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

Management in the Built Environment
Delft University of Technology

Graduation committee
Prof. Dr. E.M. van Bueren
Prof. Dr. ir. A. Koutamanis
Ir. M.G.F. Overschie

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EVA DE BIASE
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Content

1. Motivation
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3. Methodology
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Motivation

Transportation

Hanoi, Vietnam
march 2016

Big data

Slimmeengezondestad, 2017

Project development

Research background

Problem field

Many ambitions, no solutions

Problem field

Many ambitions, no solutions

Less money and space for transport

Problem field

Many ambitions, no solutions

Less money and space for transport

New residential buildings, more people

Problem field

Many ambitions, no solutions

Less money and space for transport

New residential buildings, more people

Transportation not adequately analysed

Problem field

Many ambitions, no solutions

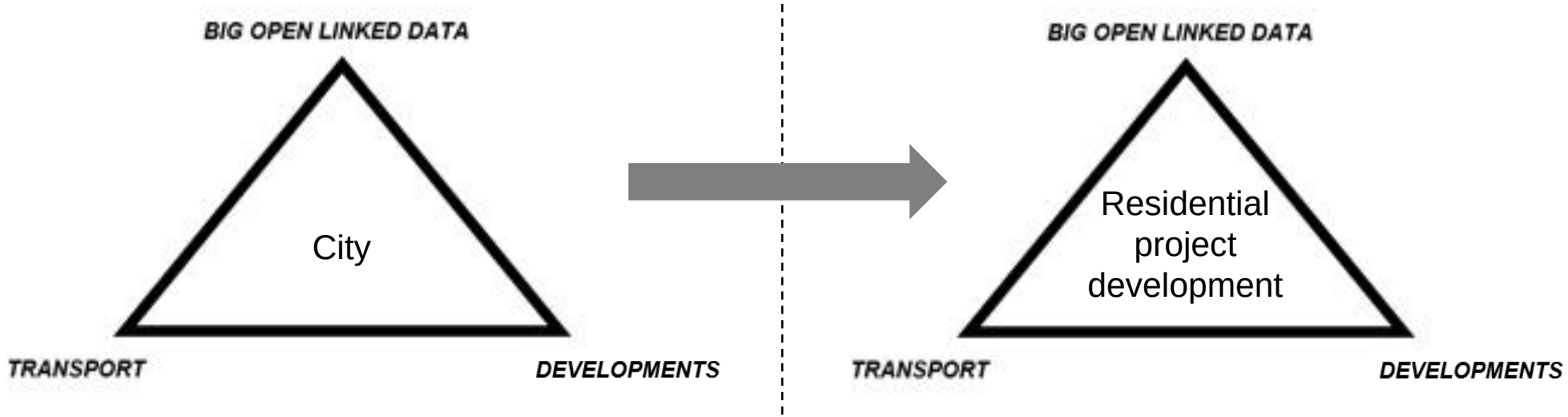
Less money and space for transport

New residential buildings, more people

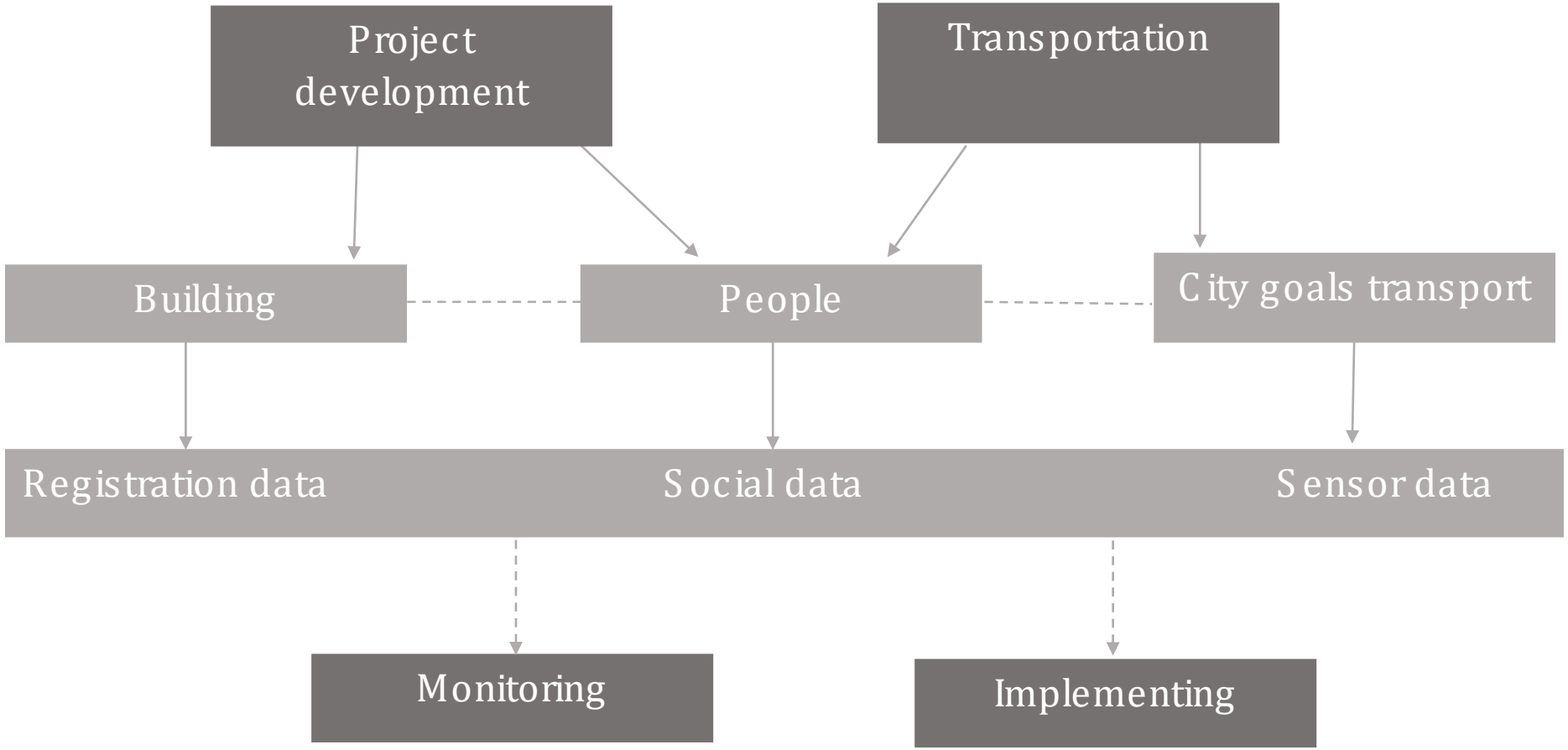
Transportation not adequately analysed

From data to information

Research triangle



Research overview



Utilisation

The developer

Utilisation

The developer

Connection building and transport

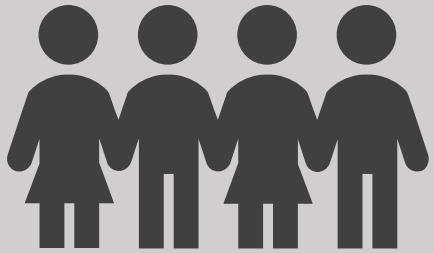
Utilisation

The developer

Connection building and transport

