vooruitstrevend. Of de mogelijkheden met deelvervoer. Volgens mij gaat dat wel goed.

Eva De Biase: En heeft u dan ook het idee dat als de gemeente komt met een parkeernorm van 0 dat er dan ook wel meer wordt gedaan? Als ze dat doen dan moeten de fietspaden wel heel veilig zijn, en het ov heel goed zijn.

Marten Boerema: Ja, daar wordt wel naar gekeken. Een parkeernorm van 0, dat zit in Amsterdam Noord volgens mij, 0 of 0,2. En dan gaat de gemeente op andere locaties wel parkeervoorzieningen realiseren. Ze doen het alleen maar als ov, fiets, dat soort dingen goed geregeld is.

Eva De Biase : Op welke manier kan een ontwikkelaar volgens u transport implementeren in een ontwikkelproces?

Marten Boerema: De parkeernormen. Als je daar goed over na denkt, welke doelgroep ga je huisvesten. Nou weet ik niet hoe het tegenwoordig met studenten is maar ik denk niet dat er heel veel auto bezit is. Dus dat is niet heel veel. Ja, dan kun je daarover wel het gesprek aan gaan. Als de doelgroep studenten is, ja waarom zou er dan een hele hoge parkeernorm moeten zijn. Daar moet je het gesprek over aan gaan. En heb je als doelgroep

net afgestudeerde jong professionals, ook daar gaat het autobezit steeds verder om laag. Daar waar vroeger heel traditioneel iedereen heel snel een auto kocht. Dat is in de grote steden niet meer zo.

Eva De Biase: Is dat meer op gevoel, een inschatting over deze mensen werken hier in de buurt en hebben geen auto nodig?

Marten Boerema: Deels is dat op gevoel, deels is dat op ervaring van andere projecten of van andere ontwikkelaars. Gaan wij woningen bouwen hier in Weesp of in de waarde polder dan weet e hoe het zit. Aan de andere kant. De verbinding Weesp Amsterdam is ook heel goed. Dus ga je appartementjes maken naast het station, dan is een parkeernorm ook niet het grootste ding. Maar bouw je voor gezinnen in de wijk, dan zul je anders over transport en verkeersbewegingen moeten nadenken.

C: Locatie analyse

Eva De Biase: Kent u toevallig de Walk Score, dit is een score in Amerika, Canada, Australië en Nieuw Zeeland die een locatie punten geeft op basis van afstanden naar Supermarkten, scholen, parken, restaurants, en winkels. En er worden voor deze landen ook onderzoeken gedaan over in welke mate deze Walk Score invloed heeft op de waarde van een woning. Welke voorzieningen zijn voor van Wijnen belangrijk in een locatie keuze?

Marten Boerema: Ja, dat is ook weer afhankelijk van. Sommige doelgroepen stellen hele hoge eisen aan voorzieningen en sommige niet. Bouw je voor hele oude doelgroepen die niet meer met de auto kunnen of hulp behoevend zijn. Dan wil je wel graag wat voorzieningen dichtbij. Of gezondheidszorg of een supermarkt dat ze eventjes een wandelingetje hebben. Maar woon jij met je gezin, ja, in een woonwijk. En de supermarkt is op vier kilometer. Dan maakt dat ook niet zo veel uit want je hebt een auto en dat kun je organiseren met elkaar.

Eva De Biase: Dus als ik het goed begrijp is het, we hebben een locatie en aan de hand daarvan kiezen we de doelgroep. Of proberen jullie bij de gemeente of iets dergelijks te pushen. Dat de locatie moet veranderen voor de doelgroep?

Marten Boerema: Ja beide, gebeurd beide,. Soms zijn er uitleg locaties die je al in bezit hebt en dan ga je et andere eigenaren en de gemeente in overleg over hoe gaan we dit organiseren. En soms zijn alle voorzieningen al in de buurt. Staat er en oud kantoor, groot kantoor. Of je sloopt het eraf en je koopt wat nieuws. Dan heb je te doen met wat er is, dus ja, wisselend.

