IMPROVED TRANSIT NETWORKS AND HOW CYCLING MIGHT BE PART OF THAT; PLANNED VS. UNPLANNED

OBSERVATIONS AND REFLECTIONS HOW TRAIN, CITY AND HUB IMPROVEMENTS IN THE NETHERLANDS ARE LEADING TO UNPRECEDENTED TRANSIT-CYCLING SYNERGY

BikeTrainGuru
@BikeTrainGuru

STUDIO BEREIKBAAR

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KOLLEKTIVFORUM - ANNUAL CONFERENCE - OSLO - FEB 6, 2017

IMPROVED TRANSIT NETWORKS:

1. INTRODUCING BIKE-TRAIN

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‘BIKE-TRAIN’ IN THE NETHERLANDS – USAGE

- BIKE USE IN 53% OF 1.300.000 TRAIN JOURNEYS. DAILY.
- 47% IN ACCESS TRAVEL, 13% IN EGRESS TRAVEL
- 5% ANNUAL GROWTH BIKE-TRAIN JOURNEYS 2000-2016

STUDIO BEREIKBAAR

‘BIKE-TRAIN’ IN THE NETHERLANDS – BIKE-PARK

- 410 STATIONS => 600.000 BICYCLE RACKS (NL POP.=17 MLN)
- INVESTMENT 2012-20: +150.000 PLACES, EUR 225 MLN
- UTRECHT CS: 20.000 RACKS → 33.000 RACKS IN 2018

STUDIO BEREIKBAAR

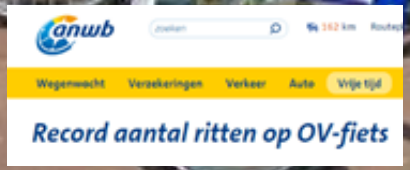
‘BIKE-TRAIN’ IN THE NETHERLANDS – OV-FIETS

- EUR 3.85 P/DAY, >300 LOCATIONS,>10.000 BIKES
- INTRODUCED IN 2003. ANNUAL GROWTH >20% EVER SINCE
- 2016: >2.000.000 RENTALS/YEAR

rtlnieuws

'NS moet bijschakelen met OV-fietsen'

Ze zijn niet aan te slepen, de OV-fietsen die de NS aanbiedt op veel treinstations. De populariteit van de OV-fiets is de laatste jaren flink toegenomen. Dat heeft tot gevolg heeft dat reizigers nu soms met lege handen achterblijven.


anwb

Record aantal ritten op OV-fiets

OV-fiets mateloos populair in de stad

Aantal verhuurde OV-fietsen in drie jaar met 150 procent gestegen Treinreizigers die ook fietsklant zijn gaan vaker met de trein, zegt NS Populariteit extra service op stations groeit door mond-tot-mondreclame Medio juli OV-fiets ook op ov-chipkaart

Economie

Megasucces OV-fiets lokt navolgers

Op elk station tegen een gering bedrag met een leenfiets wegrijden: de OV-fiets blijkt zo'n succesformule dat het andere partijen de markt op lokt. Zelfs de kwijnende binnenstad spint er garen bij.

STUDIO BEREIKBAAR

‘BIKE-TRAIN’ IN THE NETHERLANDS - FEEDER OF IC-SYSTEM

- AVERAGE CYCLE TRIP: 2.7 KM (BETWEEN 0.5 KM – 15 KM)
- ALL 410 STATIONS: 19% DUTCH POP. < 1 KM ⇔ 81% < 5 KM
- 17 LARGEST IC-STAT: 1% DUTCH POP < 1 KM ⇔ 16% < 5 KM
- NEXT 27 IC-STAT: 2% DUTCH POP < 1 KM ⇔ 29% < 5 KM
- NB… 81% < 5 KM HAS 2.3 STATIONS TO CHOOSE FROM

IMPROVED TRANSIT NETWORKS:

2. (RE)THINKING MODALITIES

THINKING MODALITIES...
(_HOW MANY DO YOU DISCERN?_)

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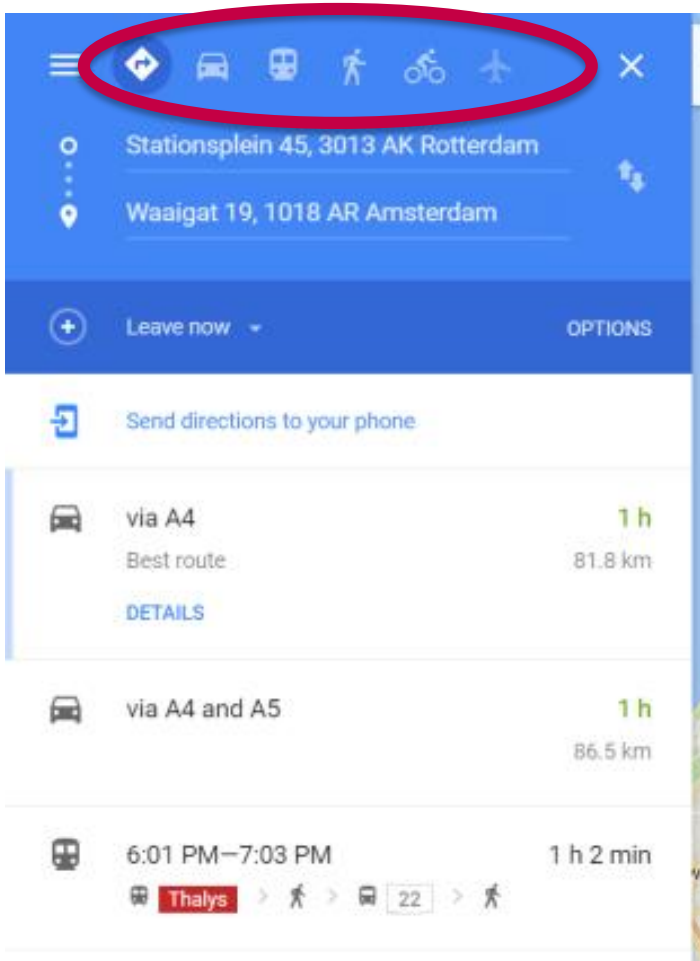
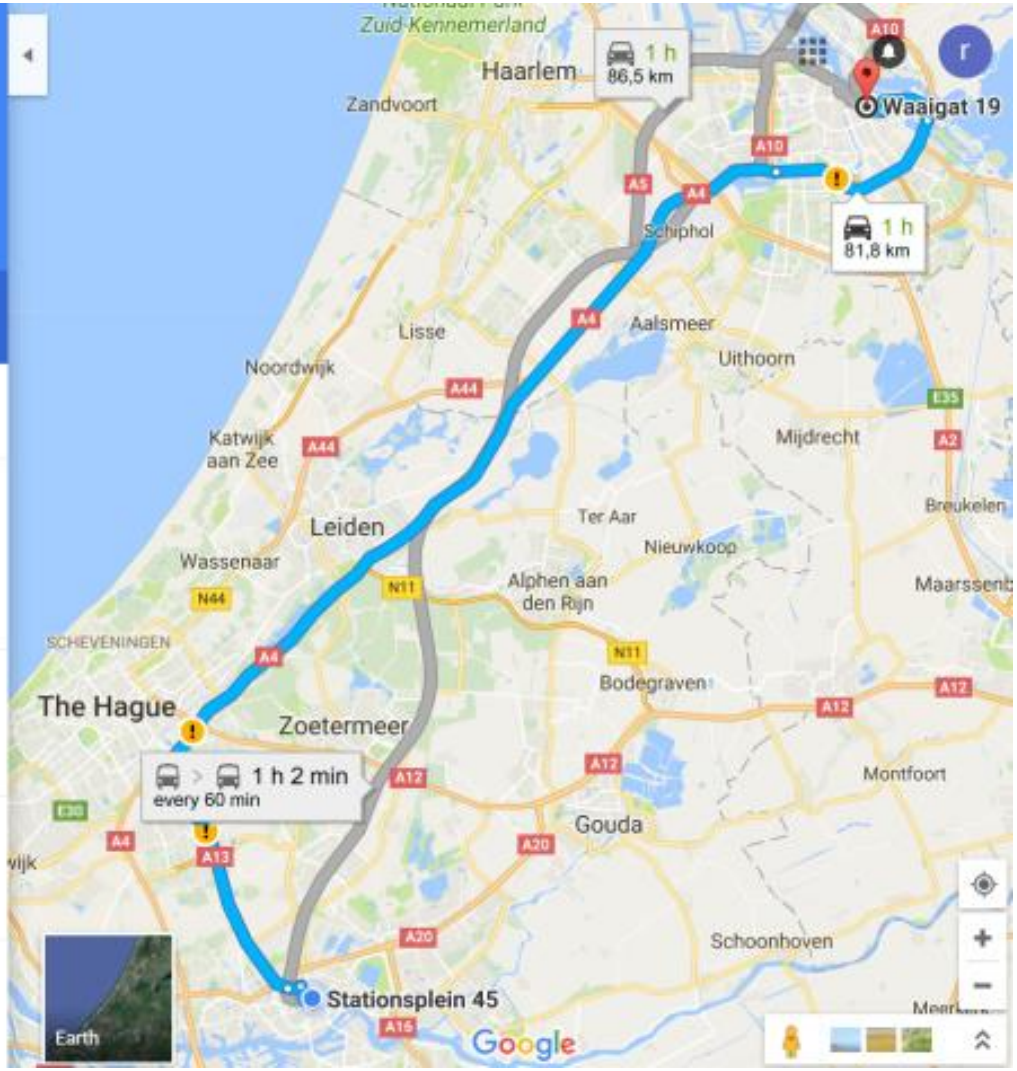
LET ME GOOGLE THAT>>> FOUR MODALITIES ?!