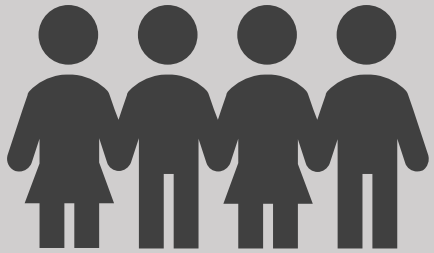
The municipality

Relevance

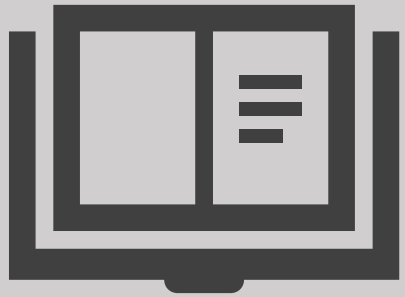


Every user of transportation

Relevance

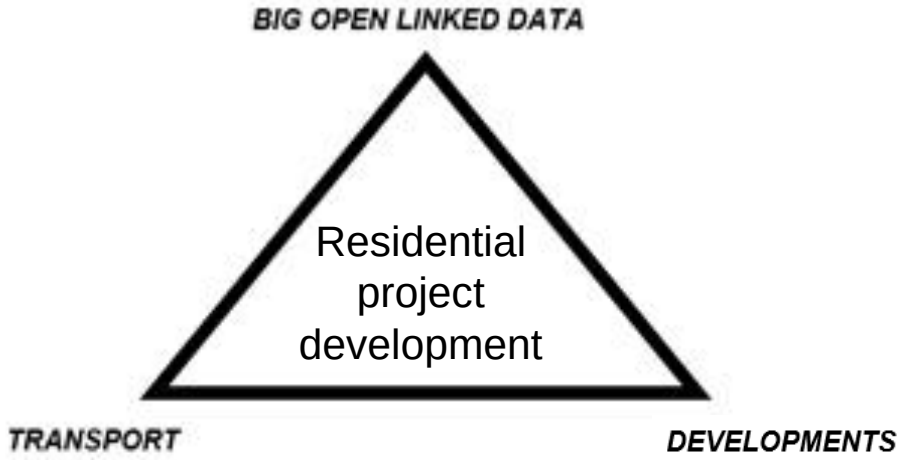


Every user of transportation



Limited body of knowledge

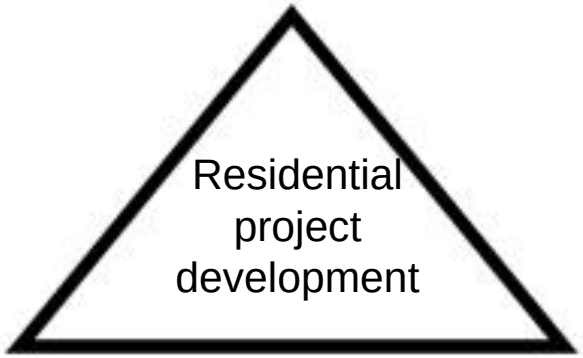
How can the triangle relation between project development, transportation and Big Open Linked Data be used in the process of monitoring and implementing ambitions for residential project developments?



Research sub-questions

Big Open Linked Data

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



Transport

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 for a certain type of transport?

Project development

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

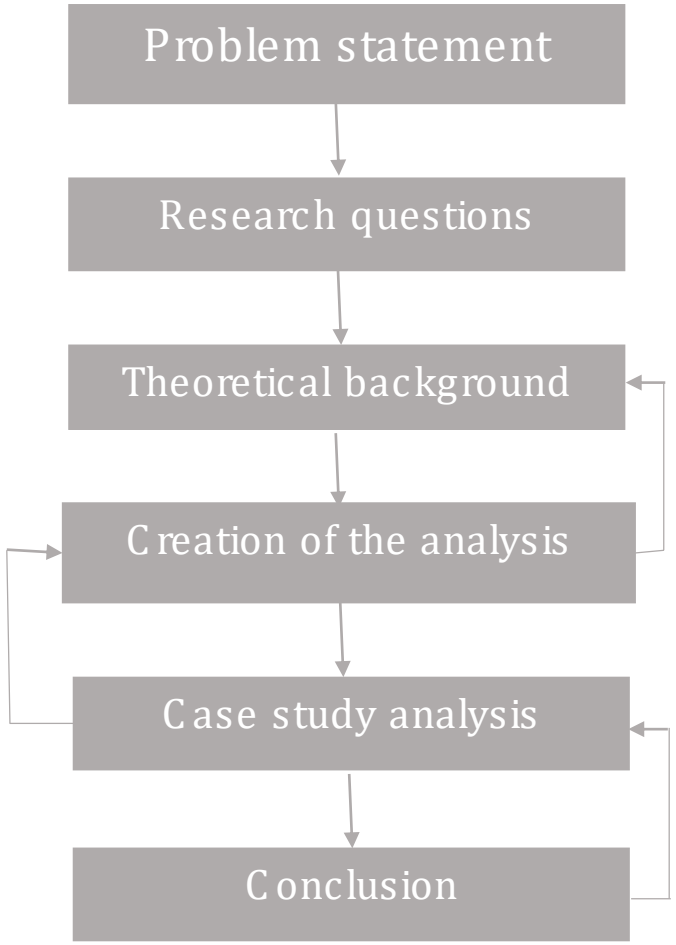
C. How does a project developer include transportation into the development process?

Hypothesis

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

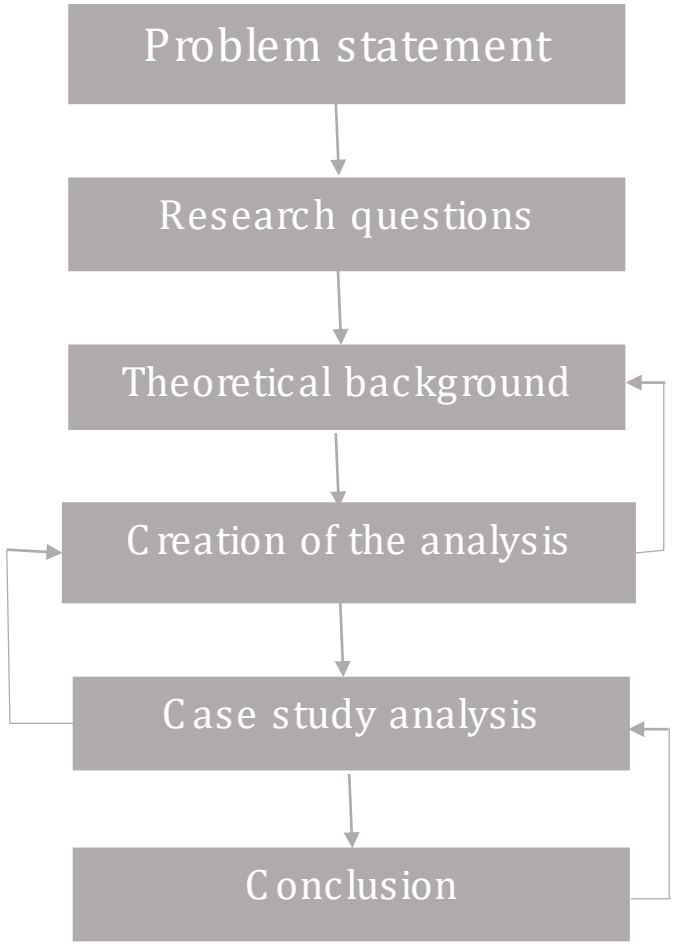
Methodology

Research steps



Research steps

- Mobility agenda's municipality
- Scientific research
- Case studies
- Site visit
- Questionnaire
- Semi-structured interviews



Case studies

Similarities

- + 100 units
- Residential market
- Year of completion 2016
- Transport systems
- Availability of data

Differences

- Neighbourhood
- Typology building

900 Mahler

amsterdamwoont.nl, n.d.

ArchiNed, n.d.

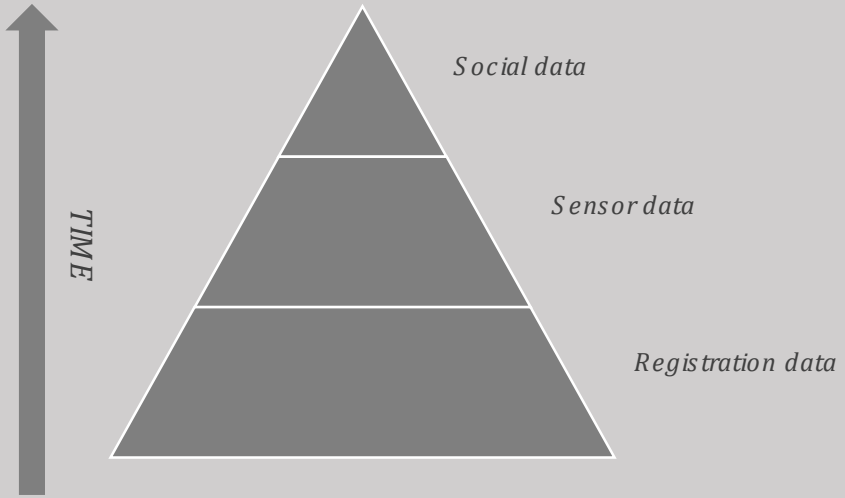
Smiley

Kwintijn

Faro, n.d.

