

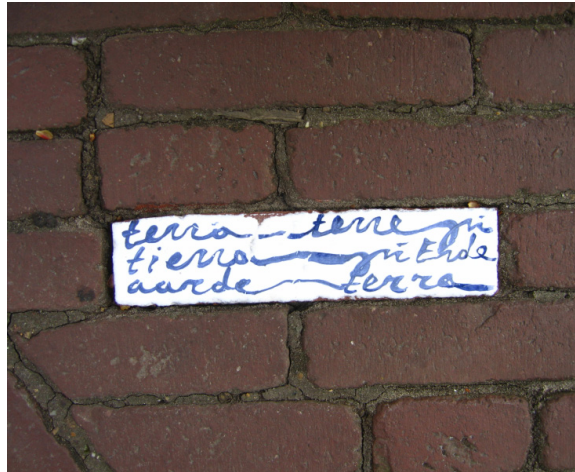


Measure, understand and improve cities!

*Visualizing pedestrian flows to improve inner-city quality in Delft
using GPS-tracking technology*

P5 - Graduation presentation
Tine van Langelaar – 1367609
MSc4 Urbanism – 12 April 2011





How did you get on the chair you are sitting on right now?

CONTENTS

Problem definition

Aims graduation project

Research questions

Methodology

What draws people to a city centre?

Research projects: preparation and execution

Research projects: results and conclusions

Evaluation city centre

Tool

Recommendations and interventions

Follow-up research

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	02 27
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PROBLEM DEFINITION

Conroy-Dalton
(2001):

“Wayfinding
is the act of
travelling to a
destination by a
continuous,
recursive process
of making
route-choices
whilst evaluating
previous spatial
decisions against
constant cognition
of the
environment”

Rafailaki, 2007



Encounters with people who got lost

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

RESEARCH
PREP/EXECUTE

RESEARCH
RESULT/CONCL

EVALUATION CC
TOOL

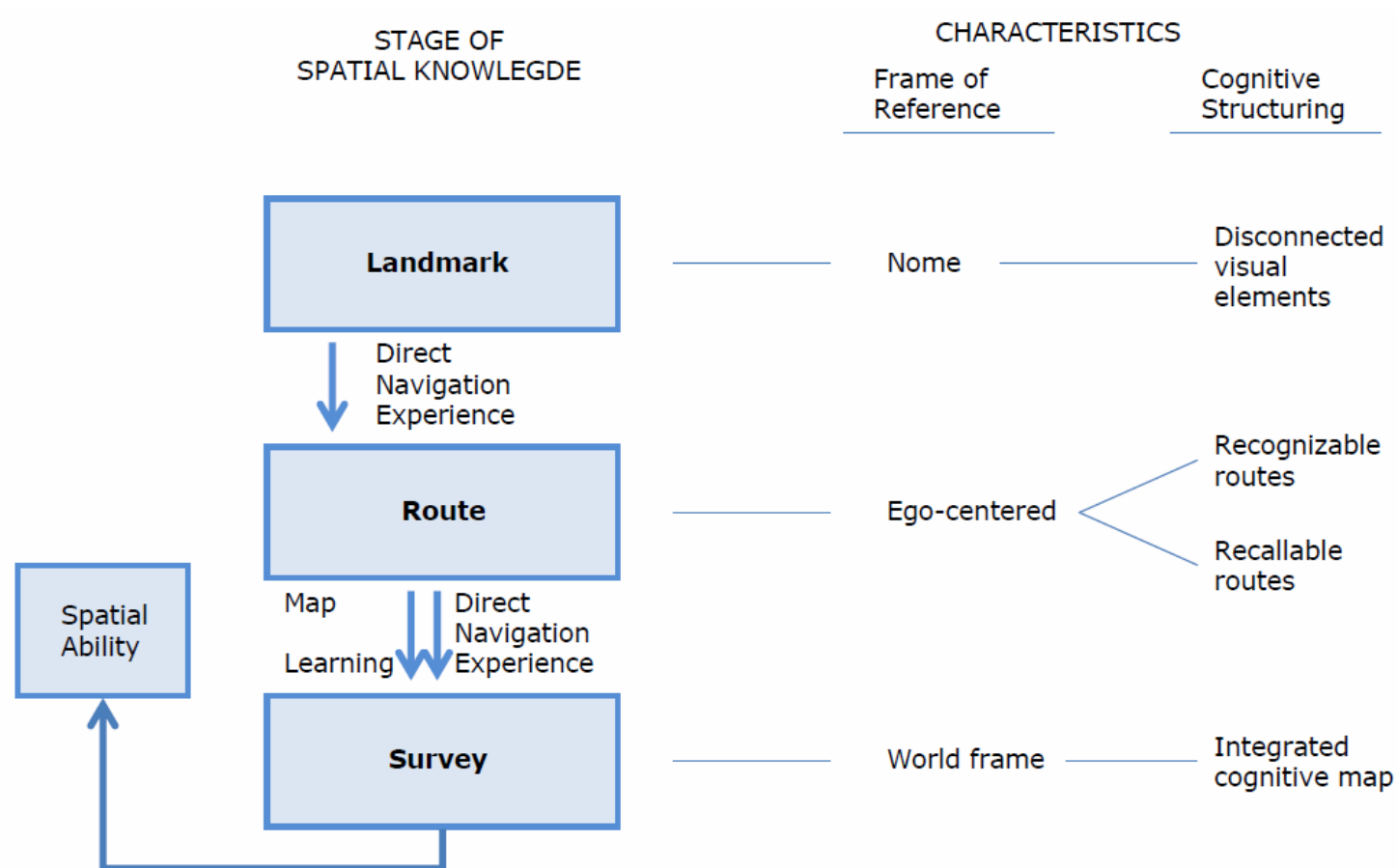
INTERVENTIONS
FOLLOW-UP

03
27

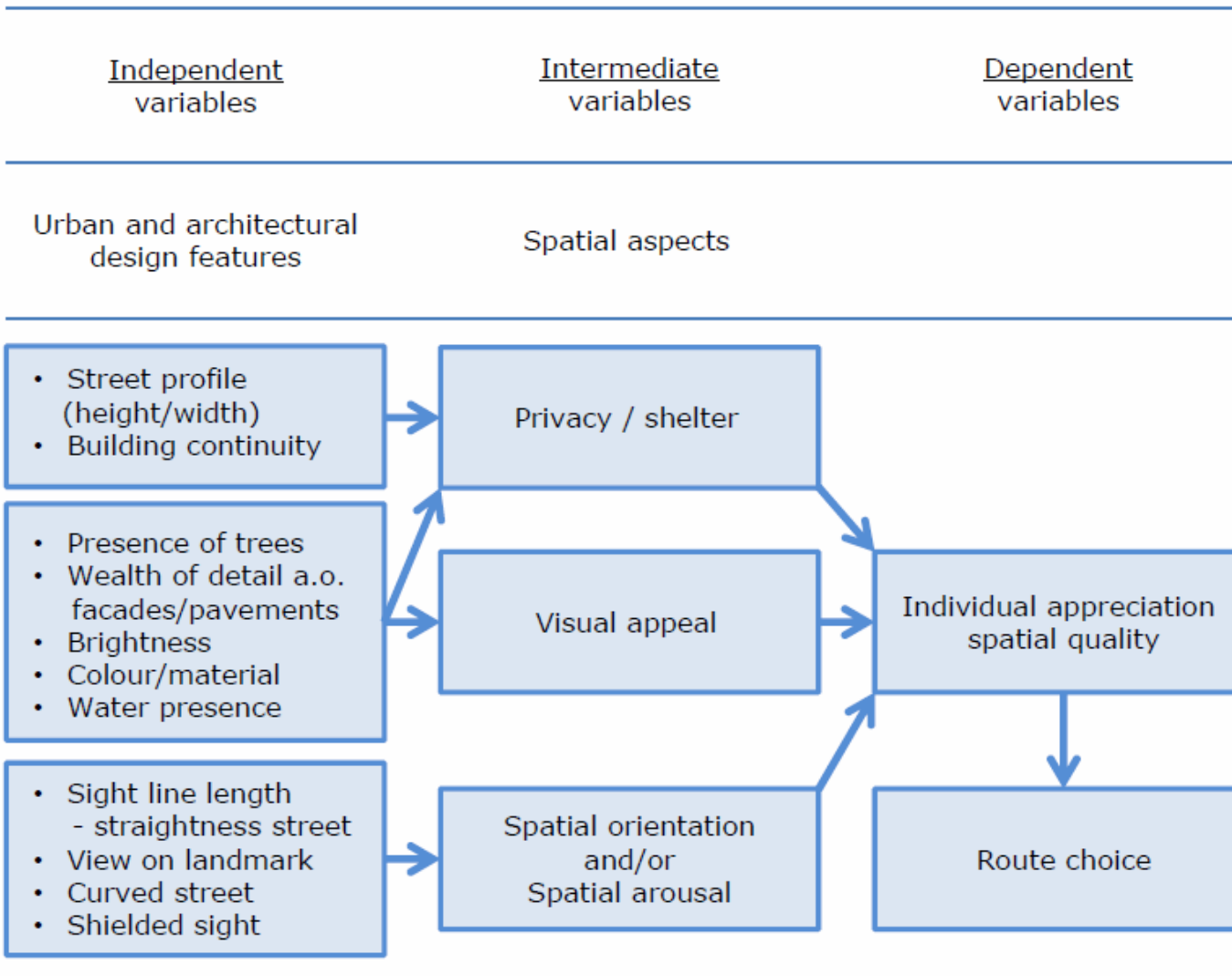
PROBLEM DEFINITION

Different kind of people orientate themselves in different ways...