Eva De Biase: Hoe wordt de locatie keuze voor nieuwe ontwikkelingen gemaakt?

Marten Boerema: Ja dat is op dit moment eigenlijk niet zo moeilijk. Alles wat je zou kunnen kopen en wat haalbaar is dat koop je. Dan kijk je ook nog wel naar de tijd. Hoelang duurt het als er een hele lange periode is, bestemmingsplan dat soort dingen moeten veranderen, dat kans soms wel jaren duren, dan ben je wat voorzichtiger. Dan koop je liever een locatie waar al voorzieningen in de buurt zijn. En als het dan wat langer duurt dan duurt het maar langer. Zijn er geen voorzieningen dan wil je de periode van ontwikkelen korter hebben.

Eva De Biase: En is dat altijd zelf aangekocht, dus niet een tender?

Marten Boerema: Ja, beide. We doen eigenlijk alles wel. Ja, het liefst niet uit een tender. Onzeker, de concurrentie is gewoon groter en de kans op slagen is gewoon kleiner. Dan kun je beter zelf opzoek gaan naar locaties in plaats van in een tender.

Eva De Biase: Op welke schaalgrootte worden locatie onderzoeken gedaan? Is dat stads niveau, wijkniveau, plot niveau?

Marten Boerema: Kijk in Amsterdam ga ik niet heel Amsterdam meer onderzoeken. Dat ken je dan al wel. Daar kijk je dicht omheen en dan kijk je naar verbindingen. Naar het centrum hoe zijn de fietsverbindingen. Ga je in een hele nieuwe gemeente die je niet zo goed kent dan onderzoek je het beter. Hoe zit de bevolking in elkaar, welke doelgroep. Dus afhankelijk van de locatie..

Eva De Biase: Voor mijn master moet ik natuurlijk literair onderzoek doen. En hierin heb ik onderwerpen gevonden die belangrijk zijn voor de gebouwde omgeving en transport. Dit zijn Identiteit en levensstijl, Mobiliteit, Natuurlijke elementen, Dichtheid, Economische activiteit en Functies. In hoeverre kunt u zich vinden in dit lijstje? En zouden dit onderwerpen zijn die houvast kunnen geven bij een locatie onderzoek?

Marten Boerema: Ja, kijk, wat ik zeg, afhankelijk van hoe goed je de locatie kent. In Amsterdam hoef je niet heel veel onderzoek te doen. Maar ga je naar een plaatsje als Nigtevecht dan moet je wat specifieker kijken want je hebt wat minder informatie en wat minder kans om juist te scoren. Kijk in Amsterdam is de vraag zo groot daar krijg je zelfs een schoenendoos verkocht zeg ik dan altijd. Dan nog moet je goed kijken want, als je het beter doet kun je de waarde optimaliseren. Maar in kleine gemeente zijn de risico's gewoon groter. Dan doe je bijvoorbeeld een concurrentie onderzoek. Als er maar 100 mensen naar een nieuw huis opzoek zijn, en er zijn al 3 ontwikkelaars bezig, ja misschien moet je het dan niet kopen. Ondanks dat het misschien een mooie plek is. Of je zegt nu niet maar misschien over drie jaar pas. Dat heb je in Amsterdam natuurlijk helemaal niet. Maar dat was ook vijf jaar geleden anders hoor.

D: Data

Eva De Biase: Onderzoekt u zelf parkeernormen of hoeveelheid fietsenstallingen die nodig zijn of vindt u dit echt een taak van de gemeente?

Marten Boerema: Ja vaak zin het gewoon normen. Fietsenstallingen en dat soort dingen zijn ook normen die in het bouwbesluit staan. Gemeente Amsterdam wijkt daar wel wat van af. Dat je gemeenschappelijke fietsen bergingen of individuele fietsenbergingen mag doen. Wij doen daar zelf niet heel groots onderzoek naar. Wel als je in discussie bent met de gemeente over parkeernormen, dan vraag je wel aan de gemeente van kijk daar ook eens praktisch naar. Maar vaak liggen parkeernormen vast in gemeentelijke verordeningen. En ook al wil de gemeente, kunnen ze niet eens afwijken. Want dan krijgen zij weer discussies met andere ontwikkelaars, van waarom mag van Wijnen het wel en wij niet.