Research output

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



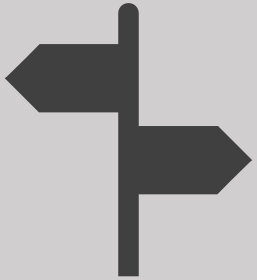
	SOCIAL DATA	SENSOR DATA	REGISTRATION DATA
What	Everything that people have posted on the internet	Everything that is captured by sensors	Everything that is registered
When	People decide how often they make use of the data sources	Real time data Changes constantly	Does not change often Changing something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

Sagl et al., 2012; Mc Afee et al., 2012; Salas-Olmedo et al., 2017

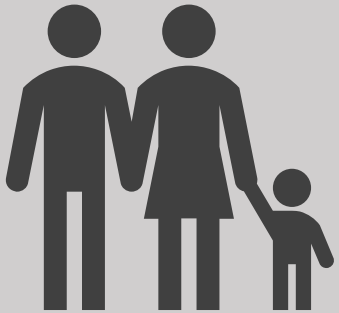
B. What are the main factors that make transportation important for a project development?

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

Building value



Transport related factors



Target group

Li et al., 2017; Muley et al., 2017; Zondag et al., 2005; Wang et al., 2011; Suparmono et al., 2017

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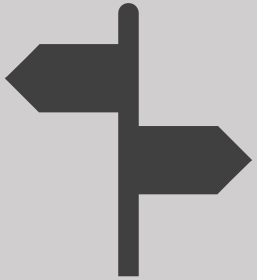
Building value



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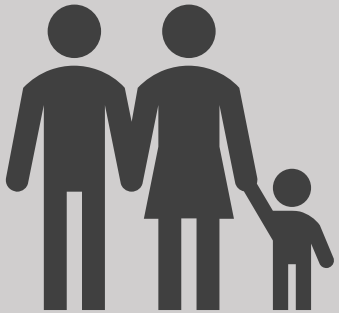

Target group

Lasley, 2017; Salas-Olmedo et al., 2017

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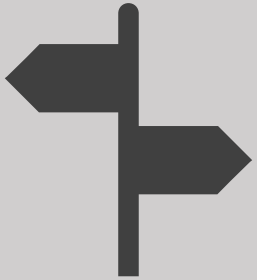

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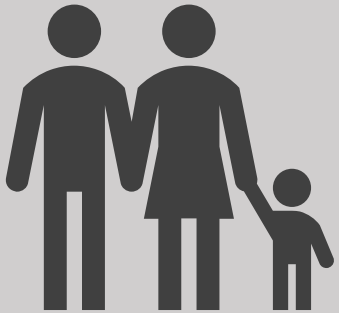

Target group

De Araujo et al., 2017

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

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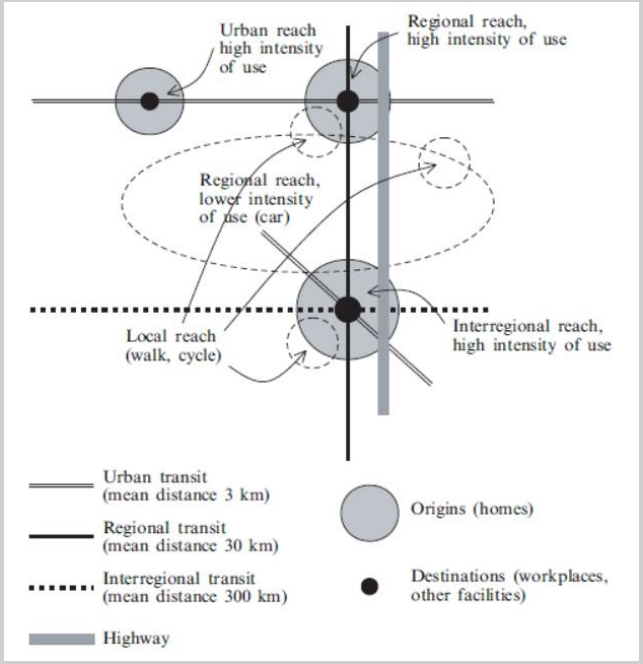
Smarter not always better



Ideal typical model

Promotion

Bertolini et al., 2005; Chorus et al., 2011

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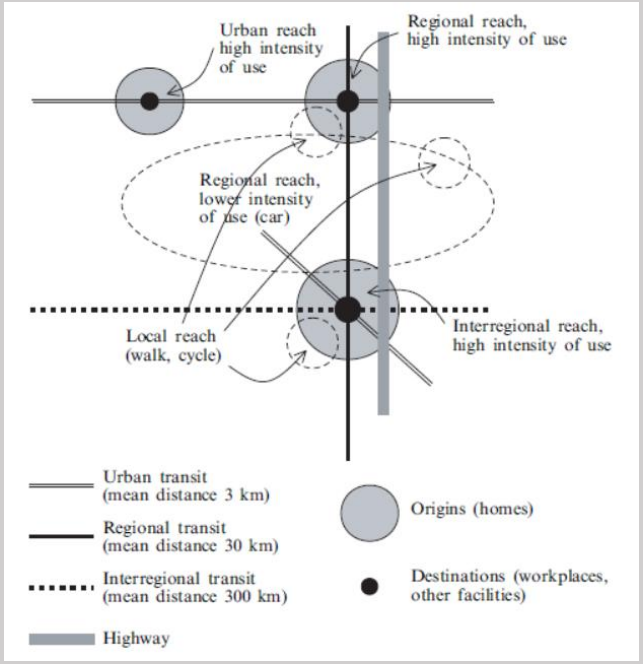

Ideal typical model

Promotion

Berlolini et al., 2003

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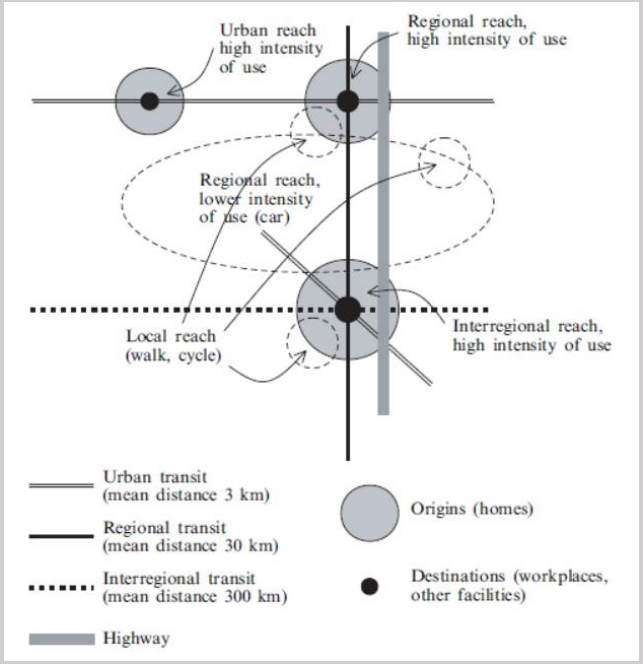
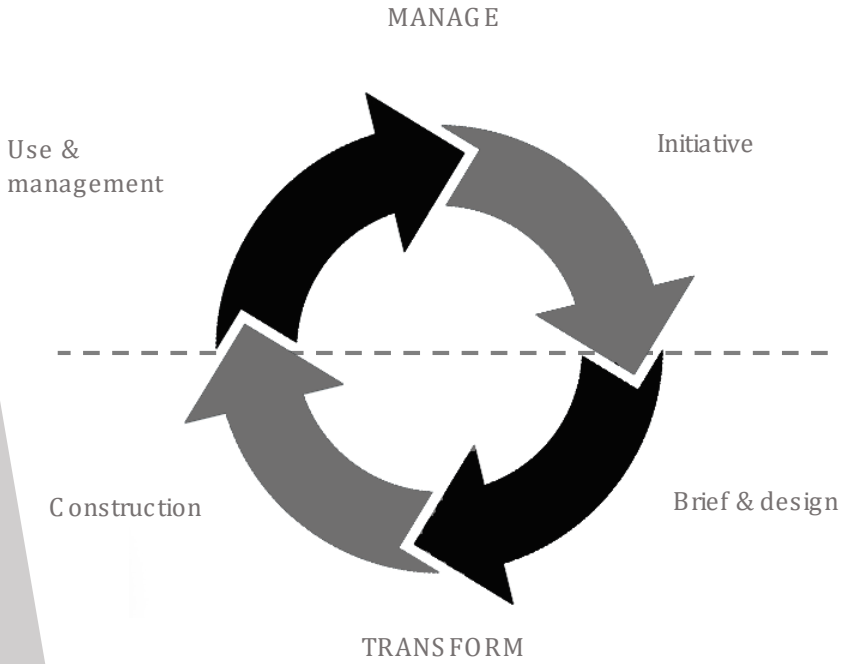