How?



Three level model of acquiring spatial knowledge (Bovey and Stern, 1990)



Design features, spatial qualities and appreciation (Korthals Altes and Steffen, 1988)

PROBLEM DEFINITION

Wayfinding in Delft

Choice motives for routes:

- 60% spatial aspects
- 29% functional aspects
- 9% traffic liveability
- 2% network aspects

Perception of aspects at routes:

- 36% emotional responses
- 27% meaning
- 26% landmarks
- 11% problems of interpretation

Korthals Altes and Steffen, 1988

(What)

To better understand how people navigate in cities ...

(Why)

... in order to develop recommendations for urban planning and design ...

(Who)

... to make city visits more enjoyable, engaging and involving for pedestrians.

(How)

(i) Checklist good public space (ii) Tool (iii) Strategic spatial design interventions

What?

Why?

Who?

How?



Street life: Oude Delft, July 2010

RESEARCH QUESTIONS

Which strategic spatial design interventions can improve public space for the slow traffic network in order to retain city visitors in the city centre of Delft?

Main research question

What are criteria for successful public spaces looking at pedestrians walking in city centres?

1st sub-research question

What is the current quality of the streets and built environment in the city centre of Delft?

2nd research question

Do pedestrians (visitors/tourists, city centre inhabitants and neighbourhood residents) use the public space in the city centre of Delft differently?

3rd sub-research question

How can the criteria for successful public spaces, the analysis of the current situation and the conclusions of how people use the city centre be embedded in strategic spatial (navigational) recommendations for the city centre of Delft?

4th sub-research question

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

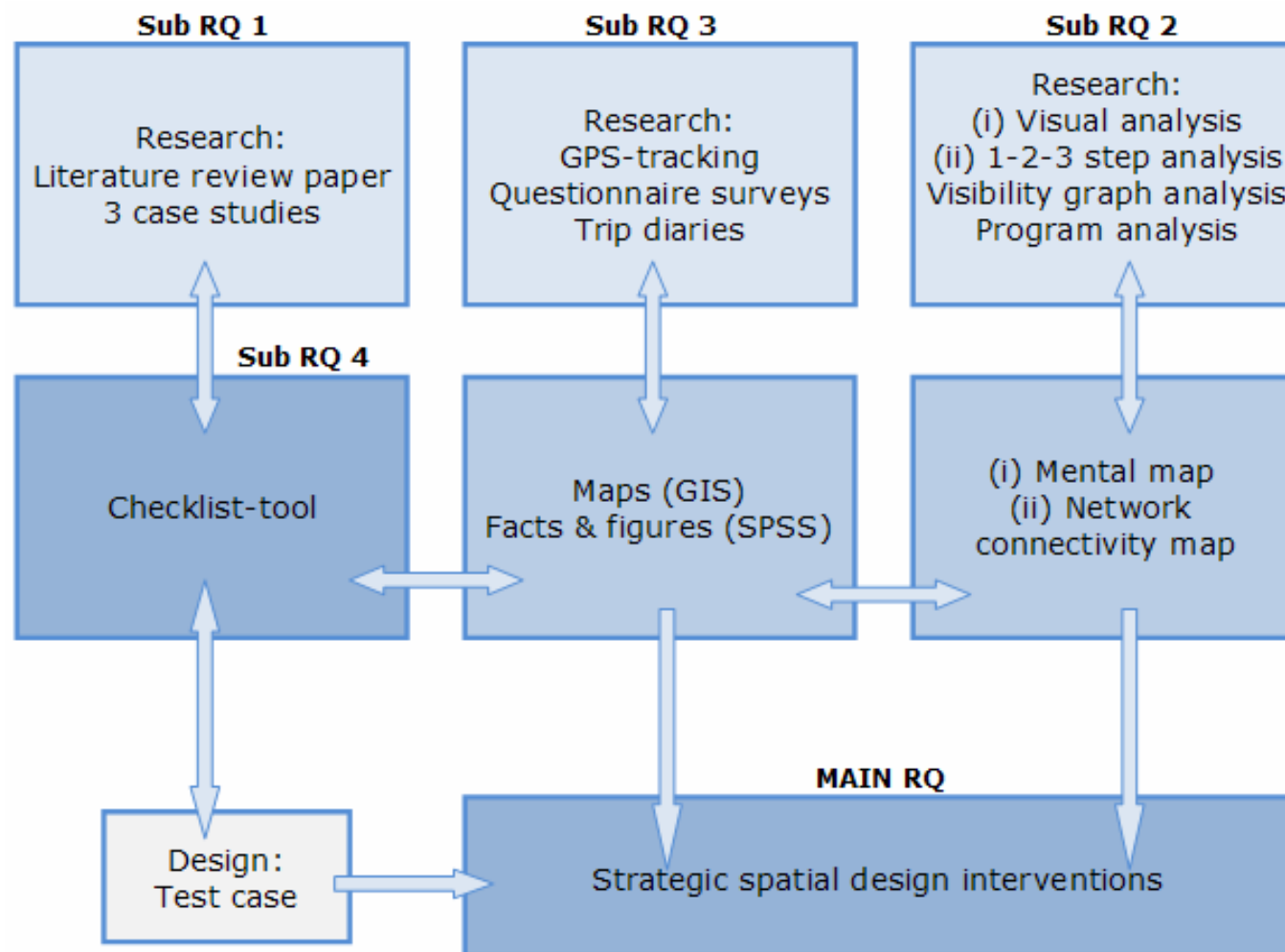
RESEARCH
PREP/EXECUTE

RESEARCH
RESULT/CONCL

EVALUATION CC
TOOL

INTERVENTIONS
FOLLOW-UP

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27



Relation between research questions and end products

METHODOLOGY



GPS device
Qstarz BT-Q1000X
Travel recorder

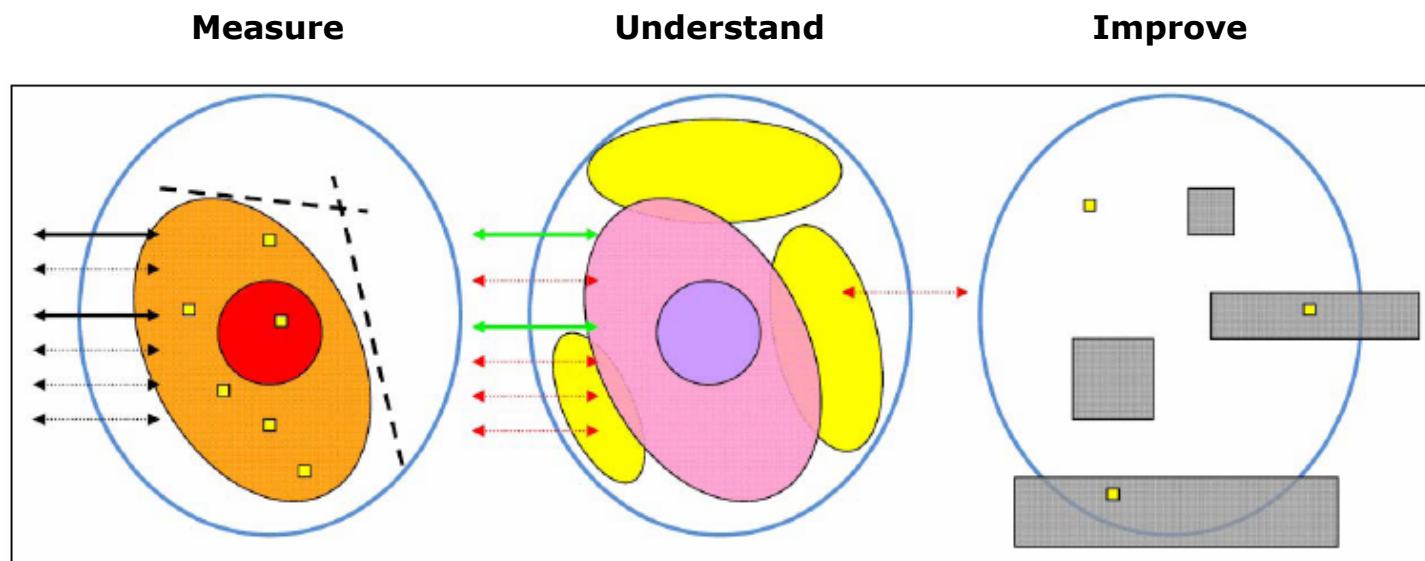


GPS-track from Phoenix garage (November 2009)

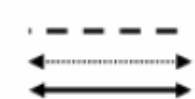
PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	09 27
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"If you cannot measure it, you cannot improve it"