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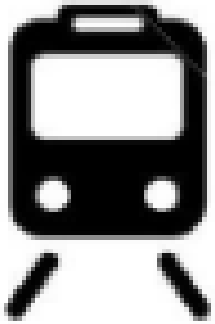
FOUR MODALITIES... ?!

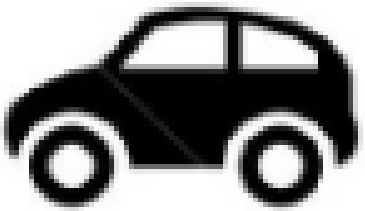
A.K.A. THE WORLD ACCORDING TO TRANSPORT ENGINEERS. AND GOOGLE ENGINEERS.

A

B



C



D

STUDIO BEREIKBAAR

FOUR MODALITIES... ?! (65KM)

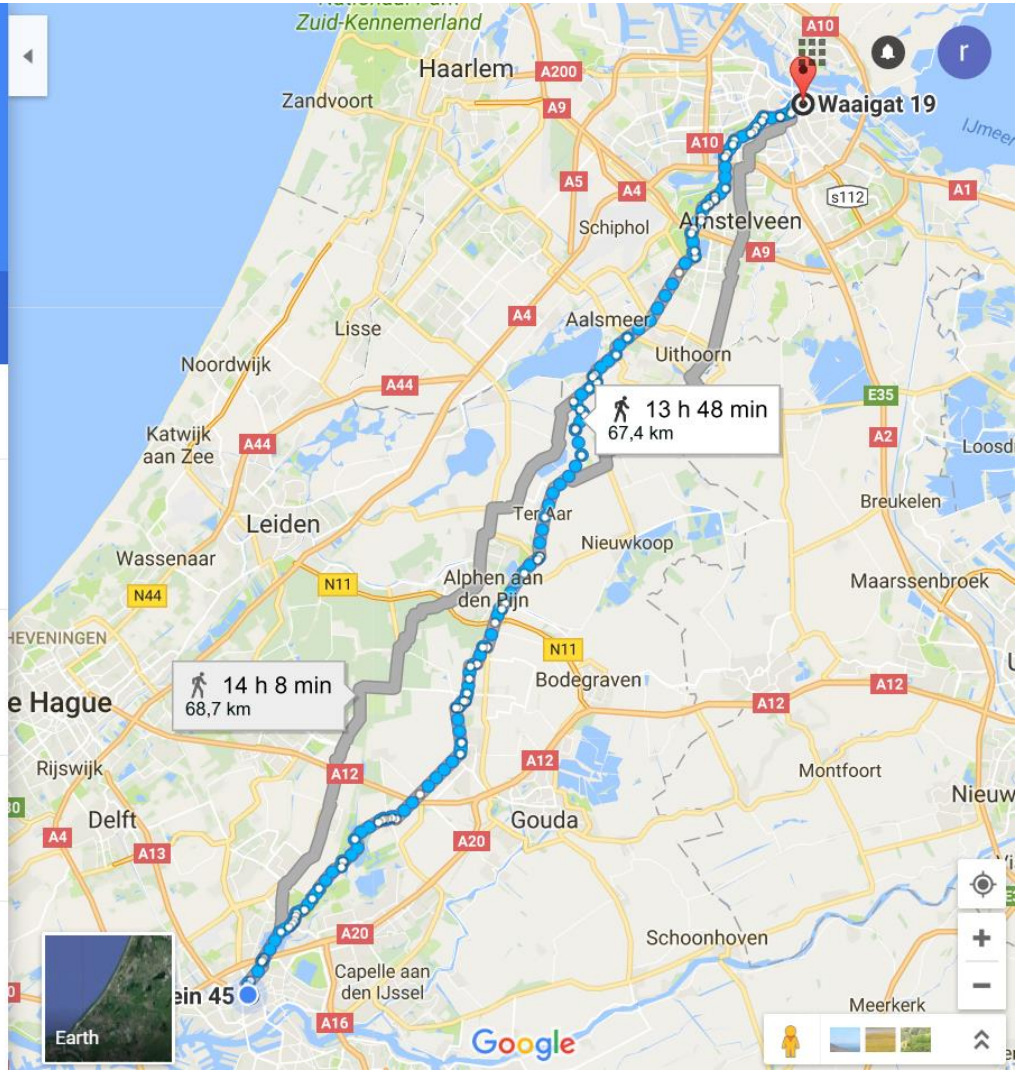
Stationsplein 45, 3013 AK Rotterdam

Waaigat 19, 1018 AR Amsterdam

OPTIONS

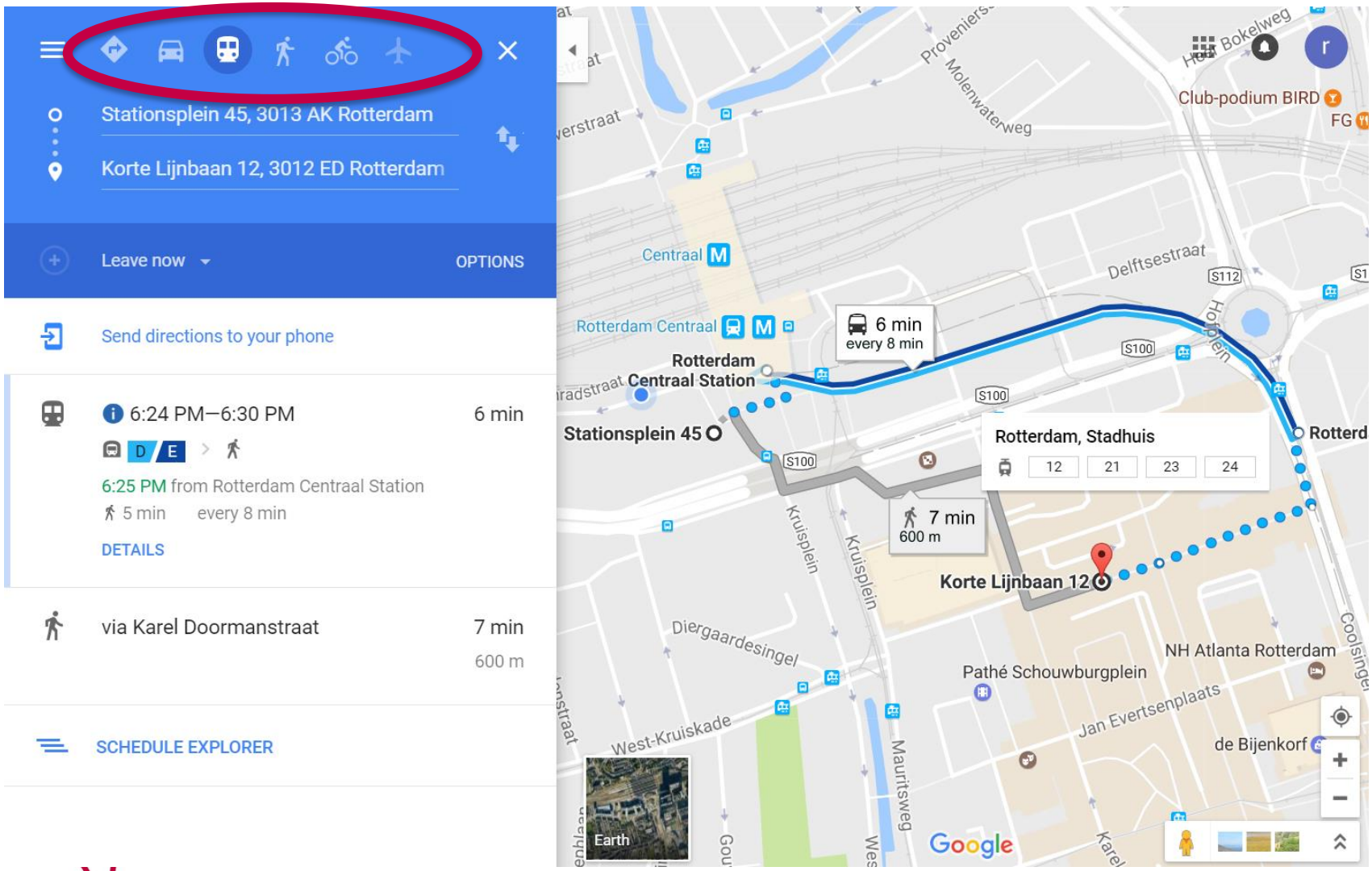
Send directions to your phone

via Oostkanaalweg DETAILS	13 h 48 min	67.4 km
via Oostkanaalweg and Beneluxbaan	13 h 54 min	67.9 km
via Langeraarseweg	14 h 8 min	68.7 km