Ideal typical model

Promotion

Bertolini et al., 2005; Thomas et al., 2015; Martens, 2007; Van der Horst et al., 2014

BOLD-driven method



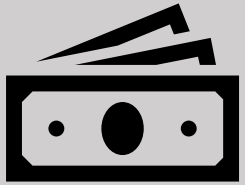
Remøy, 2010

BOLD-driven method

Location background

Identities and lifestyle

Natural elements



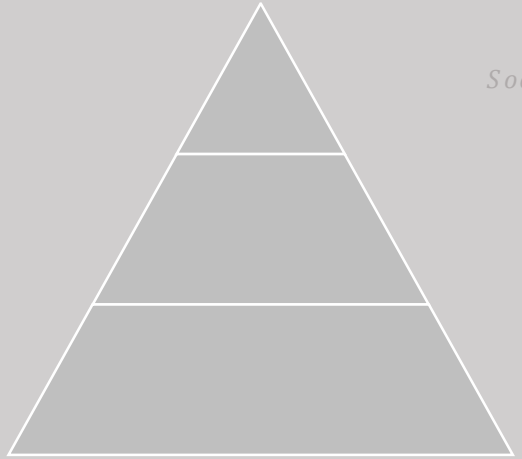
Economic activities

Spatial functions

Landcover

Gonçalves et al., 2017

Mobility



Social data

Sensor data

Registration data

BOLD-driven method

Location background

Typology building
Type of residential units
Amount of new residents
Change resident population 5 years
Couples with children
One person households
Couples without children
Single parents
Other ‘’complex’’ families
Age index
Significant land use changes
Amount of social housing

Qualitative green or water

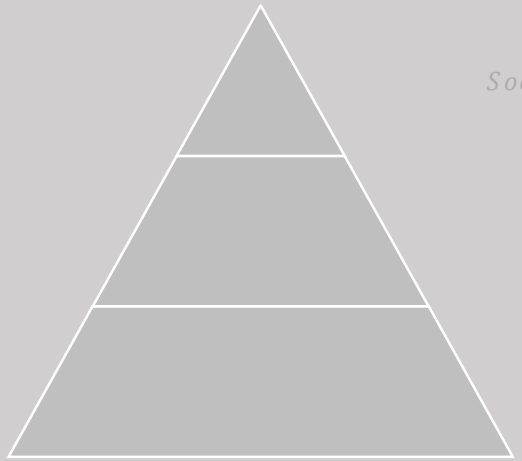
Housing density

Average value of housing supply

Population density

Centrality potential

Mobility



BOLD-driven method

Location background

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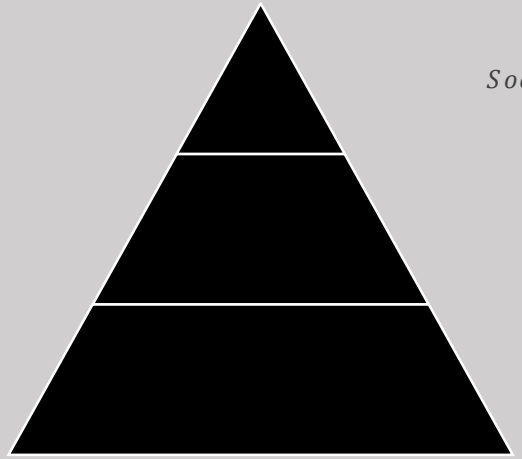
Mobility



Social data

Sensor data

Registration data

TIME

BOLD-driven method

Location background

Identities and lifestyle

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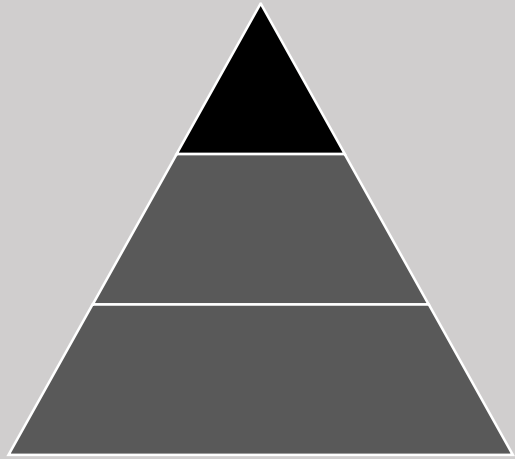
Gonçalves et al., 2017

Mobility



Mobility patterns

Safety and

(dis)satisfaction

BOLD-driven method

Location background

Identities and lifestyle

Natural elements

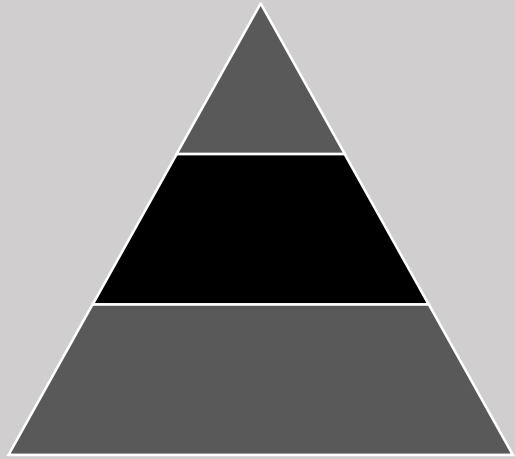
Economic activities

Spatial functions

Landcover

Gonçalves et al., 2017

Mobility



Distances

Modal split

% of people who own more than one car

Bicycles at depot

Plusnetten

Mobility patterns

BOLD-driven method

Location background

Identities and lifestyle

Natural elements

Economic activities

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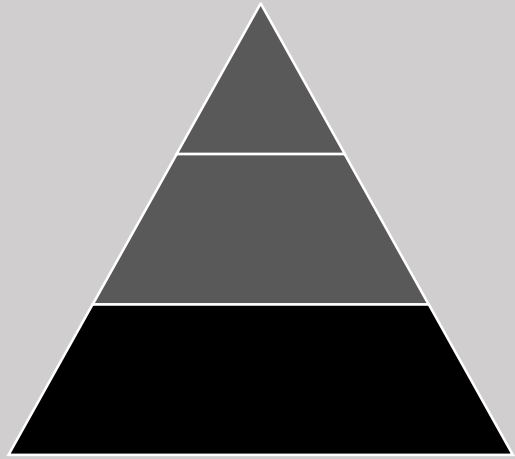
Landcover