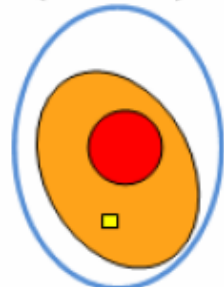
– Lord Kelvin, 19th century



Legend



Walking boundaries
Non-used streets
Used streets



City centre area
Central shopping district with the Grote Markt
Destinations

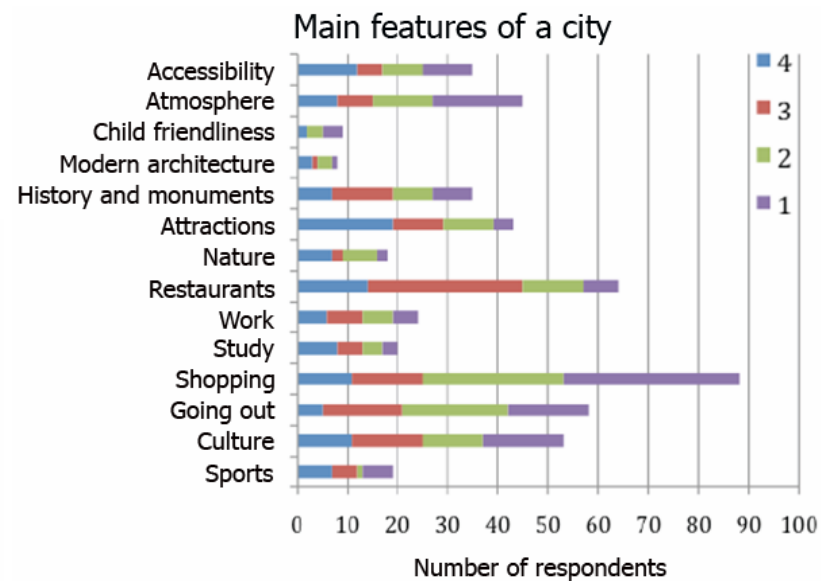
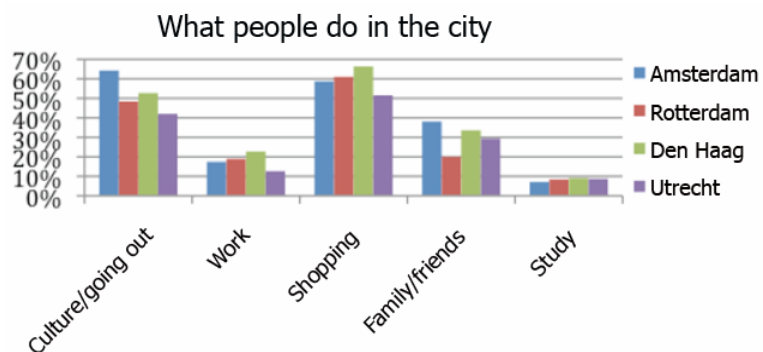


Streets with good spatial and/or programmatic qualities
Streets with bad spatial and/or programmatic qualities

Living areas
Central shopping district with the Grote Markt

Black holes (unused streets)
Interesting places

WHAT DRAWS PEOPLE TO A CITY CENTRE?



Why do people visit inner cities? And what do people like best? (Van Santen, 2008)

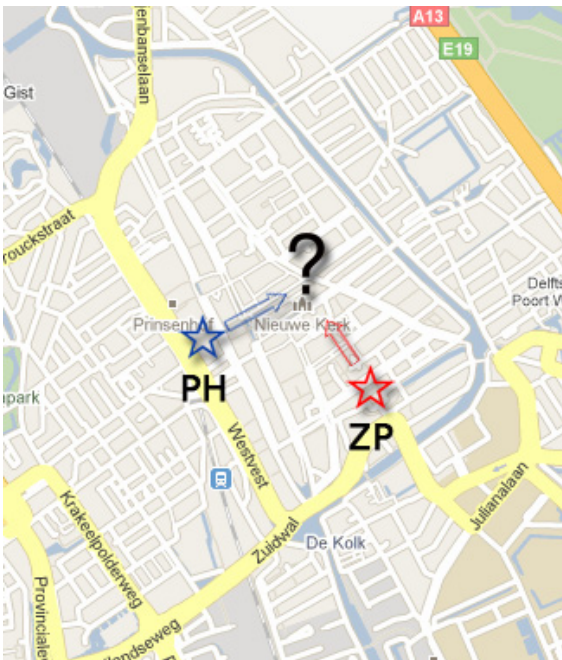
RESEARCH PREPARATION AND EXECUTION

"Tracking Delft 1"

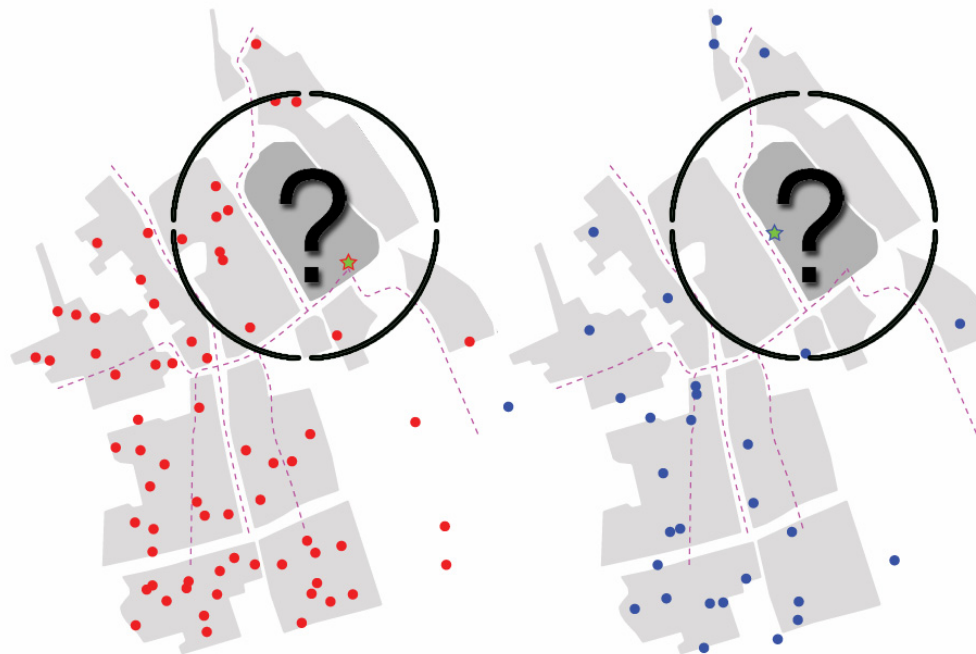
Wednesday 18 –
Saturday 21
November 2009

Arriving in the city
centre by car

Leaving the
Phoenix and
Zuidpoort garage
as a pedestrian



Following pedestrians from the
Phoenix and **Zuidpoort** garage



The research shows a gap in the collected data...

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	12 27
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Posters and flyers in DOK (public library)



Students transferring GPS-data to laptops

RESEARCH PREPARATION AND EXECUTION

"Tracking Delft 2"

Monday 26 April –
Monday 3 May
2010

Following
city centre and
neighbourhood
inhabitants



Following *city centre inhabitants*
and *neighbourhood inhabitants*

Household legend:



2 adults

1 adult + child(ren)

1 adult

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

RESEARCH
PREP/EXECUTE

RESEARCH
RESULT/CONCL

EVALUATION CC
TOOL

INTERVENTIONS
FOLLOW-UP

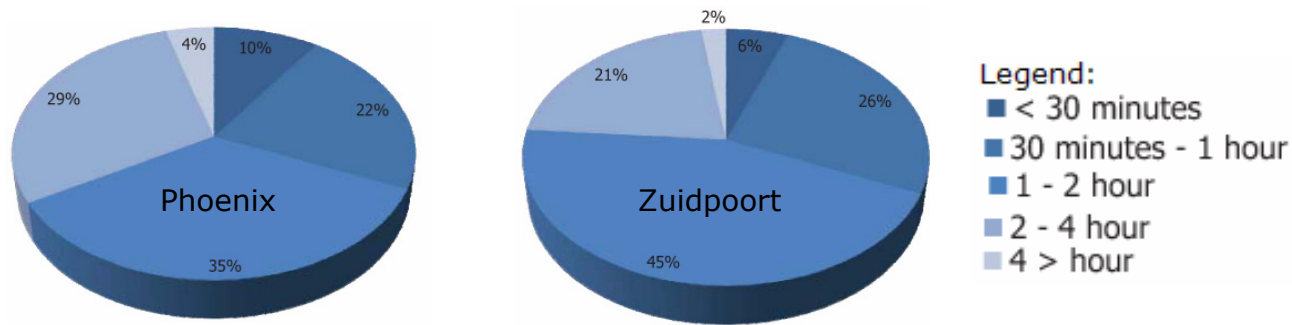
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RESEARCH RESULTS AND CONCLUSIONS