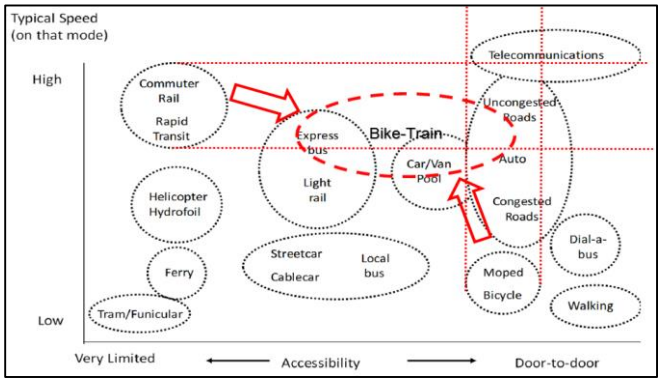
STUDIO BEREIKBAAR

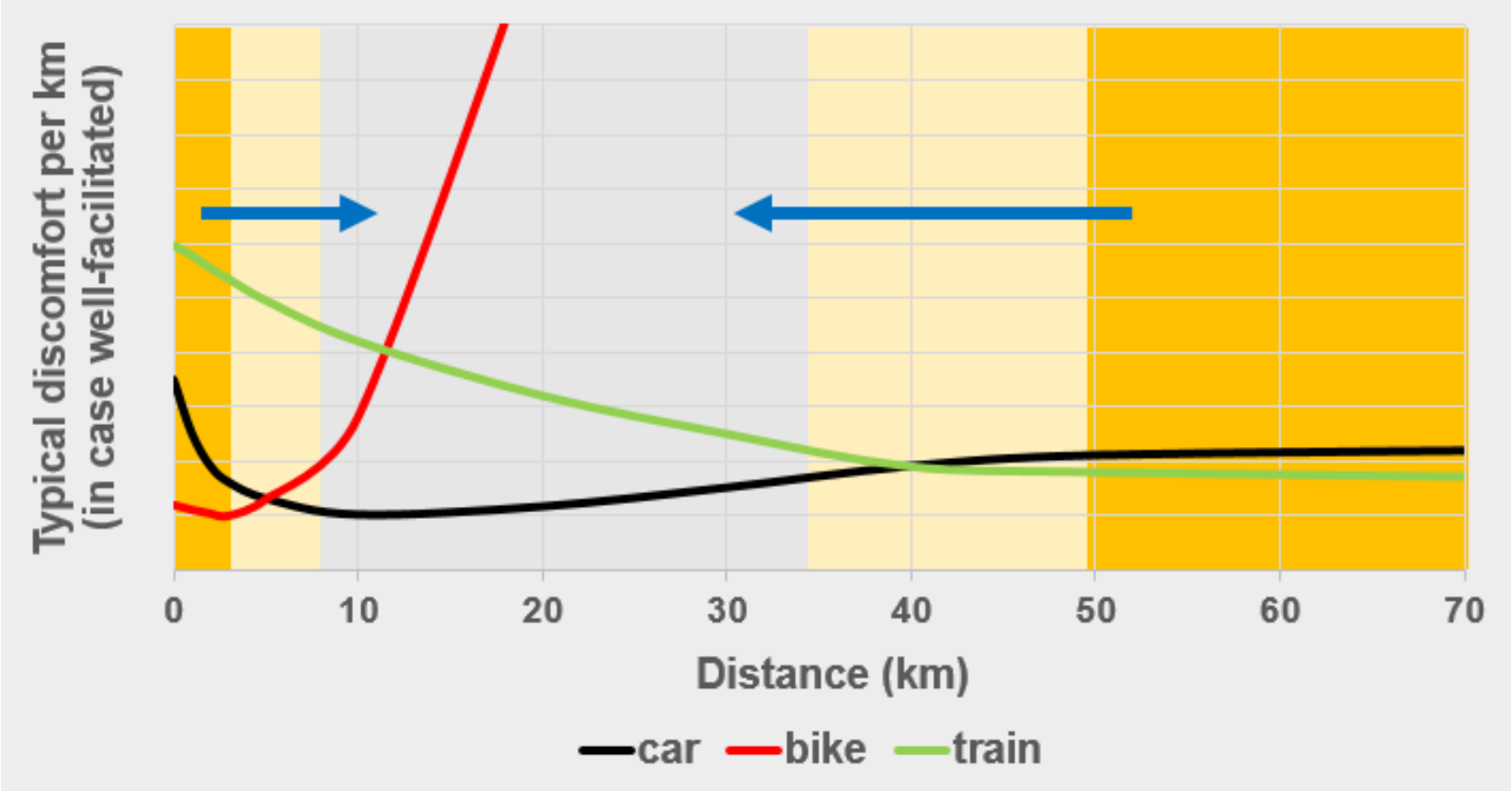
FOUR MODALITIES... ?! (1KM) (+URBAN)



STUDIO BEREIKBAAR

FOUR MODALITIES... ?!



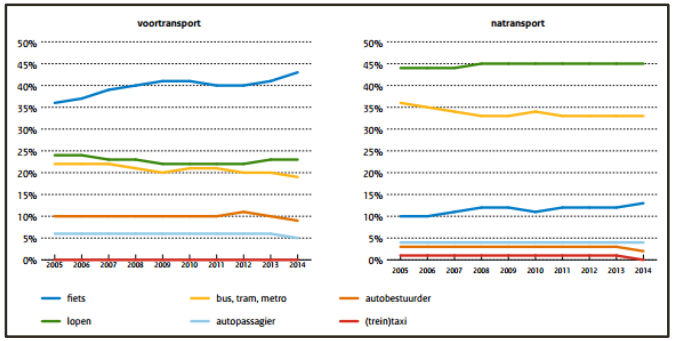


STUDIO BEREIKBAAR

FOUR MODALITIES...
OR TWO INTEGRATED MOBILITY SYSTEMS?

A

B



STUDIO BEREIKBAAR

FOUR MODALITIES...
OR INTEGRATED (LAND-USE/) MOBILITY SYSTEMS?

STUDIO BEREIKBAAR

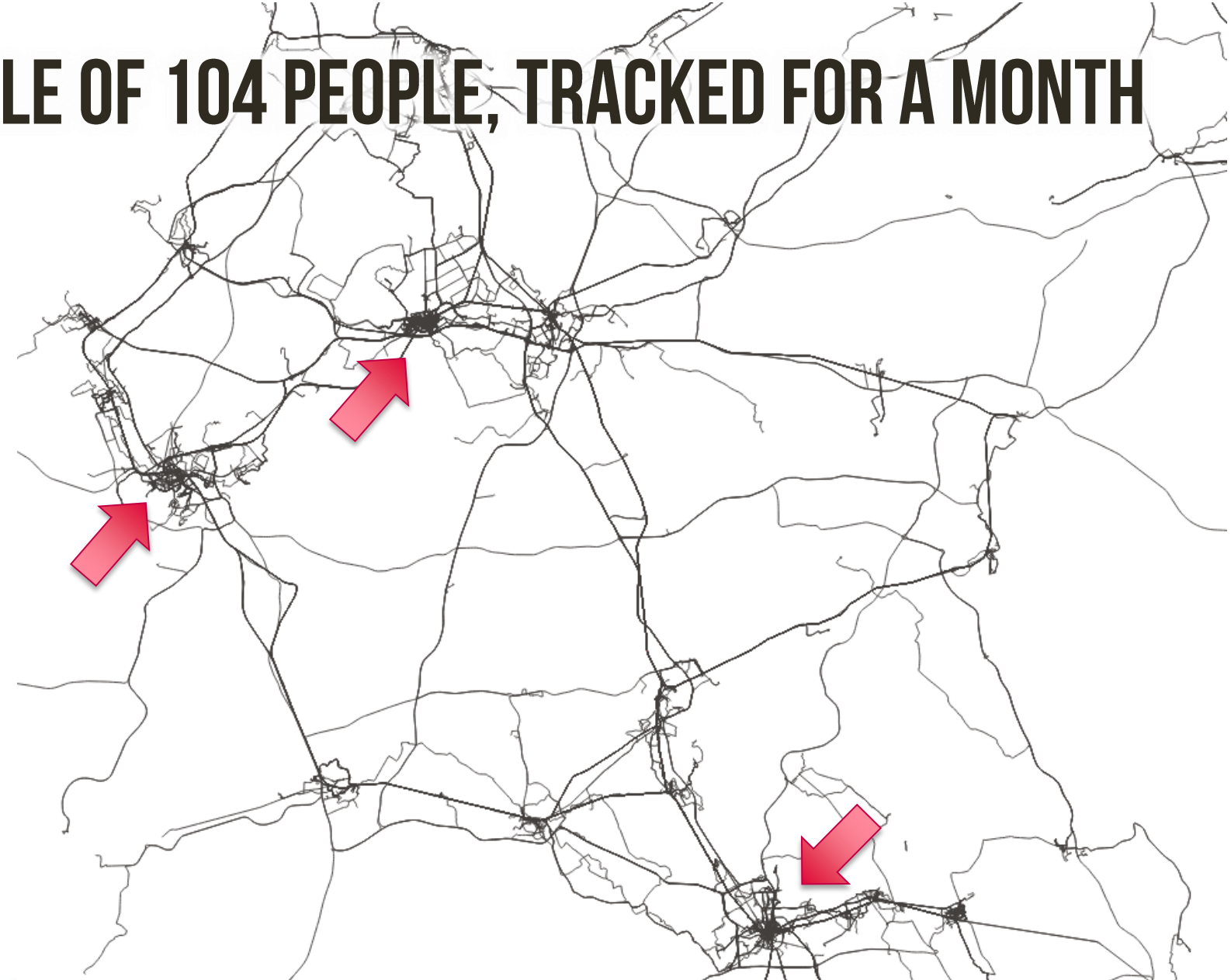
IMPROVED TRANSIT NETWORKS:

3. A STORY TOLD BY GPS-TRACKING:

TRANSIT + BIKE + WALK ≠ 3 SINGULAR MODALITIES

TRANSIT + BIKE + WALK = INTEGRATED MOBILITY SYSTEM

A TALE OF 104 PEOPLE, TRACKED FOR A MONTH



STUDIO BEREIKE

- 104 people living or working in 3 locations – tracked 28 days
- N=13.623 trips (9.465 chains), 1.532 transit (=16%)

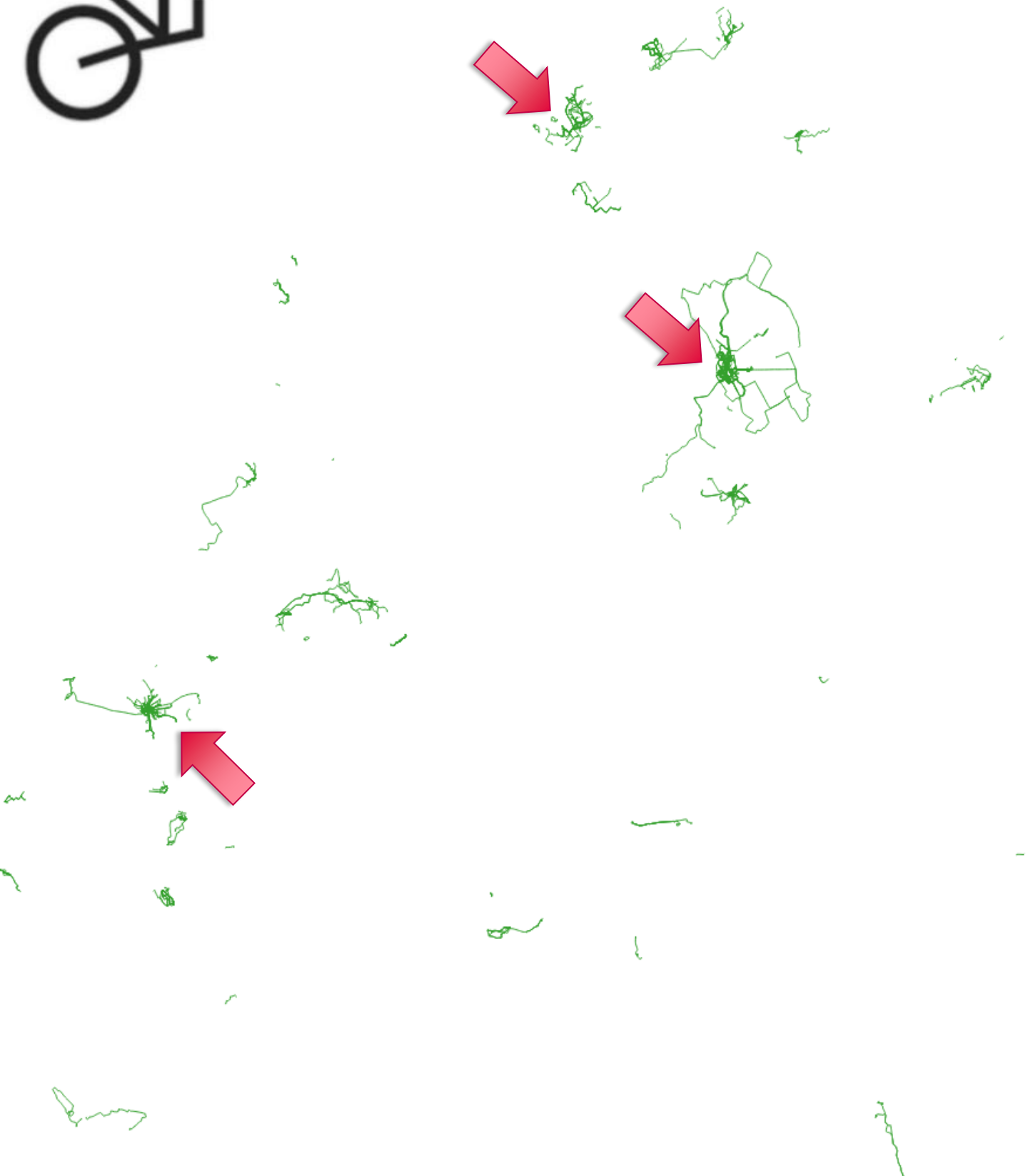
CAR : 4.340 TRIPS ➔ 32%

TRANSIT 2.291 TRIPS ➔ 17%

TRAIN: 14%

BTM: 3%

CYCLING: 3.712 TRIPS ➔ 27%