Gonçalves et al., 2017

Mobility



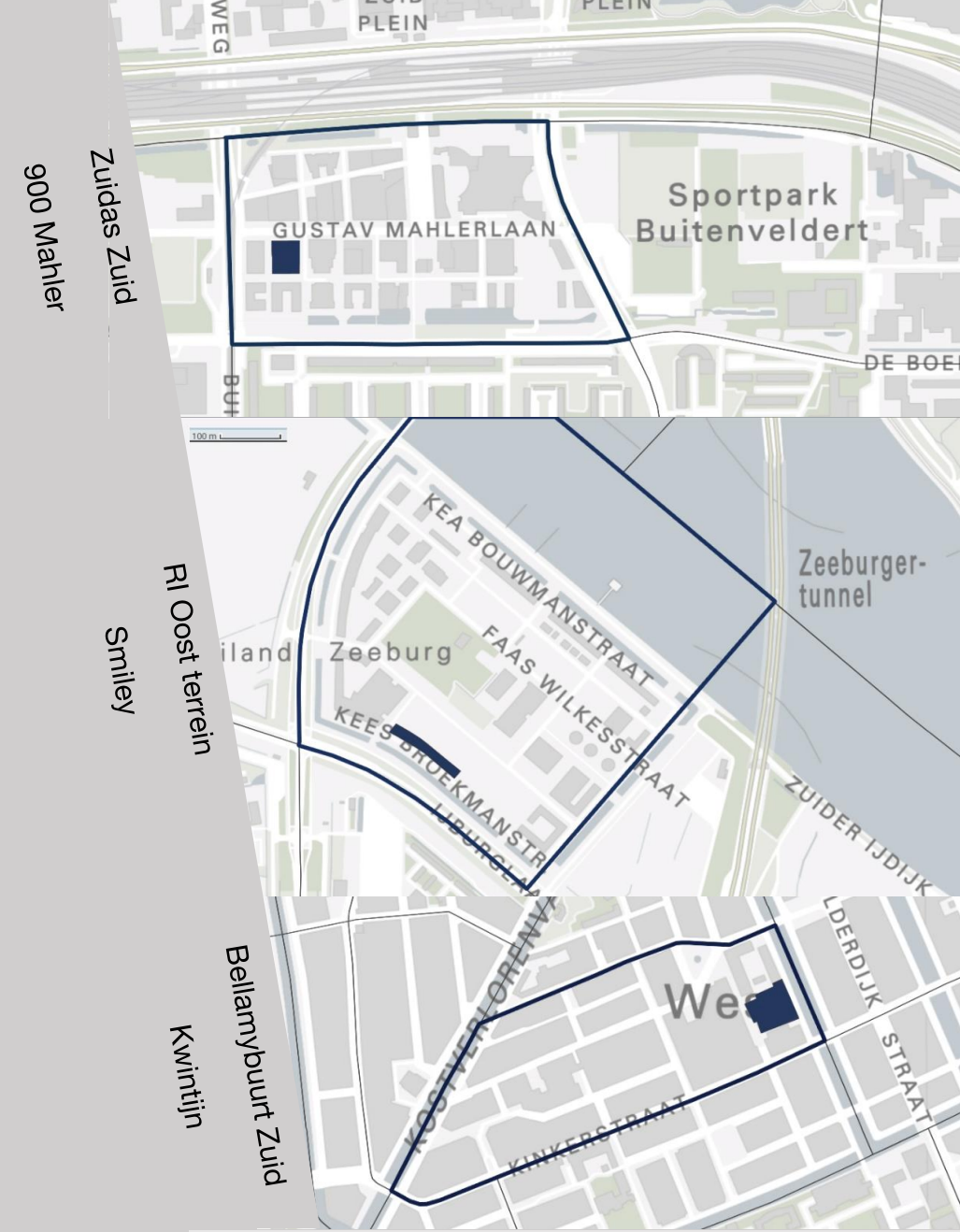
Building exits

Parking ratio

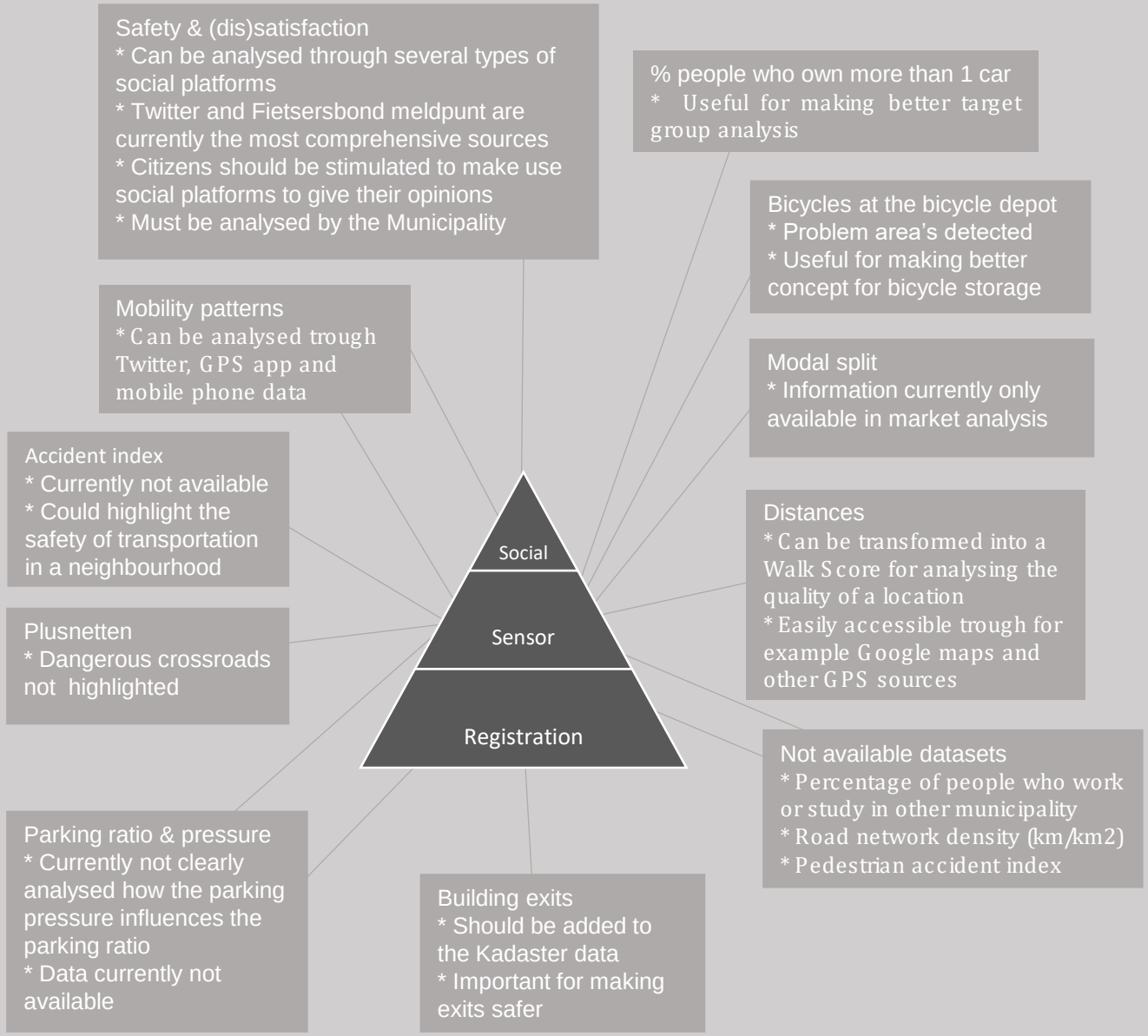
Location background

	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*	+++	+	+++

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



Mobility


Safety & (dis)satisfaction
* Can be analysed through several types of social platforms
* Twitter and Fietsersbond meldpunt are currently the most comprehensive sources
* Citizens should be stimulated to make use social platforms to give their opinions
* Must be analysed by the Municipality
% people who own more than 1 car
* Useful for making better target group analysis
Bicycles at the bicycle depot
* Problem area's detected
* Useful for making better concept for bicycle storage
Mobility patterns
* Can be analysed trough Twitter, GPS app and mobile phone data
Modal split
* Information currently only available in market analysis
Accident index
* Currently not available
* Could highlight the safety of transportation in a neighbourhood
Distances
* Can be transformed into a Walk Score for analysing the quality of a location
* Easily accessible trough for example Google maps and other GPS sources
Social
Sensor
Registration
Plusnetten
* Dangerous crossroads not highlighted
Not available datasets
* Percentage of people who work or study in other municipality
* Road network density (km/km2)
* Pedestrian accident index
Parking ratio & pressure
* Currently not clearly analysed how the parking pressure influences the parking ratio
* Data currently not available
Building exits
* Should be added to the Kadaster data
* Important for making exits safer