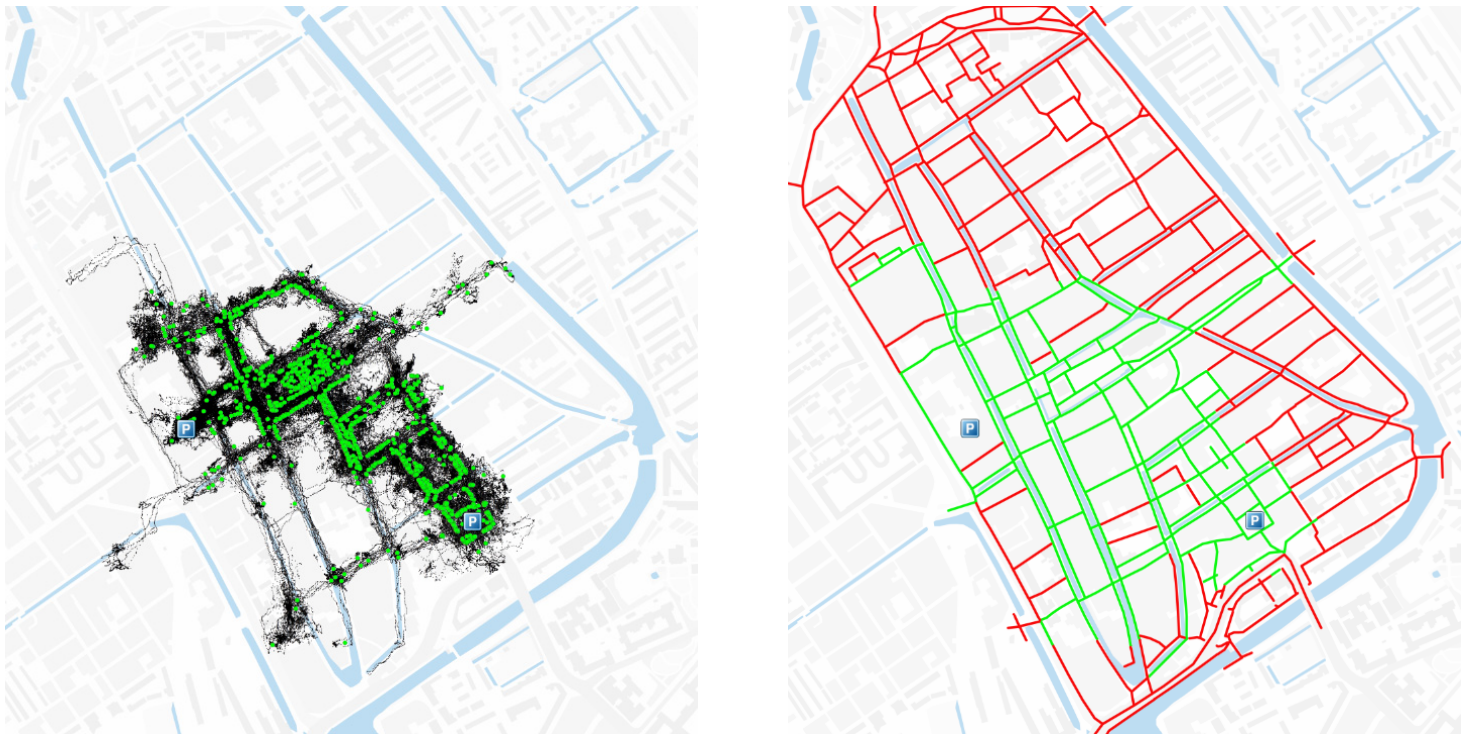
"Tracking Delft 1"

Arriving in the city
centre by car

Leaving the
Phoenix and
Zuidpoort garage
as a pedestrian



Statistics: Trip duration of pedestrians leaving the Phoenix and Zuidpoort garage



*GIS: cleaned GPS-trips Phoenix and Zuidpoort garage > **Use** and **non-use** of streets
(Black dots = **trips** and green dots = **destinations**)*

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

RESEARCH
PREP/EXECUTE

RESEARCH
RESULT/CONCL

EVALUATION CC
TOOL

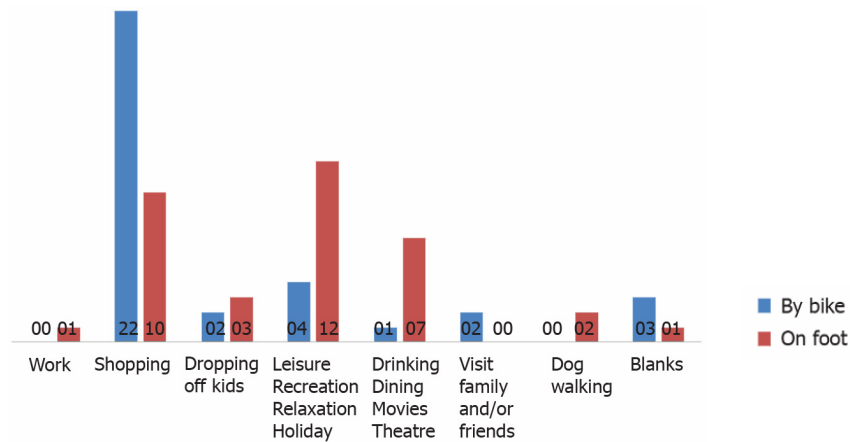
INTERVENTIONS
FOLLOW-UP

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27

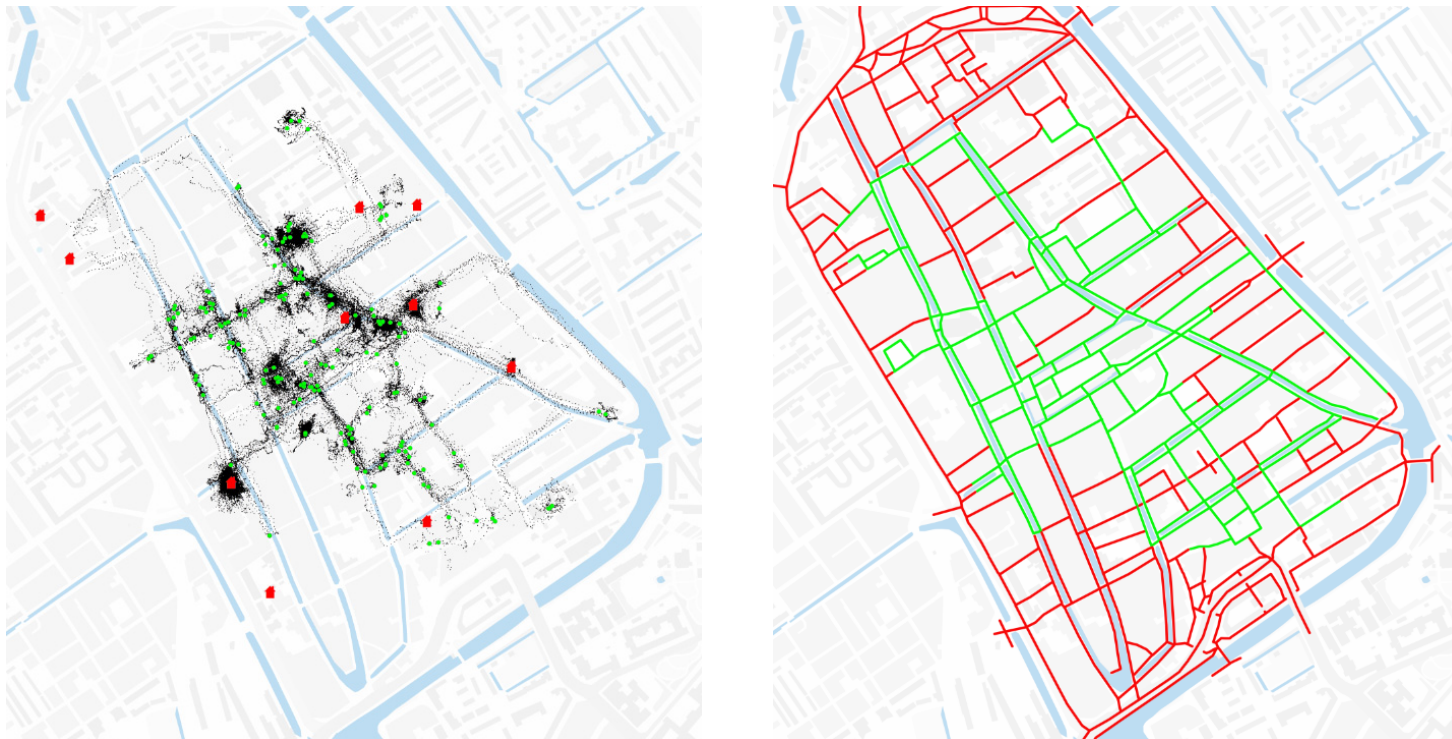
RESEARCH RESULTS AND CONCLUSIONS

"Tracking Delft 2"

City centre
inhabitants



Statistics: Destinations and transportation mode (slow network)



GIS: cleaned GPS-trips city centre inhabitants > **Use** and **non-use** of streets
Houses, **destinations** and **trips**

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

RESEARCH
PREP/EXECUTE

RESEARCH
RESULT/CONCL

EVALUATION CC
TOOL

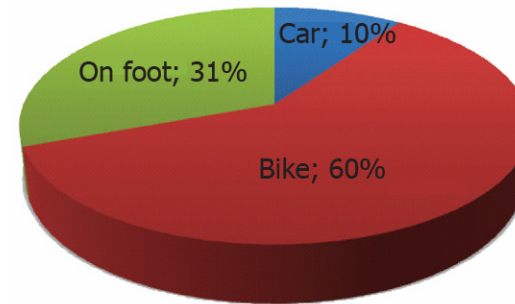
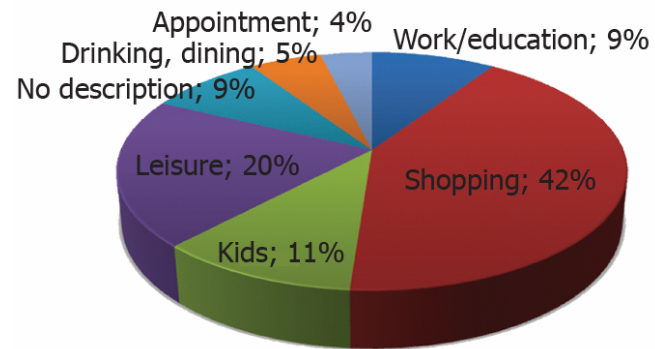
INTERVENTIONS
FOLLOW-UP