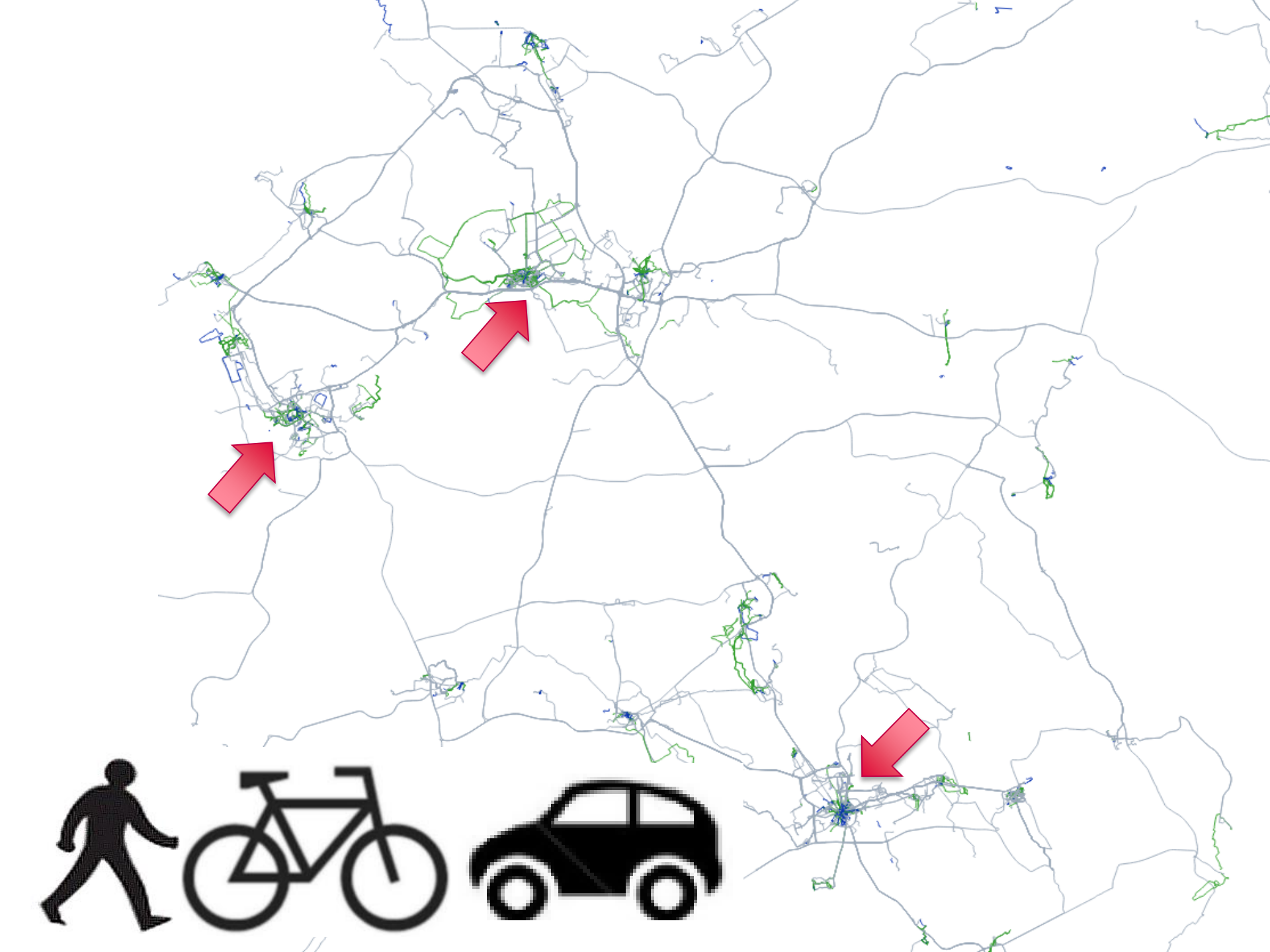
WALK: 3.132 TRIPS ➔ 23%

NEXT... SAME TRIPS BUT SHOWN IN OVERLAYS

A

B

STUDIO BEREIKBAAR

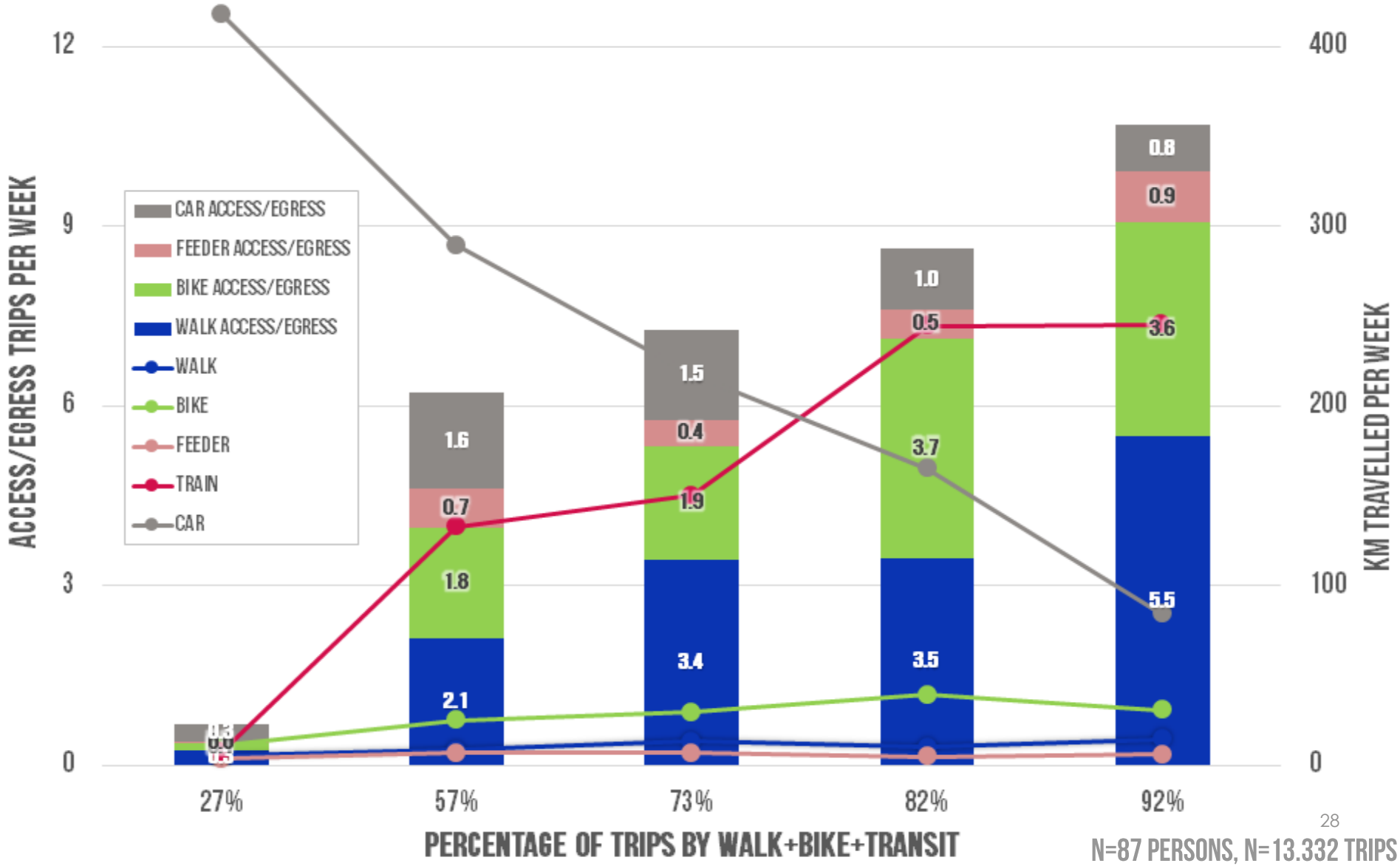


IMPROVED TRANSIT NETWORKS:

4. A CLOSER LOOK ON ACCESS/EGRESS MODES

WEEKLY TRANSIT JOURNEYS AND JOURNEY LENGTH

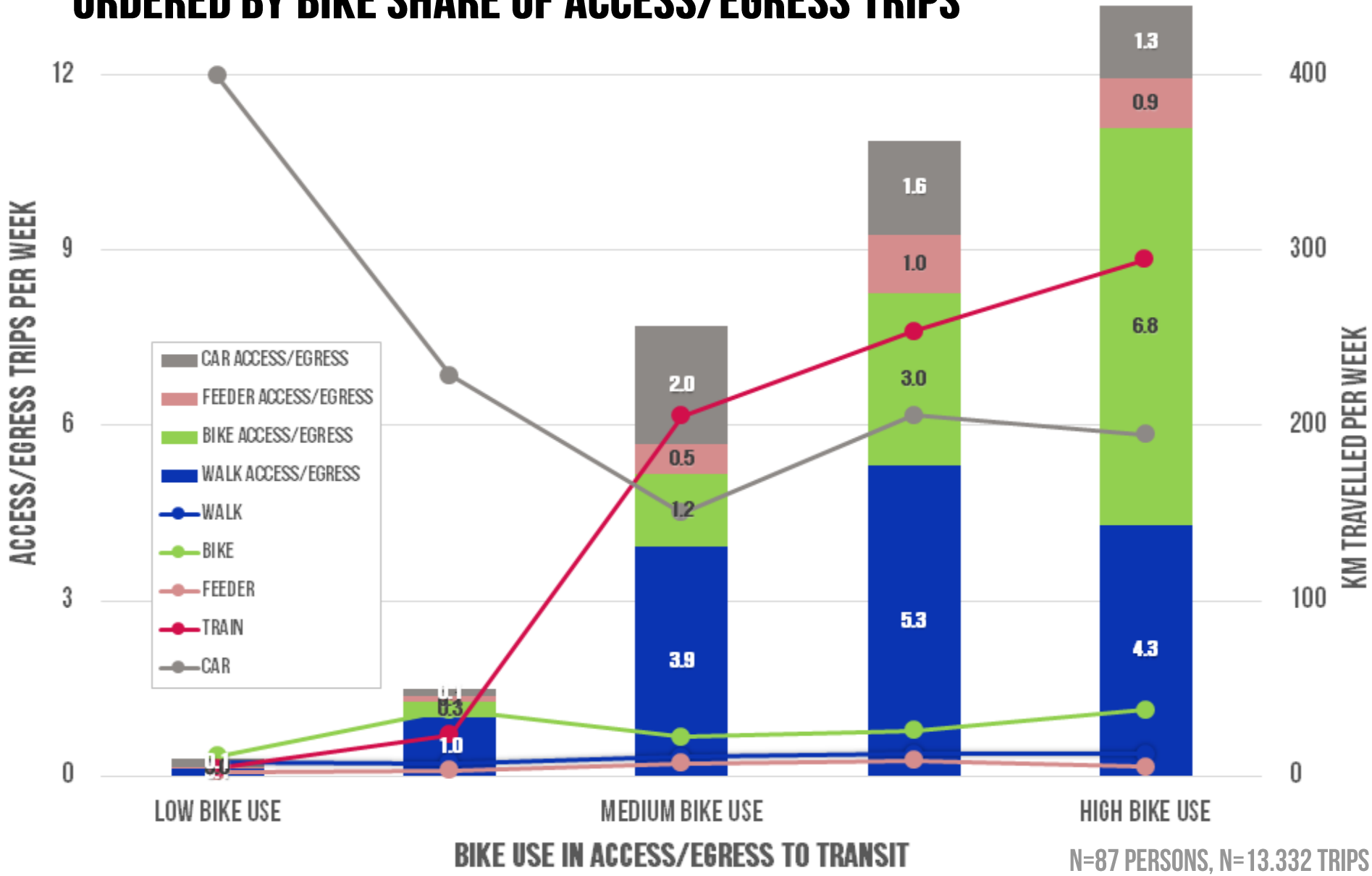
ORDERED BY USE OF ACTIVE MODES



N=87 PERSONS, N=13.332 TRIPS

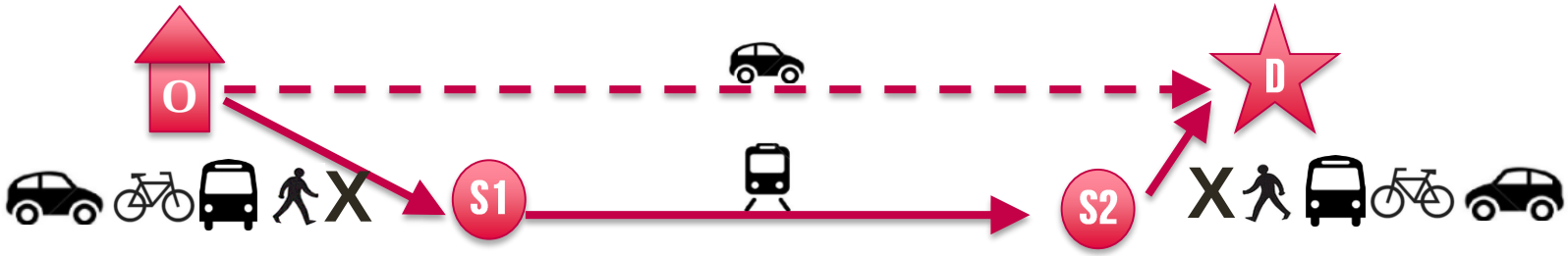
WEEKLY TRANSIT JOURNEYS AND JOURNEY LENGTH