Semi-structured interviews

Gemeente Amsterdam

Ger Baron
Chief Technology Officer
Municipality of Amsterdam

G&S

Kasper Hesp
Development manager
G&S vastgoed
Developer 900 Mahler

VAN WIJNEN

Marten Boerema
Commercial director
Van Wijnen Midden
Developer Smiley

Fons Kurvers
Commercial director
van Wijnen West
Developer Kwintijn

Semi-structured interviews

The municipality of Amsterdam

- Does not use social data
- Currently analyses transportation on a large scale for the detection of problem areas

Semi-structured interviews

The municipality of Amsterdam

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- Currently analyses transportation on a large scale for the detection of problem areas

Semi-structured interviews

The developers

- Do not deploy a location or transport analysis
- Distinction between investments and commissioned projects
- Often have a different vision than the municipality
- Have the obligation to listen

Semi-structured interviews

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Semi-structured interviews

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- Distinction between investments and commissioned projects
- **Often have a different vision than the municipality**
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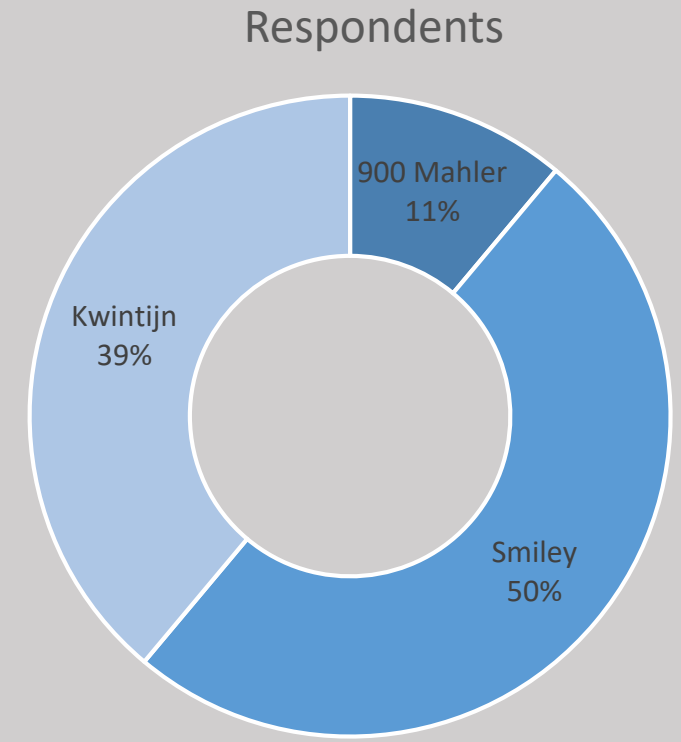
Semi-structured interviews

The developers

- Do not deploy a location or transport analysis
- Distinction between investments and commissioned projects
- Often have a different vision than the municipality
- **Have the obligation to listen**