Eva De Biase: Gebruikt u momenteel big data voor de locatie of bereikbaarheid analyse van een nieuwe ontwikkeling? Zo ja, welke en hoe? Zo nee, welke informatie gebruikt u wel?

Marten Boerema: Ja wel een beetje, maar niet heel specifiek big data. We hebben nu twee pilots lopen eentje met Eiffel die koppelt heel veel aan big data. We hebben een ontwikkeling in Laren. Daar moeten 400 woningen komen en daar hebben wij op basis van big data een doelgroepen analyse gedaan. Over welke mensen daar zouden willen en kunnen wonen. Hebben wij niet zelf gedaan, maar daarover zijn wij in gesprek gegaan met de gemeente. Ik weet niet hoe ze die analyse hebben gedaan, maar zij hebben daar allerlei modellen voor en daar is iets uit gekomen. Dat hebben wij gepresenteerd samen aan de gemeente en die was daar zeer enthousiast over. En wij hebben een andere ontwikkeling in Apeldoorn gedaan. En die koppelen allemaal bestanden aan elkaar over welke voorzieningen waar zitten. En dan hebben zij volgens mij 70 of 80 verschillende doelgroepen. En dan kwam daaruit deze locatie is het beste voor. En dan was ik daar nog wel een beetje sceptisch over want het lag tegen het centrum aan, ja dit is wel geschikt voor ouderen. Ja dat wisten we zelf ook al. Dat had je van te voren ook wel kunnen zien.

Eva De Biase: Ik onderzoek Big Open Linked Data. Uitleg. Social data, Sensor data, Registration data. Welke van deze typen BOLD zijn een toevoeging voor uw analyse proces?

Marten Boerema: Ja tuurlijk is dat handig, maar, ja, als of je daar dan daadwerkelijk iets mee doet. Het gaat natuurlijk om het omzetten. Hoe ga je die data precies omsluiten. Er is zo veel data. Wat ga je er precies mee doen. Vroeger was het natuurlijk geweldig met Google, maar nu typ je iets in en denk je pfoe welke neem ik al eerste. Dus het omsluiten van de data dat is het belangrijkste wat er is.

Eva De Biase: Welke rol moet de gemeente spelen in het zichtbaar maken van deze data? Merkt u bijvoorbeeld dat u bepaalde informatie soms mist?

Marten Boerema: Ja mis je weleens gegevens. Nou. Weet ik niet. Niet direct. Kijk als je niet weet dat er iets is dan mis je het ook niet. Nee.

Eva De Biase: In hoeverre denkt u dat type bewoners invloed hebben op transport?

Marten Boerema: Ja dat is groot. In het verleden moesten ook alle woningcorporaties overal parkeerkelders maken. Maar de sociale huurwoningen die mensen zijn blij dat ze hun huur kunnen betalen, dus die mensen hebben helemaal geen geld voor een auto. En in het verleden hebben we weleens mis gezeten, dus of te veel, of te weinig. Ja het gaat heel snel, vroeger wilde iedereen een auto en nu is auto bezit niet het grootste genot dat er is. Dus dat veranderd wel snel. Ja, je zou daarmee moeten experimenteren. Dat gebeurd in Amsterdam veel, in Utrecht ook veel. Ja de wegenstructuur houdt het niet meer vol. Vroeger hadden ze bedacht we maken gewoon geen parkeerplaatsen en dan zullen mensen hun auto wel weg doen. Dat werk dus ook niet.

E: Smiley

Eva De Biase: Hoe zijn jullie aan het plot gekomen? Tender of zelf geselecteerd?