ORDERED BY BIKE SHARE OF ACCESS/EGRESS TRIPS



N=87 PERSONS, N=13.332 TRIPS

LENGTH OF TRAVEL (IN KM) - PER ACCESS MODE

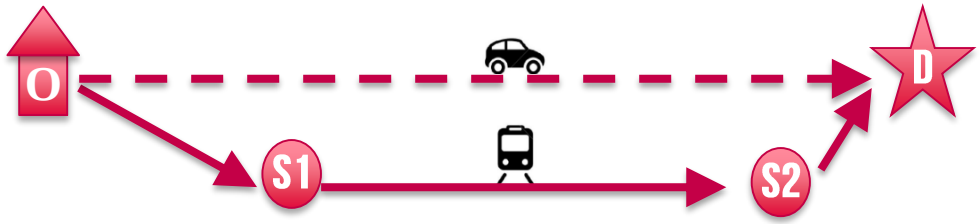


MODE 1 →	CAR	BIKE	FEEDER *	WALK	NONE
O→D - STRAIGHT DIST	40.9	36.9	45.5	28.4	24.3
O→S1 - MODE1 (ACC/EGR)	7.1	2.1	4.2	1.0	-
S1→S2 - MAIN TRANSIT	36.6	36.3	45.3	27.4	24.3
S2→D - MODE2 (ACC/EGR)	1.9	1.1	0.9	0.5	-
O→S1→S2→D	45.6 (+12 %)	39.5 (+7 %)	50.4 (+11 %)	28.9 (+2 %)	24.3
# OBSERVED TRIPS	282	524	82 *	336	229

STUDIO BEREIKBAAR

- Transit targeted by bike access = services travelling +30% km
- Out of car/bike/feeder; bike best aligned (only +7% km)

SPEED OF TRAVEL (KM/H)



MODE 1 →	CAR	BIKE	FEEDER *	WALK	NONE
O➔ D - STRAIGHT DISTANCE	41.0	36.9	45.7	28.1	24.3
O➔S1 - MODE1 SPEED	33.1	15.9	18.7	7.1	-
O➔S1 – TRANSFER TIME	6 MIN	5 MIN	7 MIN	5 MIN	-
S1➔S2 - MAIN TRAVEL SPEED	76.1	75.9	75.5	64.3	45.4
S1➔S2 – INNER TRANSFERS	2 MIN	2 MIN	4 MIN	2 MIN	2 MIN
S2➔D - TRANSFER TIME	4 MIN	3 MIN	4 MIN	1 MIN	-
S2➔D - MODE2 SPEED	13.5	10.1	10.4	9.2	-
O➔S1➔S2➔D - EFFECTIVE SPEED = ACC + MAIN + EGR IN STRAIGHT LINE + TRANSFERS	33.5	33.8	31.9	32.7	37.7

STUDIO BEREIKBAAR

- Transit targeted by bike access = services +18% faster
- compensating +110% longer access distance ➔ TOD 2.0

TRANSIT SERVICES NOT USED (BUT <500M NEARER THAN SELECTED TRANSIT SERVICE)

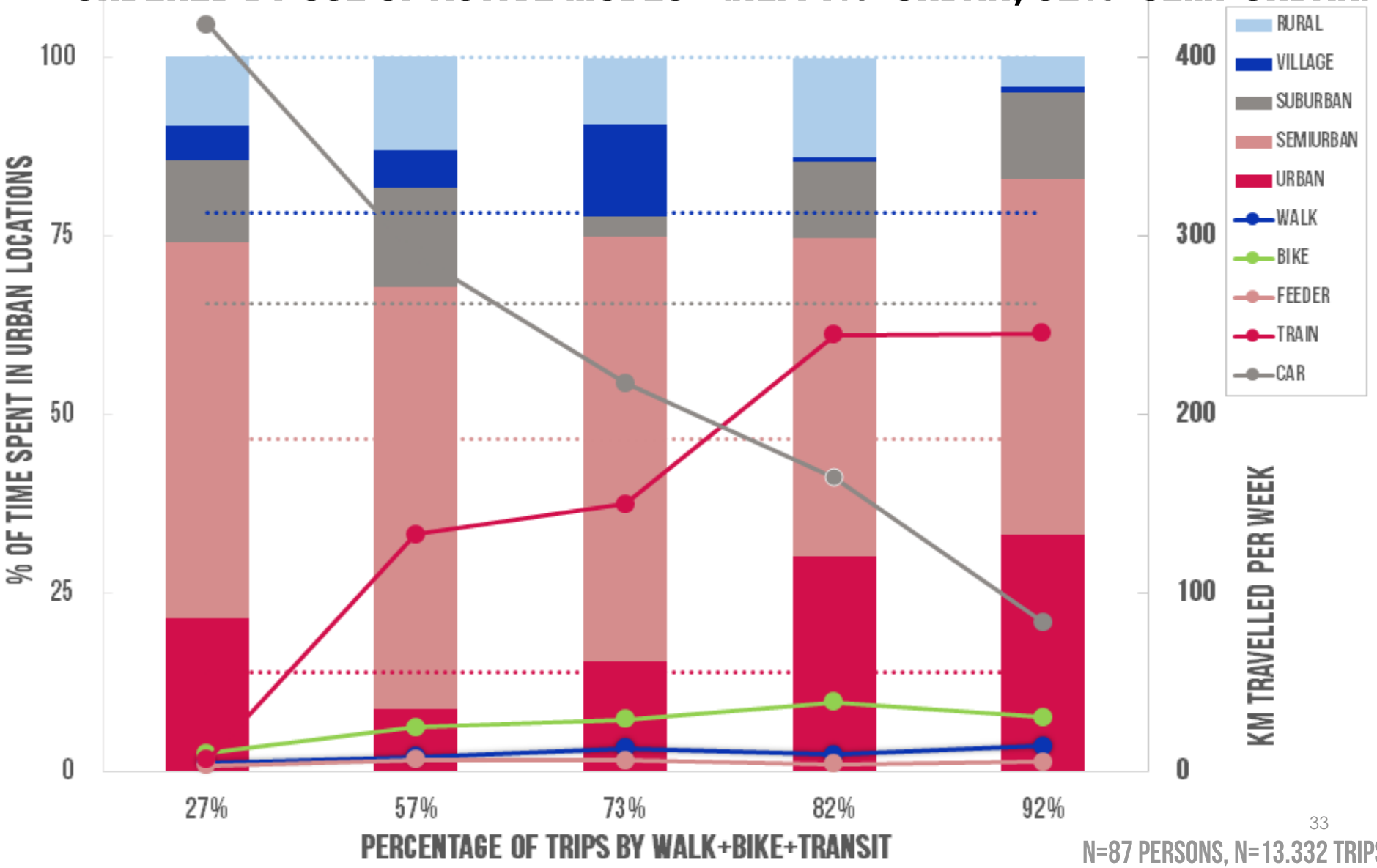
MODE 1 →	CAR	BIKE	WALK
STRAIGHT DISTANCE MODE 1	7.1 KM	2.1 KM	1.0 KM
FERRY	0.4	0.2	0
BUS	28.9	10.4	3.8
TRAM	1.6	1.1	0.2
METRO	0.5	0.4	0
TRAIN – LOCAL	2.1	1.0	0.3
TRAIN – IC	2.4	0.9	0.3
TOTAL (# LINES)	35.9	14.0	4.6

STUDIO BEREIKBAAR

- Bike & car access despite (high) availability of transit services
- Even IC services skipped ➔ topology matters

TIME SPENT IN URBAN LOCATIONS

ORDERED BY USE OF ACTIVE MODES (NL: 14%=URBAN, 32%=SEMI-URBAN)



N=87 PERSONS, N=13.332 TRIPS

IMPROVED TRANSIT NETWORKS:

5. REFLECTING ON URBANITY, CITY IMPROVEMENTS, HUB IMPROVEMENTS

MODAL SPLIT BY URBANITY CLASS (ORIG➔DEST)...