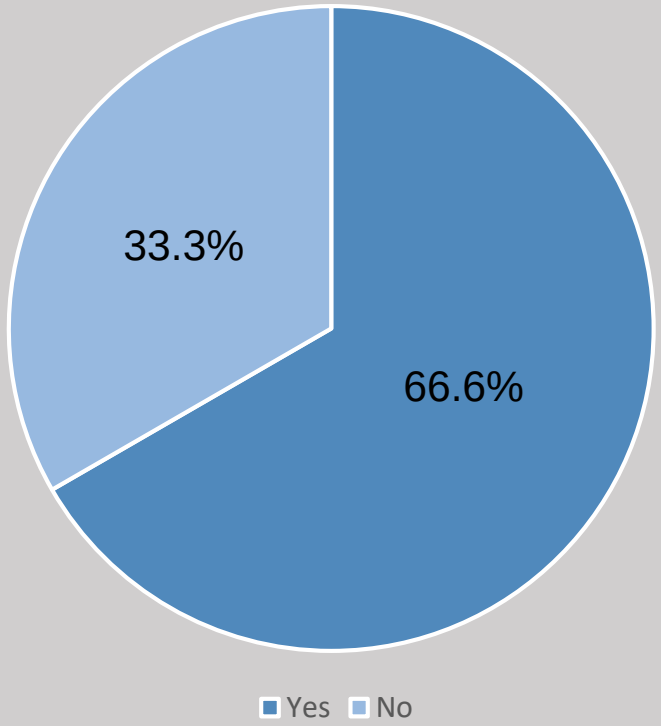
Site visit and questionnaire

18 respondents

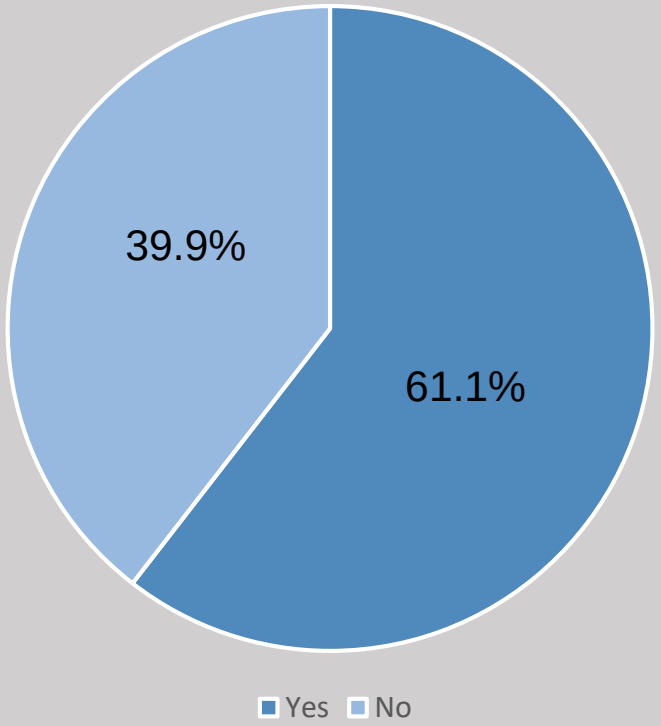


Site visit and questionnaire

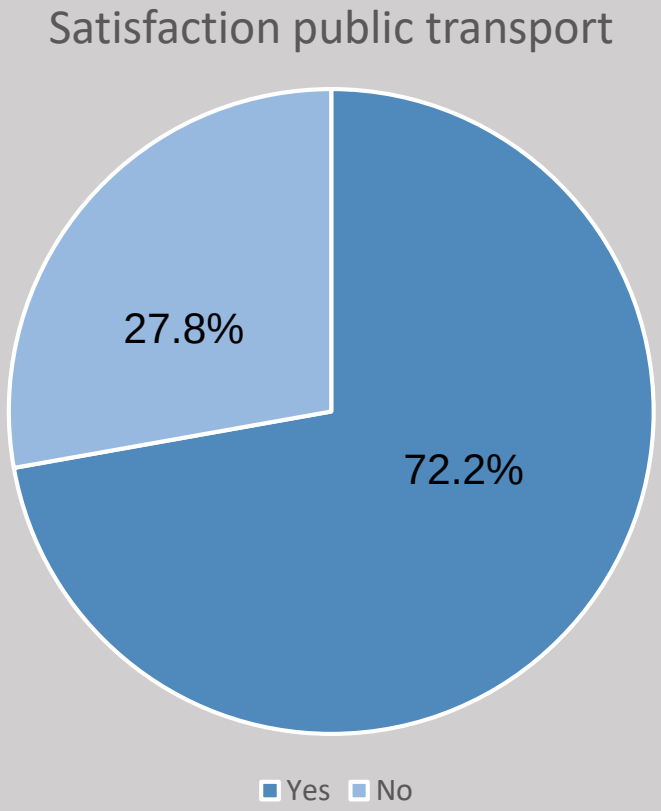
Enough amenities

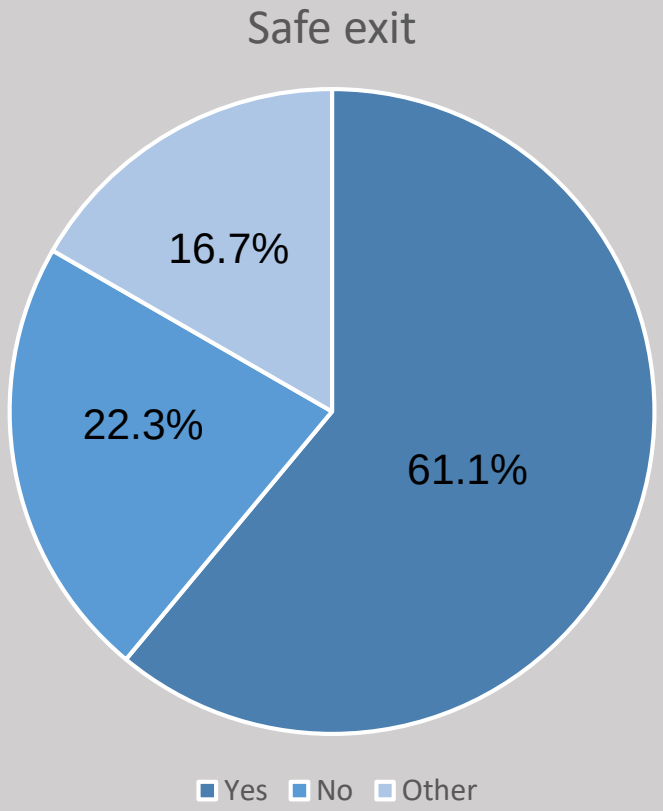


Enough bicycle storage



Site visit and questionnaire





Problems and improvements

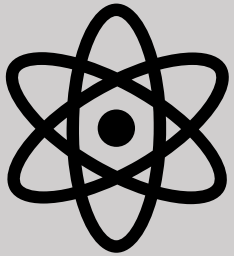
Anticipate upon

- 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
- Bicycle racks outside the building not used properly or not at all
- Bicycles parked against the building and in gardens
- Not enough (affordable) parking space
- Dangerous exits parking garage

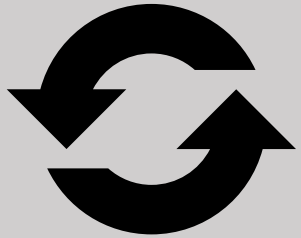
Negotiate upon

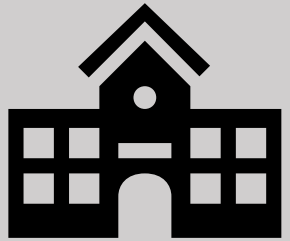
- A fiscal barrier between two parts of the city due to the tramline
- Dangerous bicycle paths at crossroads
- Traffic jams in busy hours at crossroads
- Many delays in public transport
- Insufficient daily amenities in the neighbourhood

Incentives public parties



Municipality promotes innovative methods





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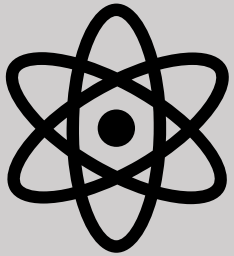
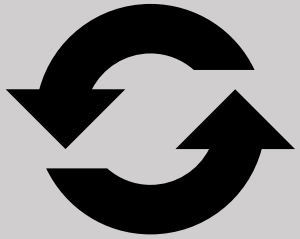
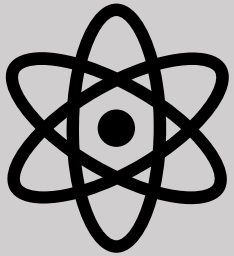
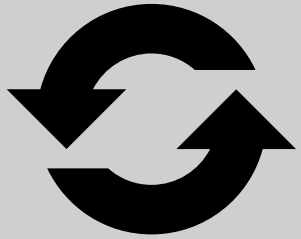




Municipality states they want to be more adaptive

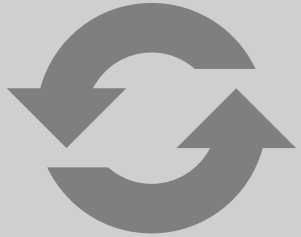
Incentives public parties

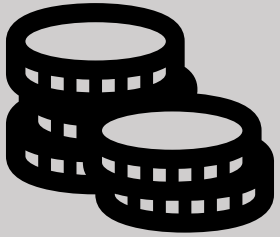




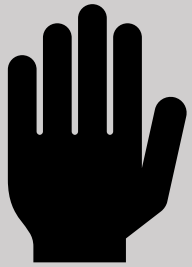
Implementing data in planning regulations