Marten Boerema: De locatie was van woningbouw de Key, die hadden een selectie uitgeschreven. Wie kan hier het meest efficiënt studenten woningen maken. Die selectie wonnen wij als van Wijnen. Maar de Key bleek achteraf te weinig geld te hebben voor de realisatie. Dus toen hebben wij gezegd, als wij iemand vinden die het wel kan betalen. Nou uiteindelijk ging dat ook niet door. Dus uiteindelijk hebben wij met de gemeente Amsterdam een overeenkomst gesloten om het te kopen. En uiteindelijk een belegger en een huurder gevonden.

Eva De Biase: Hoe bent u omgegaan met transport in deze buurt?

Marten Boerema: Wij eigenlijk niet. Want de hele woonwijk zeeburgereiland is ontwikkeld door de gemeente met de hele infrastructuur erbij. Door duwo zijn er wel gesprekken geweest met de gemeente. Buiten ons om.

Eva De Biase: Hoe bent u bij deze ontwikkeling omgegaan met de verhouding tussen auto, openbaar vervoer en fiets gebruik? Parkeernorm, hoeveel fiets.

Marten Boerema: Fietsen zijn, het zijn studenten kamers, een student per kamer, een gemeenschappelijke fietsenberging, 1 fiets per kamer. En openbaar parkeren auto's was een norm van de gemeente. Denk dat het er 20 of 30 zijn geweest voor het gebouw.

Eva De Biase: Wat vindt u van het voorzieningen niveau in dat gebied?

Marten Boerema: Ja volgens mij zijn er niet echt voorzieningen.

Eva De Biase: In relatie tot de bereikbaarheid, transport en de voorzieningen in en rondom het gebouw, wat zouden mogelijke verbeteringen zijn volgens u?

Marten Boerema: Ik denk hoe kom je over eiburgerlaan heen. En in de tunnel kun je daar op een of andere manier ook voorzieningen voor de fiets maken. De tram is natuurlijk fantastisch, maar hoe ko je veilig bij de tram. En kun je ook makkelijk met de fiets naar het centrum.

F: Overig

Eva De Biase: Zijn er nog andere analyse technieken die gebruikt worden (of die de gemeente of ontwikkelaars) in uw ogen zouden moeten gebruiken bij het onderzoeken van een potentiele ontwikkellocatie? Oftewel is er nog informatie die mist bij het ontwikkelproces?

Marten Boerema: Nou bij deze ontwikkeling niet al de onderzoeken zijn natuurlijk gewoon door de gemeente gedaan. Voordat we hadden besloten om zeeburgereiland om te turnen naar een woonwijk. Heb je hele grote ontwikkelingen in Weesp Bloemendale polder waar 2700 woningen komen daar doen we het samen met de gemeente en de andere grondeigenaar. Dus hoe groot, waar is de locatie en op welk moment stap je in. Eigenlijk was Zeeburgereiland al ontwikkeld en moesten er alleen nog mensen gevonden worden om de gebouwen te realiseren. Een weiland met koeien dat je 15 aar geleden hebt gekocht, daar gaan we nu pas aan beginnen dus dat is heel anders.

Appendix E: Dimensions and indicators selected

(Source: Gonçalves et al. (2017))

Dimensions and indicators selected.