BASED ON NAT. TRAVEL SURVEY 2010-2015, N = 252.110 RESP.

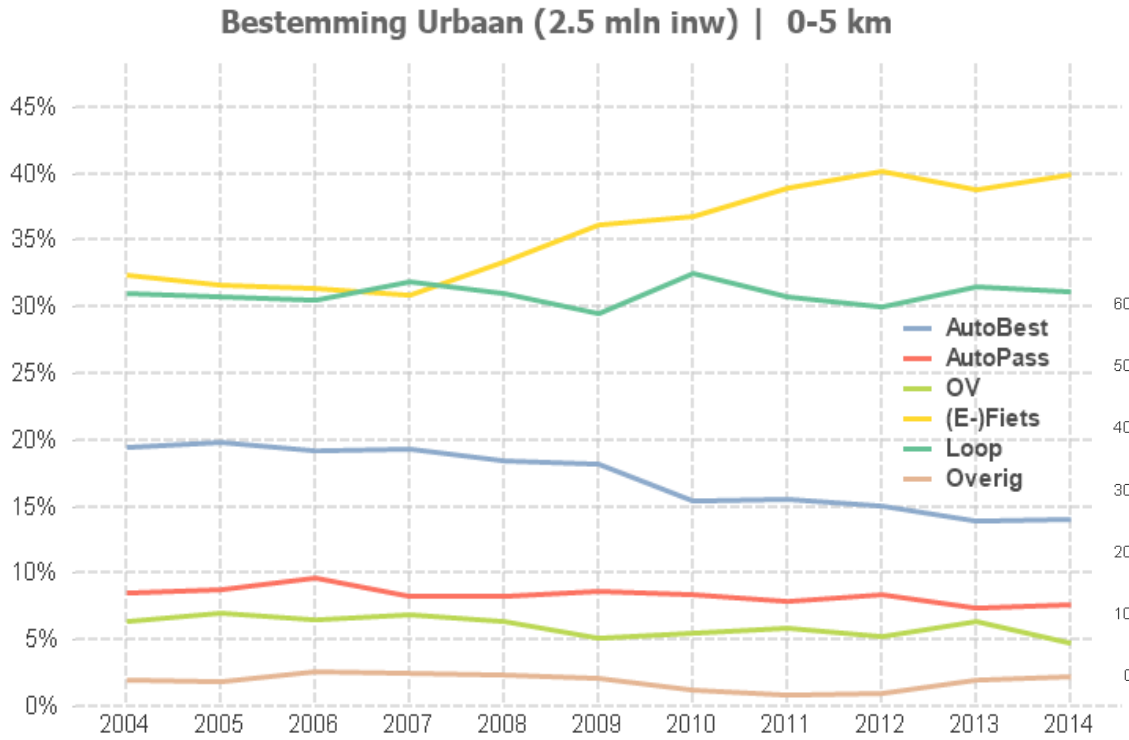
? ➔ ?	⟷	🚗	🚌🚆	🚲
🏘➡🏘	5 – 10 km	55 %	1 %	16 %
🏘➡🏙	5 – 10 km	42 %	11 %	25 %
🏙➡🏙	5 – 10 km	28 %	23 %	23 %
🏘➡🏘	25 – 40 km	67 %	4 %	0 %
🏘➡🏙	25 – 40 km	47 %	21 %	0 %
🏙➡🏙	25 – 40 km	14 %	71 %	0 %

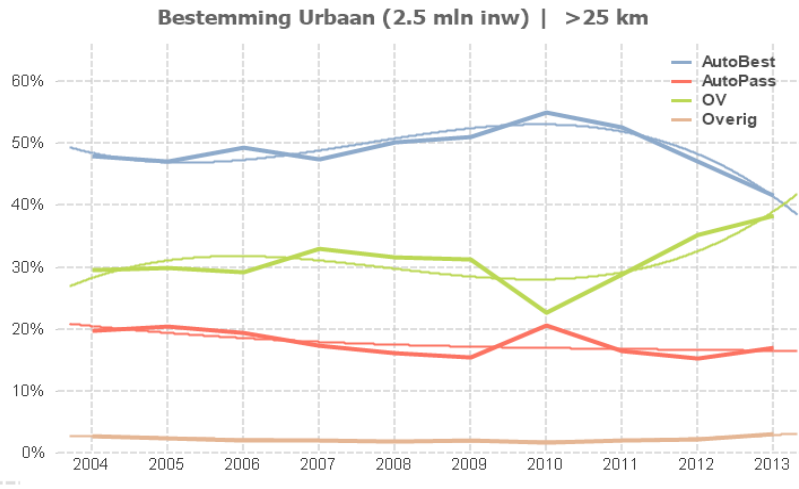
STUDIO BEREIKBAAR

- Car=car-driver. Selection of distance and urbanity classes
- Selection of modes (figures don't add up to 100%)

TRENDS ARE DIVERGING...

ANALYSIS NAT. TRAVEL SURVEY 2004-2014





STUDIO BEREIKBAAR

- +30% cycling (0-5km), +30% transit (>25km) for urban dest.
- Stable or opposite trends for nun-urban destinations

+URBAN TRANSFORMATIONS...

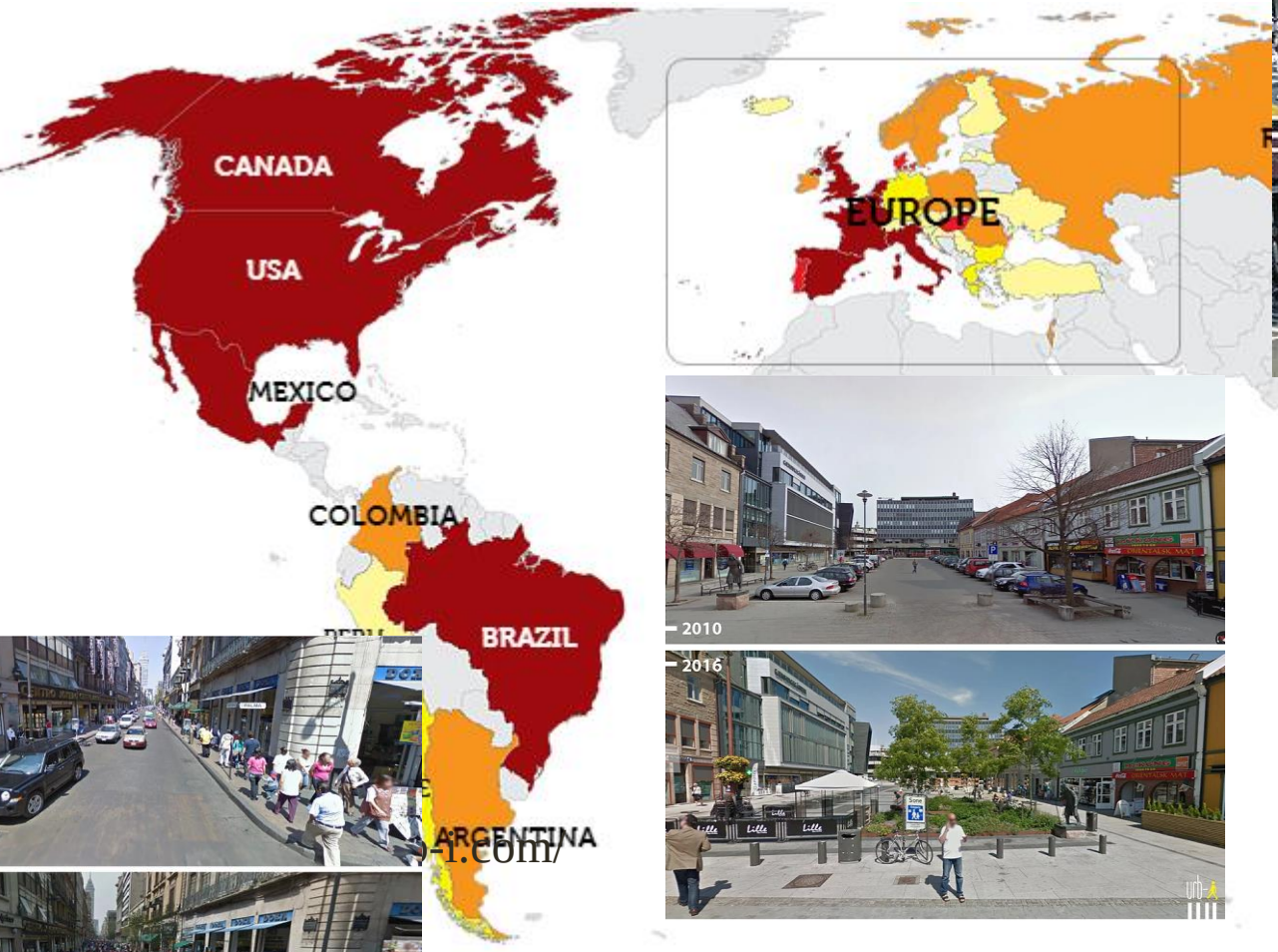
➔CORNELIA DINCA

+URBAN TRANSFORMATIONS...