Turn offs public parties

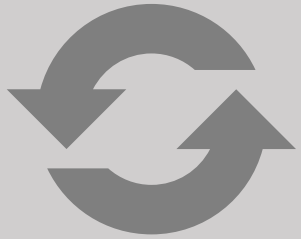


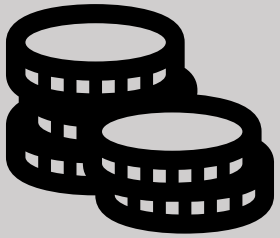


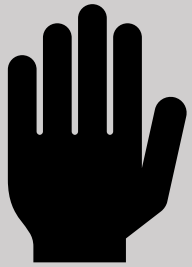
Less money for transportation



Turn offs public parties







Need for permits

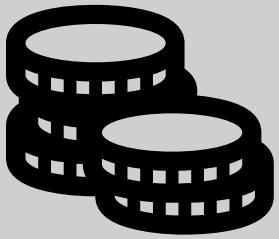
Incentives private parties

Increase in building value

Incentives private parties

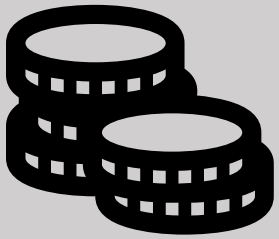
People's choices

Turn offs private parties



Costs

Turn offs private parties

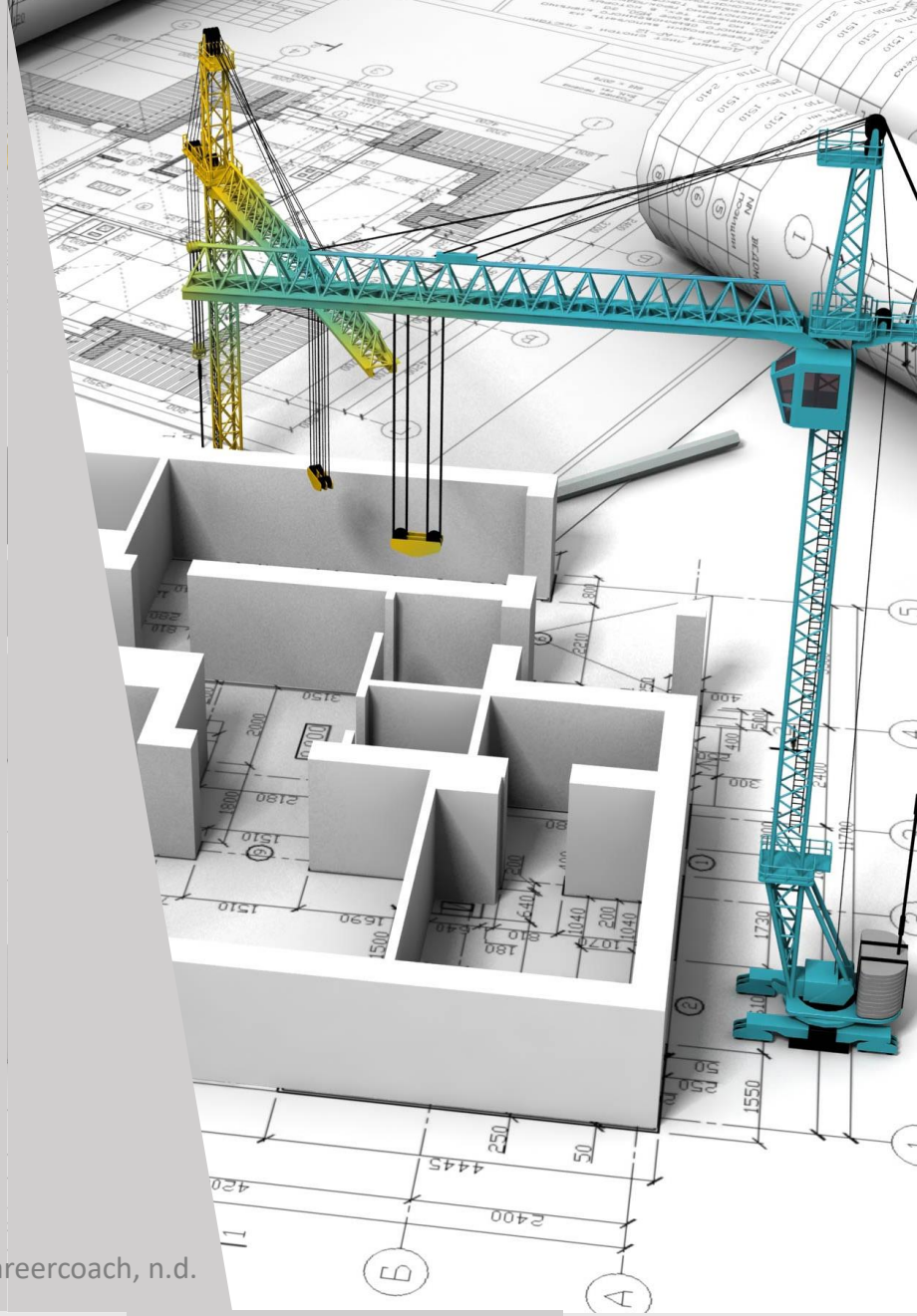


ICT skills

Conclusion

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?

- Monitor and Integrate ambitions



The Campus Careercoach, n.d.

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?

- Monitor and Integrate ambitions
- **Obligations through planning regulations**

Quora, 2017

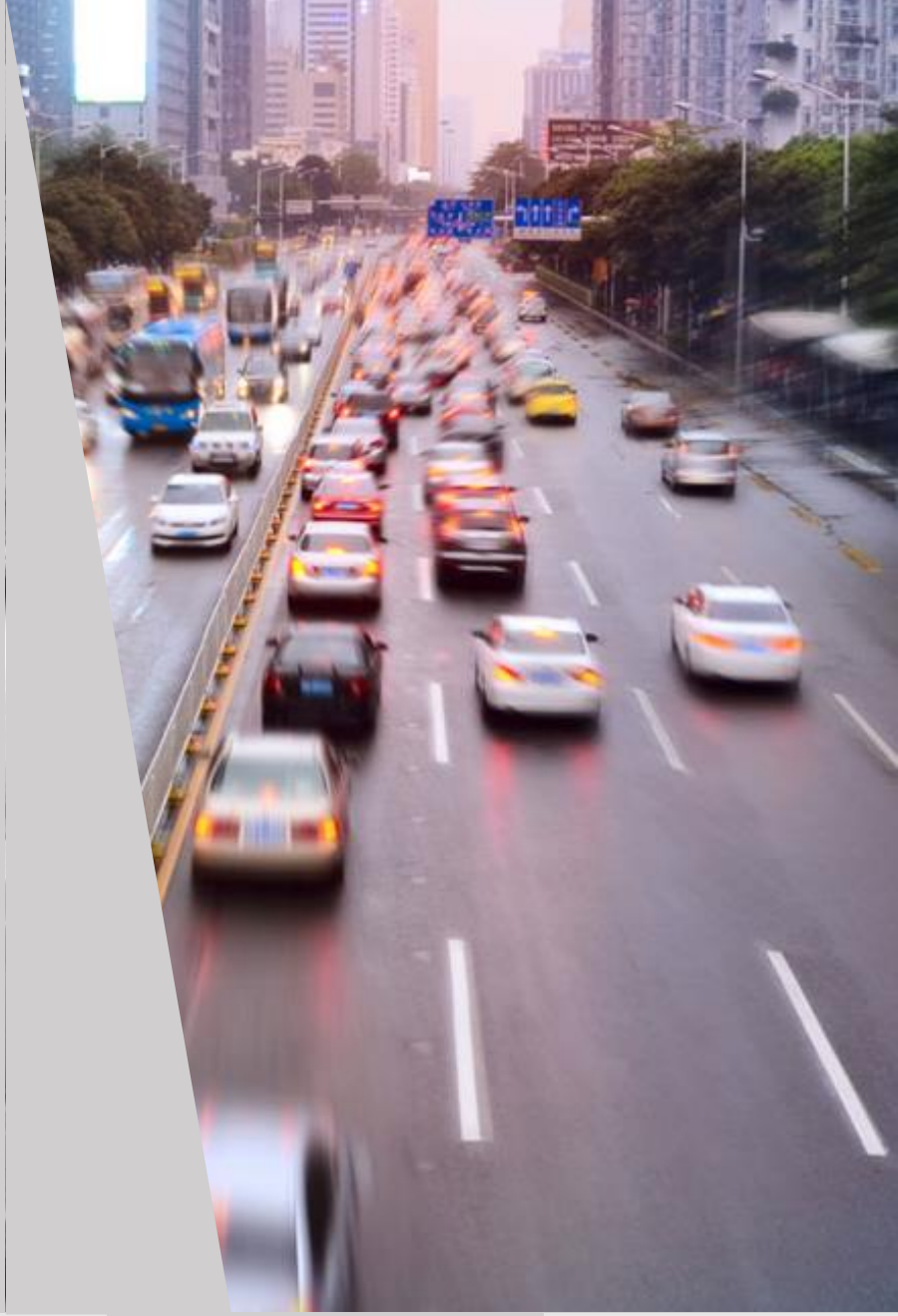
How can the triangle relation between project development, transportation and Big Open Linked Data be used in the process of monitoring and implementing ambitions for residential project developments?

- Monitor and Integrate ambitions
- Obligations through planning regulations
- **Developer must comply with feasibility**

The Nenagh Guardian, 2017

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?

- Monitor and Integrate ambitions
- Obligations through planning regulations
- Developer must comply with feasibility
- **Transport analysis tools**



Tarlach, 2017

The BOLD-driven method

- A framework

The BOLD-driven method

- A framework
- **Multiple spatial levels**

The BOLD-driven method

- A framework
- Multiple spatial levels
- **Real time solutions**

The BOLD-driven method

- A framework
- Multiple spatial levels
- **Real time solutions > planning and design in de 21st century**

Recommendations

Creating & implementing

- Created by the municipality

Creating & implementing

- Created by the municipality
- Link score to the different components

Creating & implementing

- Created by the municipality
- Link score to the different components
- **Possibly add more data sets**

Creating & implementing

- Created by the municipality
- Link score to the different components
- Possibly add more data sets
- Obligations through planning regulations

Further research

- Explorative research

Further research

- Explorative research
- **Extend research towards other cities**

Further research

- Explorative research
- Extend research towards other cities
- **Add other transport systems**

Further research

- Explorative research
- Extend research towards other cities
- Add other transport systems
- **Statistical regression analysis**

Hypothesis

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

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

Management in the Built Environment
Delft University of Technology

Graduation committee
Prof. Dr. E.M. van Bueren
Prof. Dr. ir. A. Koutamanis
Ir. M.G.F. Overschie

P4 presentation
November 2018

EVA DE BIASE
4157338

Appendix

A. Indicators Gonçalves et al. (2017)

B. Social data

C. Registration data

D. Sensor data

E. Stakeholders

Appendix A. Indicators 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/km^2)	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

Appendix B. Social data

LEVEL OF ANALYSIS	DATA SOURCE	DATA OWNER	DATA AVAILABILITY	DATA SET	USEFULNESS	INTEREST GROUP	TRANSPORT TYPE	PHASE**
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

Appendix C. Registration data

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

Appendix D. Sensor data

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

Appendix E. Stakeholders

	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	Safety and (dis)satisfaction	-	-	Neighbourhood / City
	Plusnetten*	Plusnetten*	Plusnetten*	Neighbourhood / City
	Distances	Distances	Distances	Neighbourhood / City
City goals	Modal split	Modal split	Modal split	Neighbourhood / City
	Amount of parking spaces / ratio / pressure	-	-	Neighbourhood