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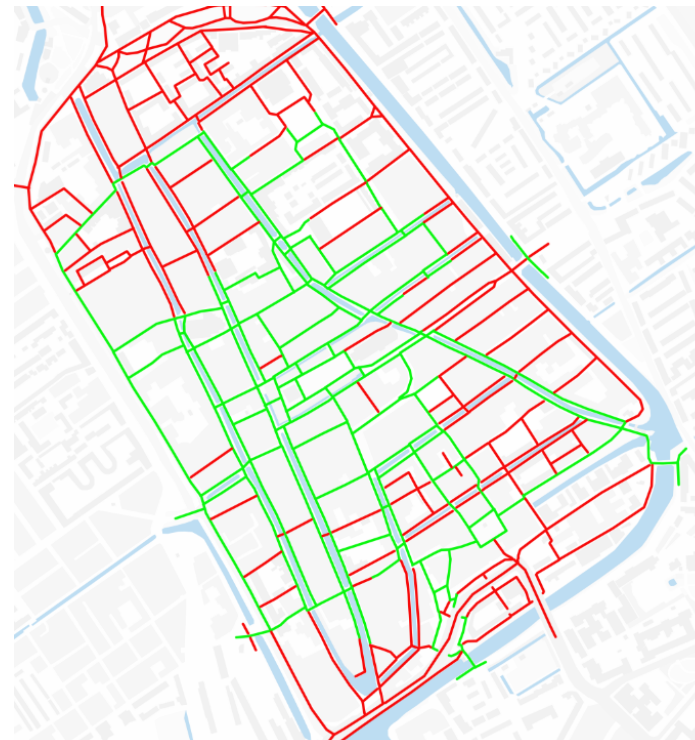
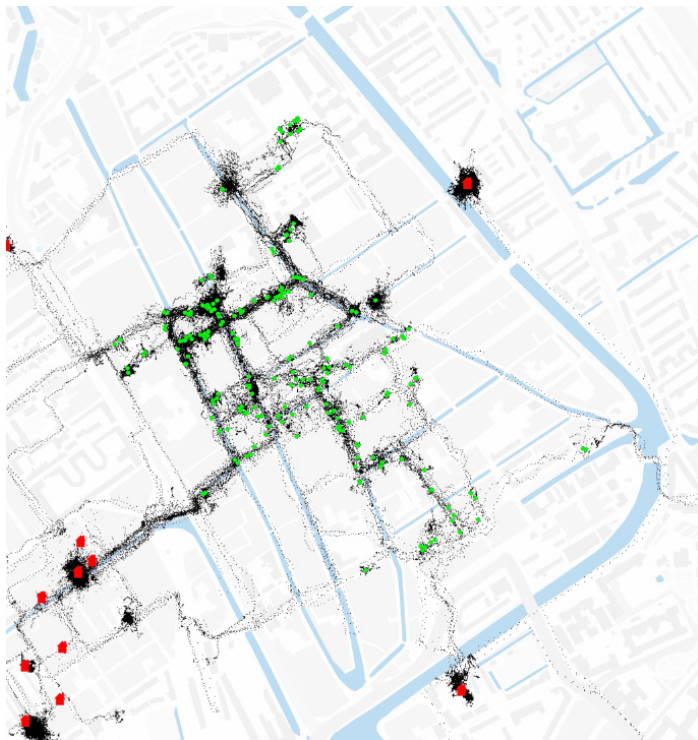
RESEARCH RESULTS AND CONCLUSIONS

"Tracking Delft 2"

Neighbourhood
inhabitants



Statistics: Destinations and transportation mode



GIS: cleaned GPS-trips neighbourhood inhabitants > **Use** and **non-use** of streets
Houses, **destinations** and **trips**

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

RESEARCH
PREP/EXECUTE

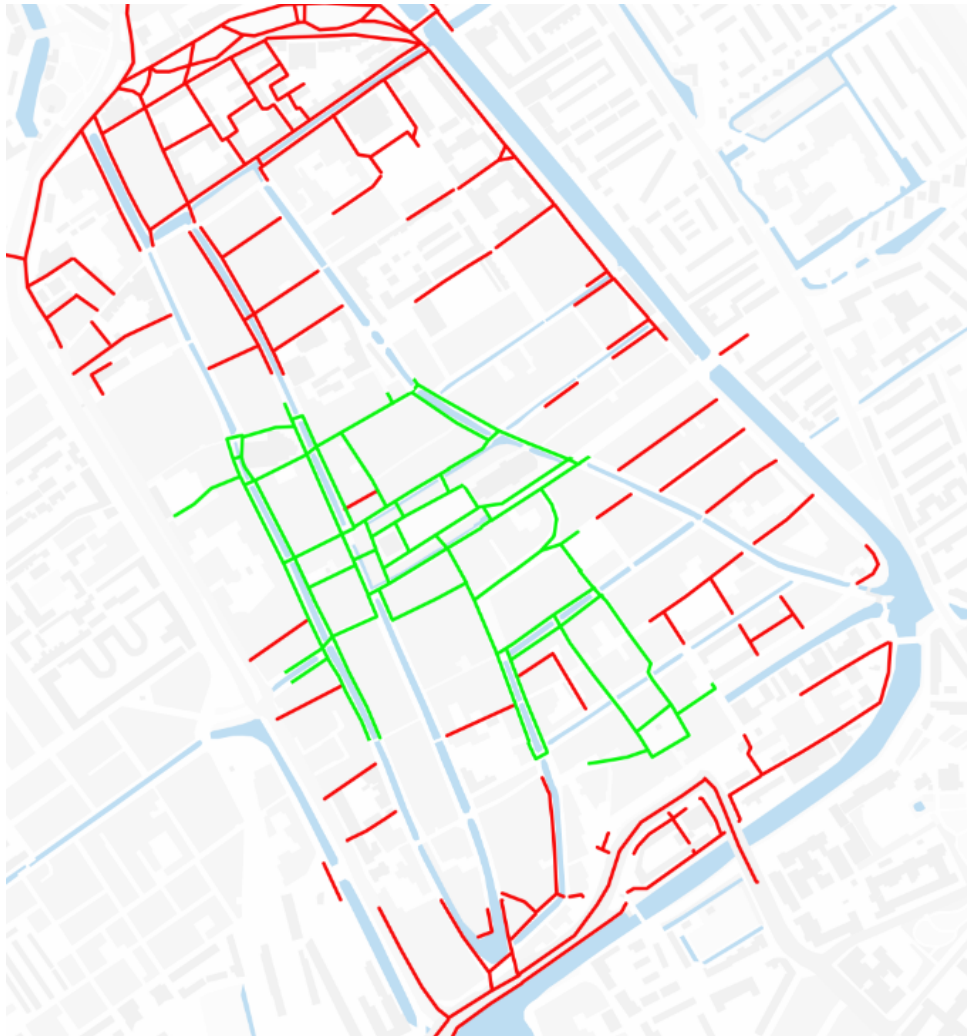
RESEARCH
RESULT/CONCL

EVALUATION CC
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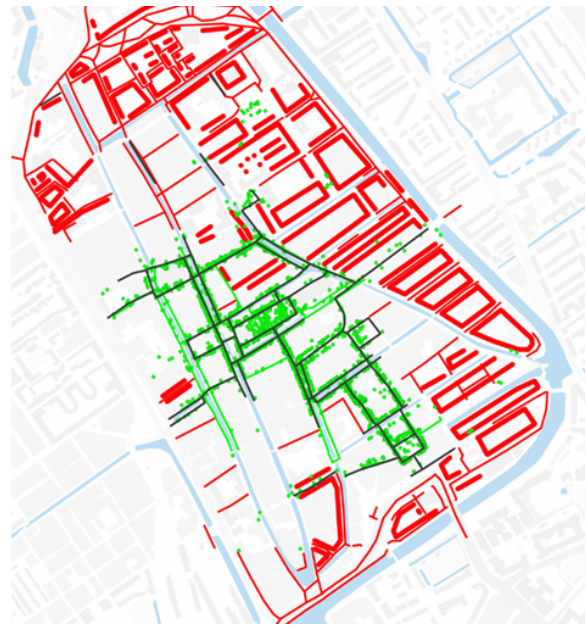
Conclusions