Dimension	Aspect	Indicator
Mobility	Public transport supply	Distance in public transport to the municipality (km)
		Travel time in public transport to the municipality (min)
		Distance in public transport to Lisbon (km)
		Travel time in public transport to Lisbon (min)
		Modal split by bus (%)
		Modal split by Metro/underground (%)
		Modal split by train (%)
	Car dependency	Modal split by car (%)
		Motorization rate
	Commuting	People who work or study in other municipality (%)
	Road network	Road network density (km/km^2)
	Road vs street conflict	Pedestrian accident index
		Road network in urban areas (%)
Identity and lifestyle	Identity recomposition	Proportion of new residents in 2011 compared to 2005, originating from other parish in same municipality, other municipality or other country (%)
		Percentage of resident population born in the parish they currently reside in (%)
		Change in resident population between 2001 and 2011 (%)
		Proportion of new residents in 2011 compared to 2005, originating from another parish in the same municipality (%)
		Proportion of new residents in 2011 compared to 2005, originating from other municipality (%)
		Proportion of new residents in 2011 compared to 2005, originating from other country (%)
		Variation in the 'weight' of population with higher education between 2011 and 2001 (%)
		Location coefficient – couples with children
		Location coefficient – unipersonal family cores
		Location coefficient – other coreless families
		Location coefficient – couples without children
		Location coefficient – single parents
		Location coefficient – complex families
		Aging index change (%)
		Change in number of detached single-family homes(%)
		Weight of secondary housing in 2011 (%)
		Change in weight of secondary housing between 2001 and 2011 (%)
		Location coefficient – detached single-family homes
		Land-use changes between 2000 and 2006 (%)
		Percentage of RSI (social integration income) beneficiaries (%)
		Change in rejuvenation index (%)
	Relationship with the community	Average percentage of voters in local elections in 2005 and 2009 (%)
Economic activities	No defined specialization	Specialization of employment, based on 2011 Population Census
		Employment specialization index, based on data tables from the Ministry of Economy and Employment (Portugal)
		Company specialization index, based on data tables from the Ministry of Economy and Employment (Portugal)
	Multiplicity of economic activities	Employment diversification index, based on data tables from the Ministry of Economy and Employment (Portugal)
		Diversification of employment, based on 2011 Population Census
		Company diversification index, based on data tables from the Ministry of Economy and Employment (Portugal)
		Location coefficient – employment in Logistics and Distribution Sector
	Special presence of agriculture	Location coefficient – employment in agricultural sector
		Location coefficient – enterprises in agricultural aector
		Percentage of land classified as agricultural use (%)
	Agro-industrial presence	Significance of agro-industrial sector (%)
	Agricultural business structure	Average size of agricultural farm (ha)
		Proportion of farmers under 65 years (%)
		Proportion of agricultural producers performing other economic activities in addition to agriculture (%)
		Average size of agricultural farms (no. of employees)
		Proportion of "*Caixa Agrícola*" branches/agencies in relation to total (other) bank branches (%)
	Attractiveness	Average value of housing supply (€/m^2) (sensitive values)
		Index of corporate rent – warehouse (industry) (€/m^2) (confidential)
		Requests for construction (%)
Spatial functions	Availability of technical infrastructures and basic services	Dwellings for habitual residence without running water (%)
		Dwellings for habitual residence without wastewater drainage (%)
		Buildings not served by municipal solid waste collection (%)
	Housing function	Population density in urban areas (inhabitants/hectare)
	Specialized functions	Centrality potential
Natural elements	Availability of semi-natural and green areas	Percentage of area occupied by green elements (%)
		Percentage of area occupied by land cover categories with natural value (%)
		Percentage of area classified as Natura 2000 (%)
	Coexistence of continuities and discontinuities	Largest patch index of elements with natural value
		Number of patches with natural value
	Presence of water	Length of channels (km)
Land cover	Land cover diversity and interspersion	Percentage of area occupied by agro-forestry systems (%)
		Percentage of area occupied by annual crops (%)
		Percentage of area occupied by permanent crops (%)
		Percentage of area occupied by forest (%)
		Percentage of area occupied by shrublands (%)
		Percentage of area occupied by farmland mosaic (%)
		Percentage of area occupied by other artificial surfaces (%)
		Percentage of wetlands (%)
		Percentage of area occupied by urban areas (%)
		Land cover variety
		Total number of patches
		Total edge density (km/km^2)
	Housing density	Housing density (residential units/km^2)
	Urban-rural interface	Total urban-rural edge (km)
		Total urban-rural edge per urban unit (km/km^2)
	Rural continuity	Largest patch index of rural areas (%)
	Urban morphology	Number of urban patches
		Standard deviation of the urban patch size