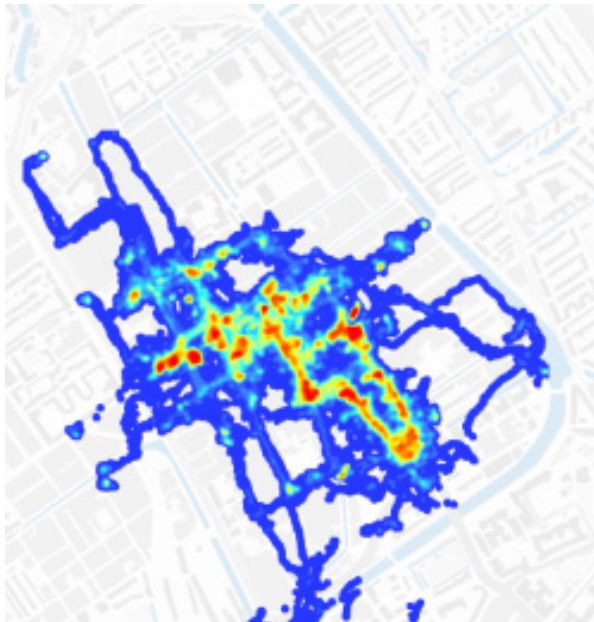
Synthesis map **used** and **non-used** streets



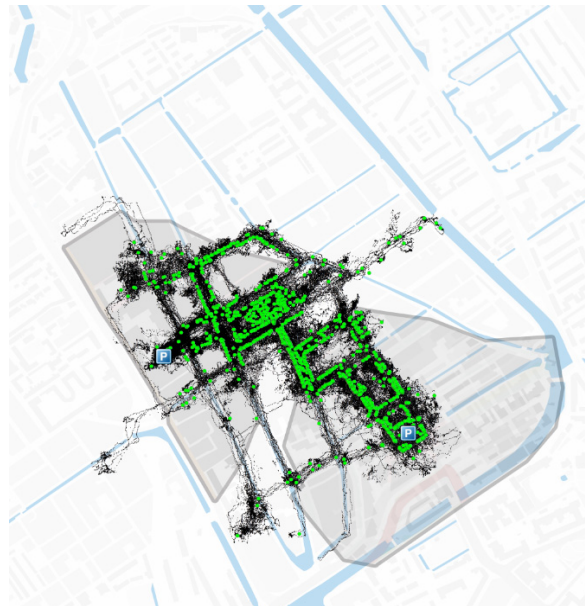
Quality perception inhabitants (TD2)



Destinations, shopping streets,
non-used streets and living areas



Density analysis (TD1: Friday)



Walking 400 meters from the garages

EVALUATION CITY CENTRE

Conclusions
additional analyses

Multi method
evaluation

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
PEOPLE IN CC

RESEARCH
PREP/EXECUTE

RESEARCH
RESULT/CONCL

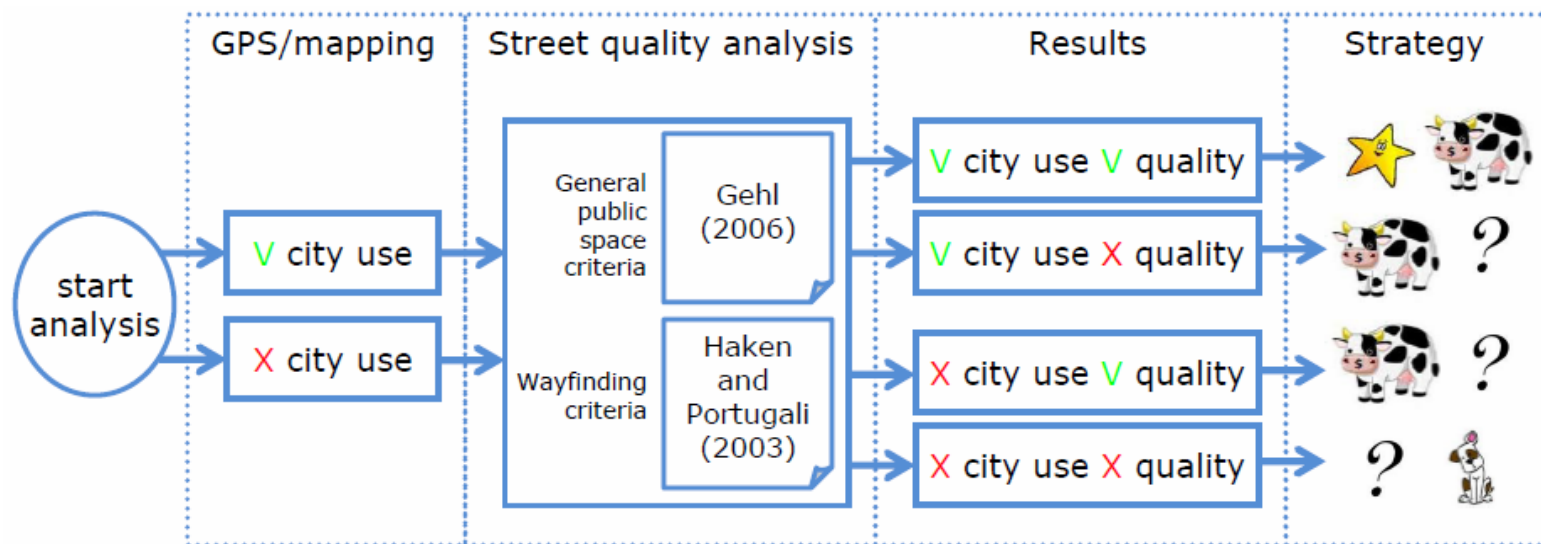
EVALUATION CC
TOOL

INTERVENTIONS
FOLLOW-UP

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TOOL

From city use
towards strategic
spatial design
interventions

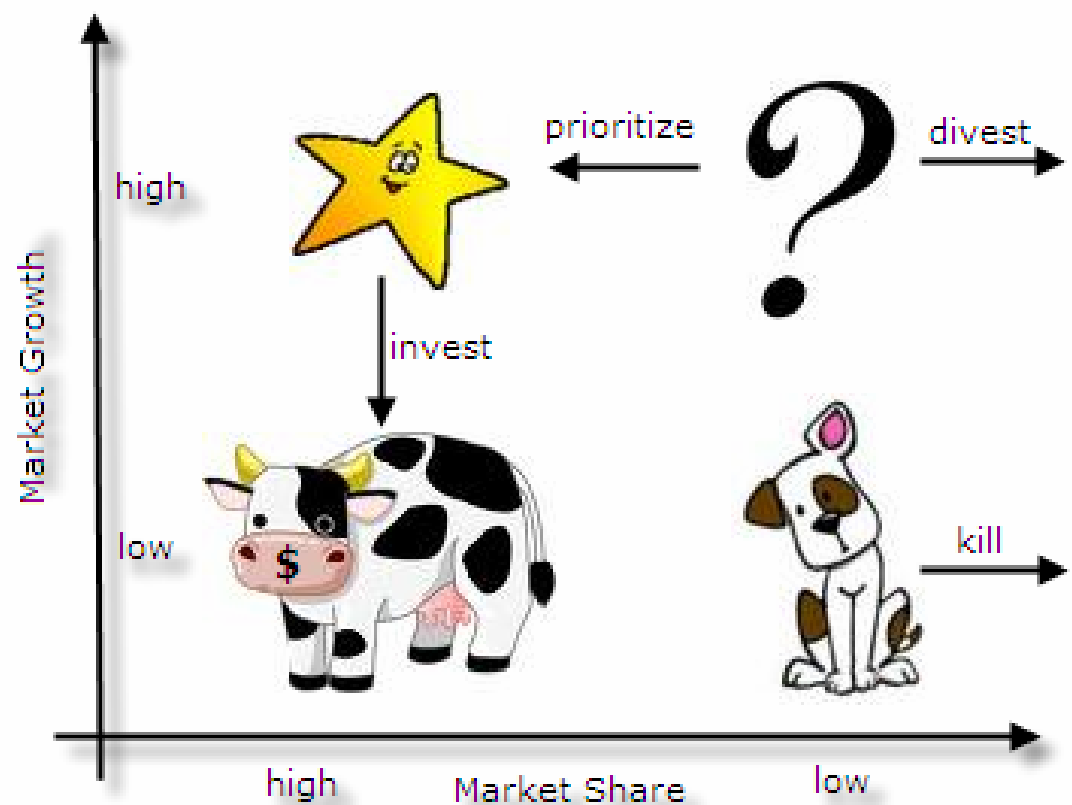


GPS-flowchart

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	19 27
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TOOL

BCG-matrix:



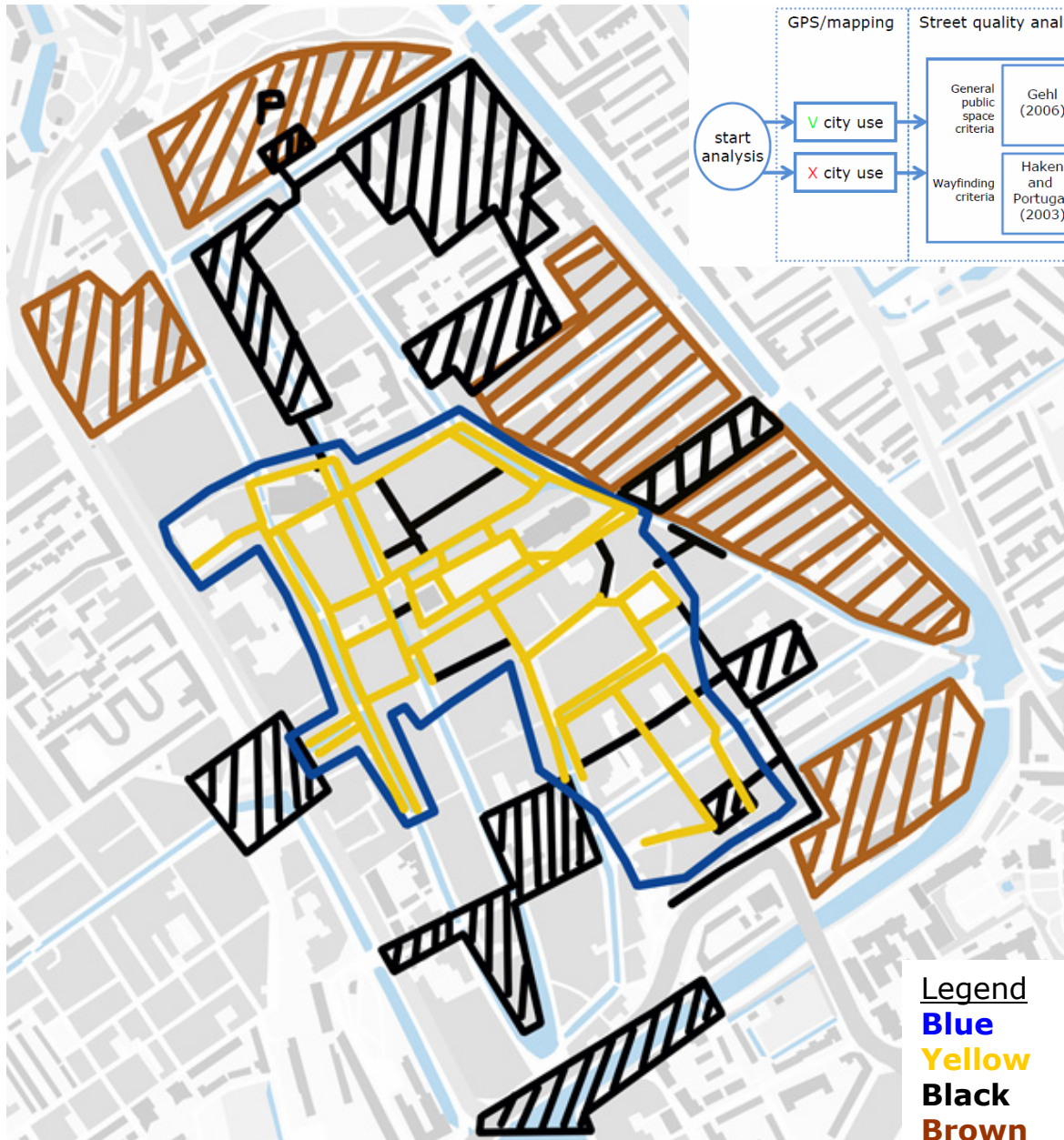
BCG-matrix model

Star
= hold strategy

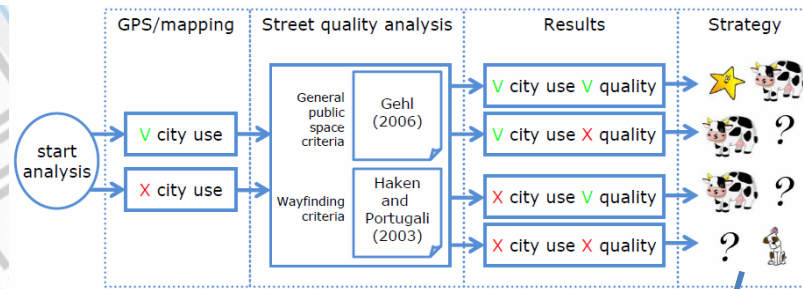
Cash cow
= harvest strategy

Question mark
= build strategy

Dog
= divest strategy



Intervention map



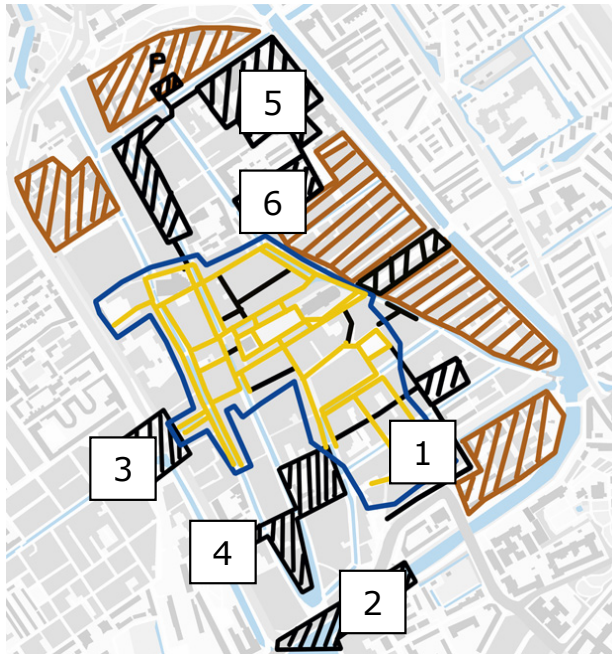
RECOMMENDATIONS AND INTERVENTIONS

City centre scale

- = Star
 = Cash cow
 = Question mark
 = Dog

What are the:
 - Stars
 - Cash cows
 - Question marks
 - Dogs

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	21 27
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Intervention map

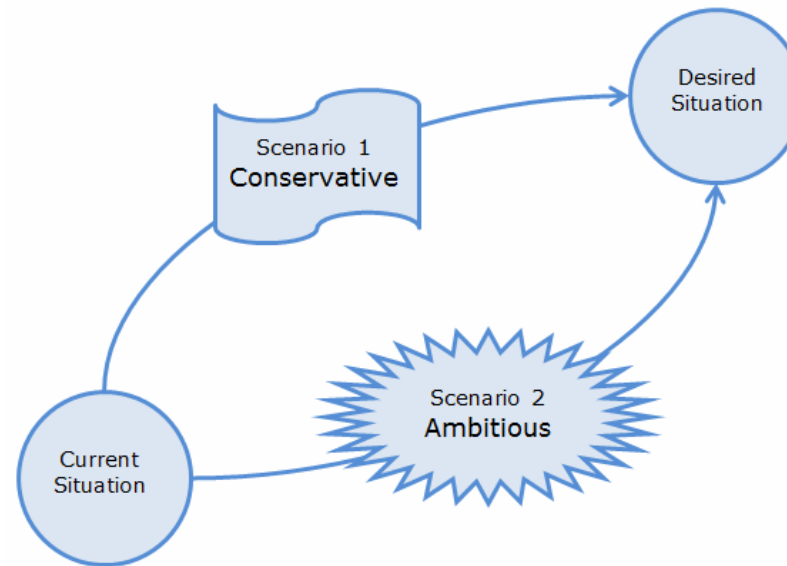
Question marks: Intervention areas (in black on the map)

Conservative interventions

1. Shopping centre (Zuidpoort, Beestenmarkt)
2. Zuidwal
3. Spoorzone - Bolwerk

Ambitious interventions

4. Barbarasteeg / Breestraat / Gasthuisplaats / Army Museum
5. Paardenmarkt / Gasthuisplaats / Ypenstraat
6. Doelentuin / Voorstraat / Nieuwe Langendijk



*Conservative and ambitious interventions
(Nieuwenhuis, 2008)*

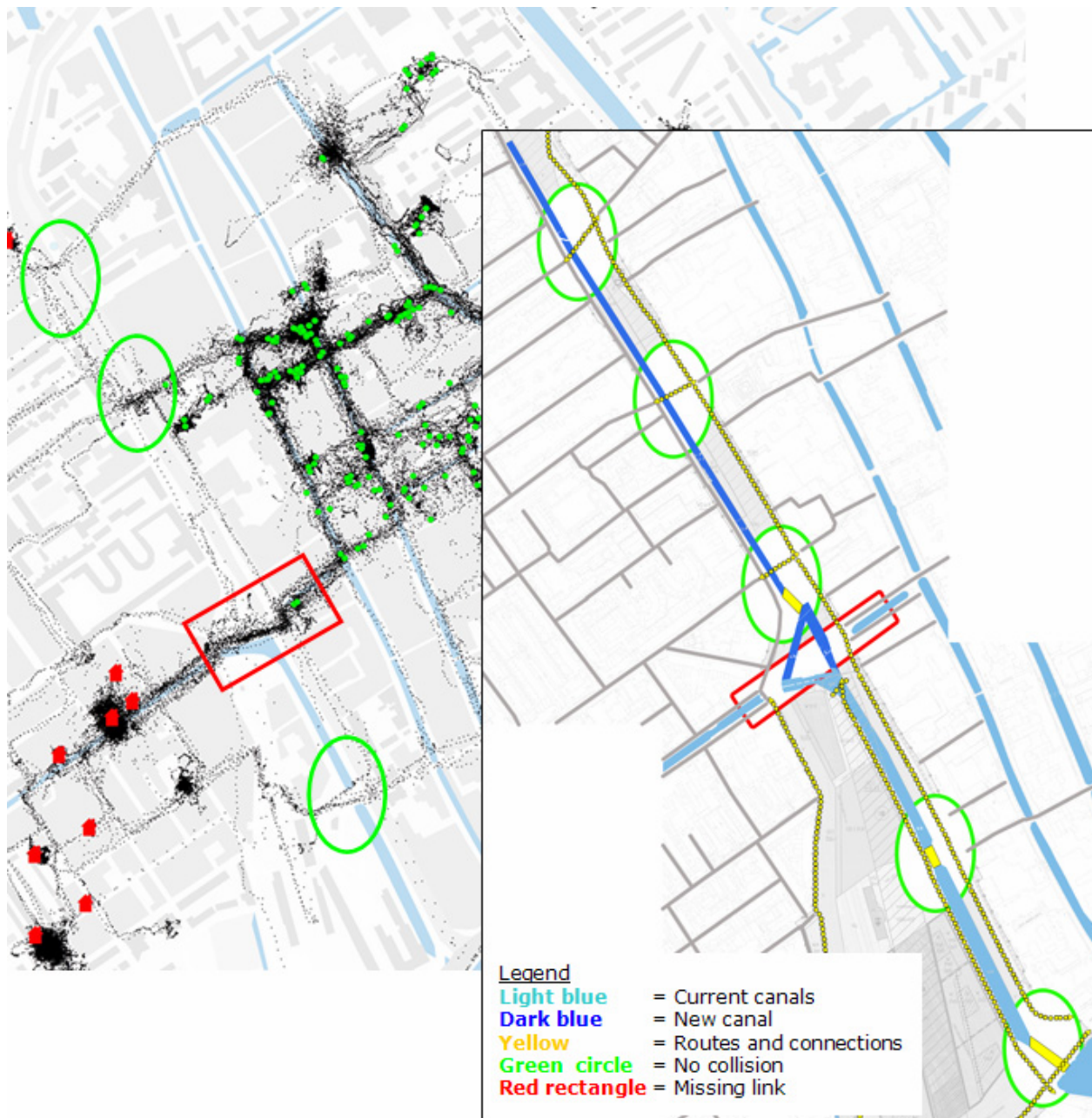
RECOMMENDATIONS AND INTERVENTIONS

District and street
scale

What are the:

- Stars
- Cash cows
- Question marks
- Dogs

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	22 27
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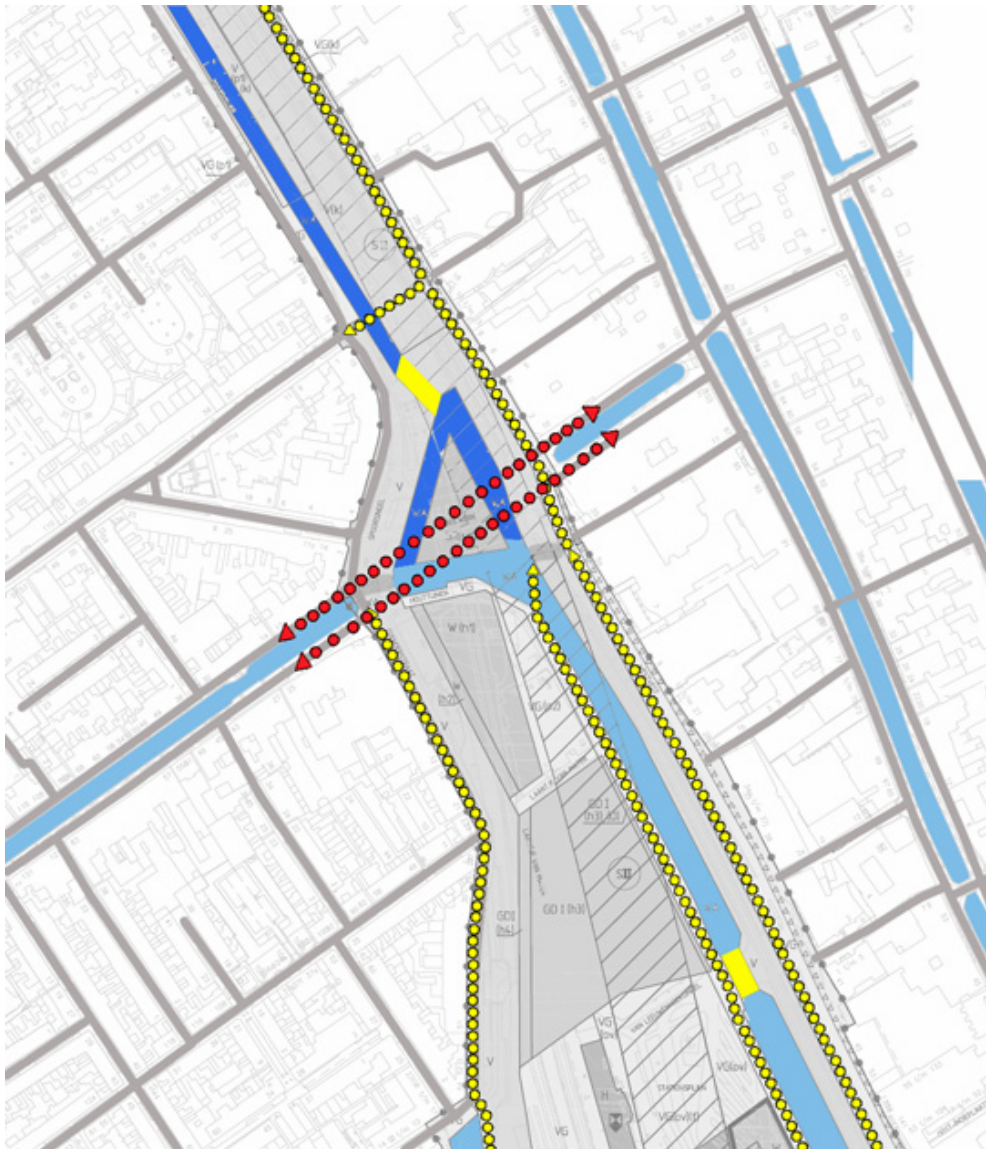
City use of neighbourhood inhabitants (left) and future connections by Spoorzone Delft (right)

RECOMMENDATIONS AND INTERVENTIONS

District and street
scale

Conservative
intervention:
3. Spoorzone -
Bolwerk

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	23 27
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Legend

Light blue
Dark blue
Yellow
Red

= Current canals
= New canal
= Routes and connections
= Proposed link

New land use plan with connectivity proposal slow network

RECOMMENDATIONS AND INTERVENTIONS

District and street
scale

Conservative
intervention:
3. Spoorzone -
Bolwerk

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	24 27
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Paardenmarkt,



Gasthuisplaats



and Ypenstraat = parking



Example of an urban farm, artisan and organic products

RECOMMENDATIONS AND INTERVENTIONS

District and street
scale

Ambitious
intervention:
5. Paardenmarkt /
Gasthuisplaats /
Ypenstraat

PROBLEM/AIM
RESEARCH Q

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FOLLOW-UP

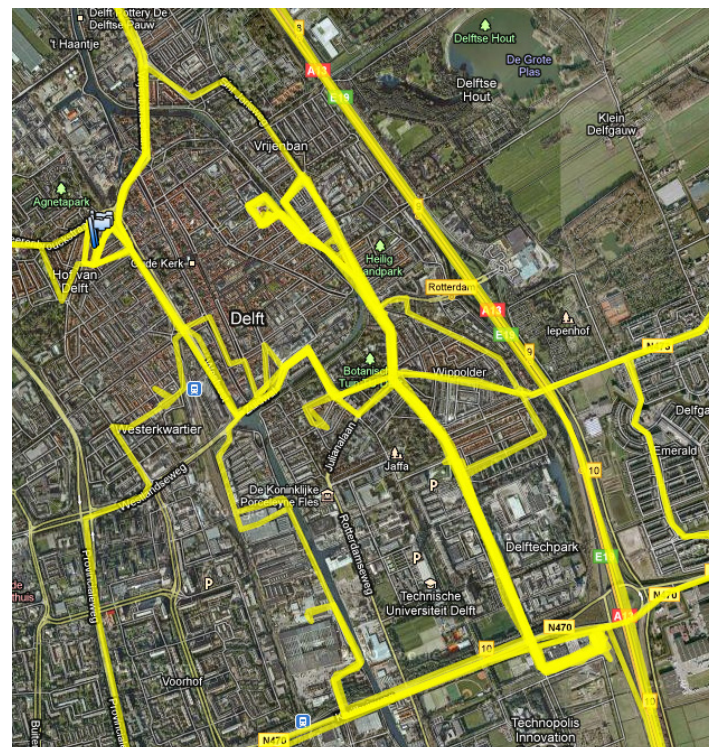
25
27

FOLLOW-UP RESEARCH

Examples:



A participant who did all trips by bike



A participant who did all trips by car

- Mobility

		06 GENDER		Total
		Male	Female	
DAY	Wednesday	6	12	18
	Thursday	17	29	46
	Friday	13	21	34
	Saturday	9	7	16
Total		45	69	114

Example of a cross tabulation: day and gender

- SPSS software

PROBLEM/AIM RESEARCH Q	METHODOLOGY PEOPLE IN CC	RESEARCH PREP/EXECUTE	RESEARCH RESULT/CONCL	EVALUATION CC TOOL	INTERVENTIONS FOLLOW-UP	26 27
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time

Movement Patterns Households Delft (2010)

Delft University of Technology (2010)

Tracking Delft 2



Pedestrian movement, neighbourhood inhabitants, Delft, 2010

PROBLEM/AIM
RESEARCH Q

METHODOLOGY
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RESEARCH
PREP/EXECUTE

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RESULT/CONCL

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