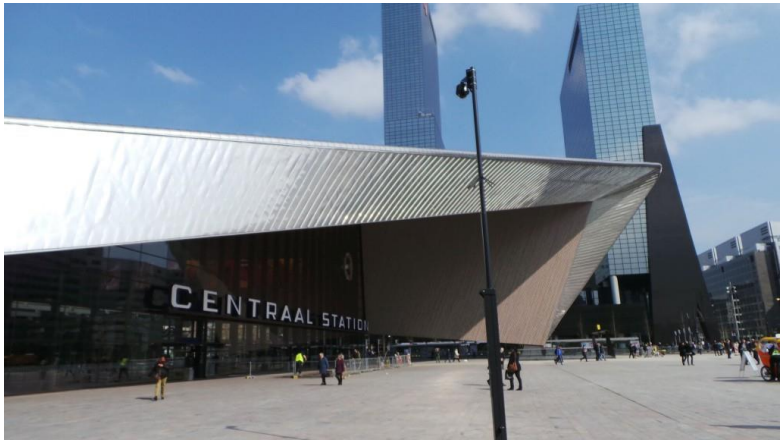
➔WWW.URB-I.COM

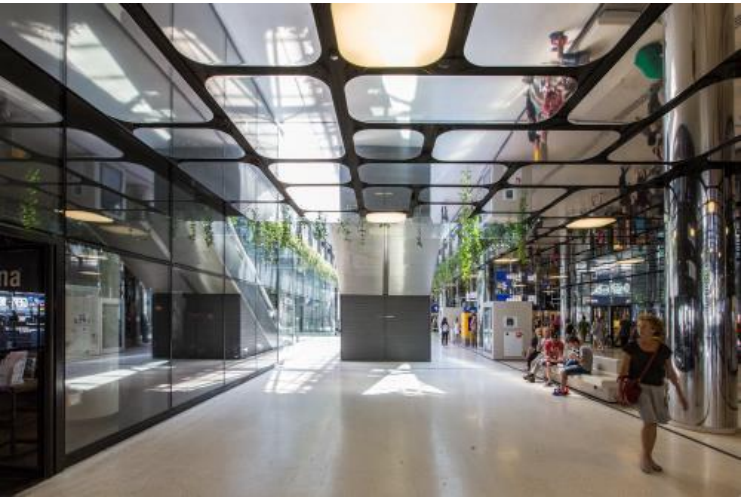
BEFORE | AFTER >>

WORLDWIDE PUBLIC SPACE TRANSFORMATIONS

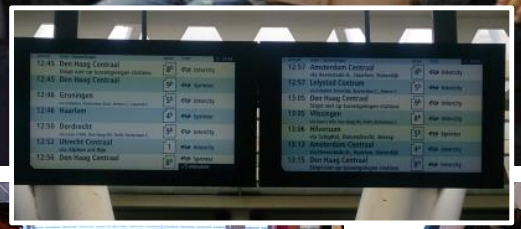


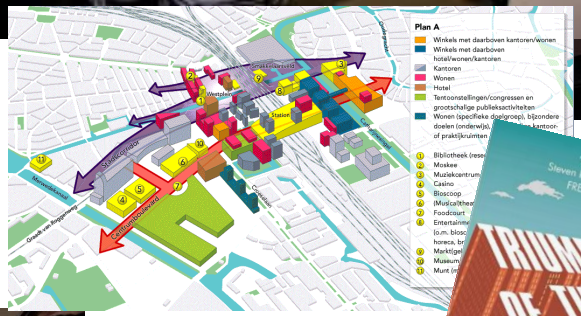
+HUB IMPROVEMENTS...

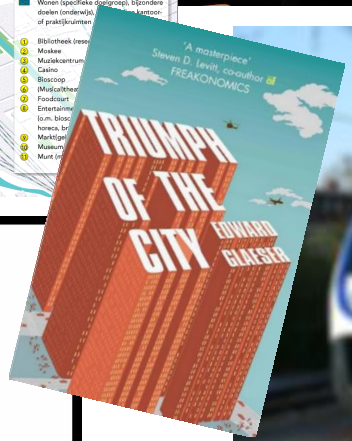


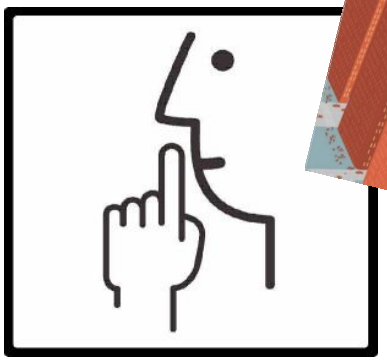


+OTHER IMPROVEMENTS...









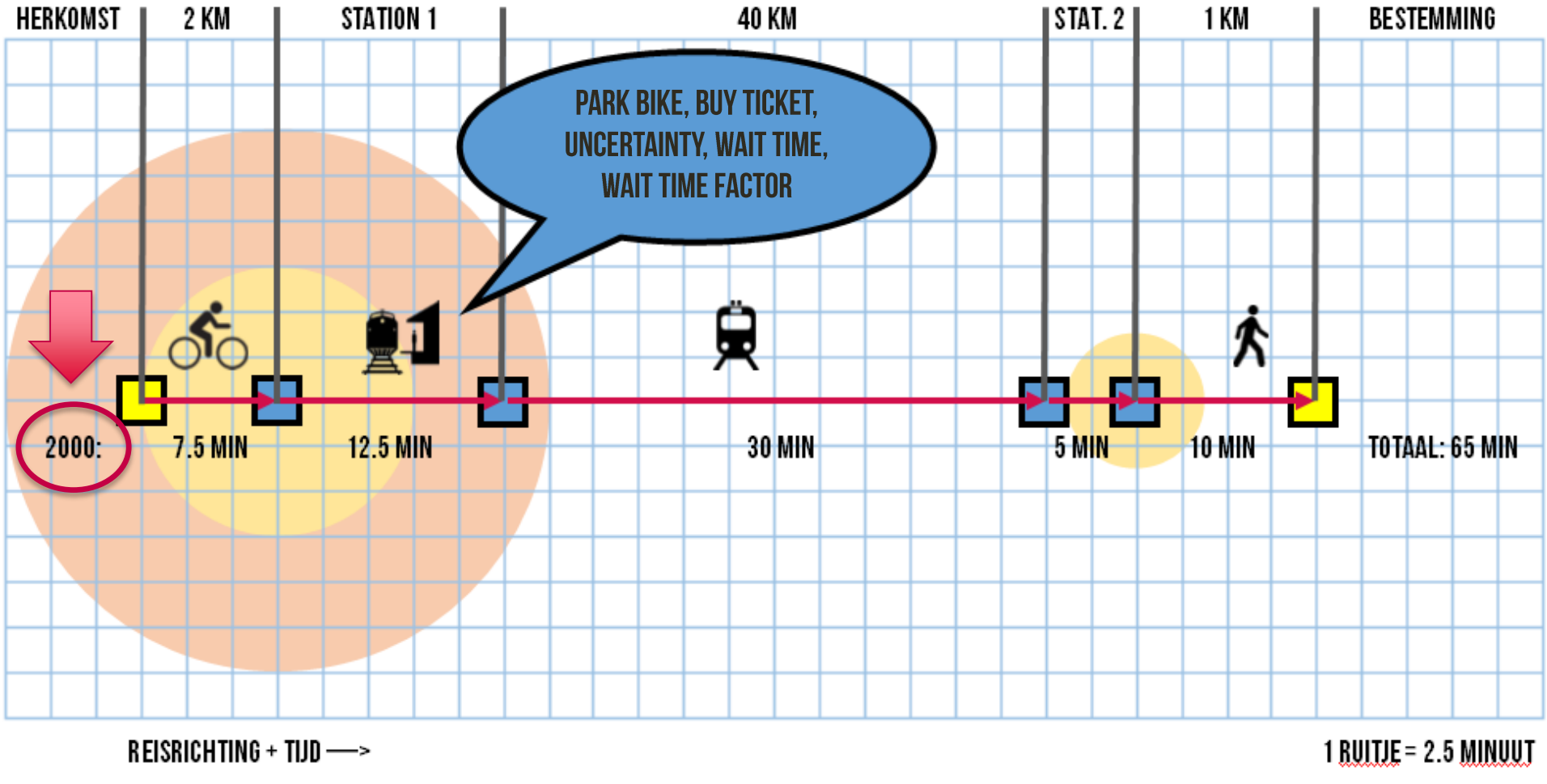
IMPROVED TRANSIT NETWORKS

6. ALL THESE IMPROVEMENTS...

WHY ARE BIKE-TRAIN JOURNEYS BENEFITING MORE ? (+5% ANNUALLY, OTHERS +1%)

TRANSIT, CITY, HUB IMPROVEMENTS IN NL ➔

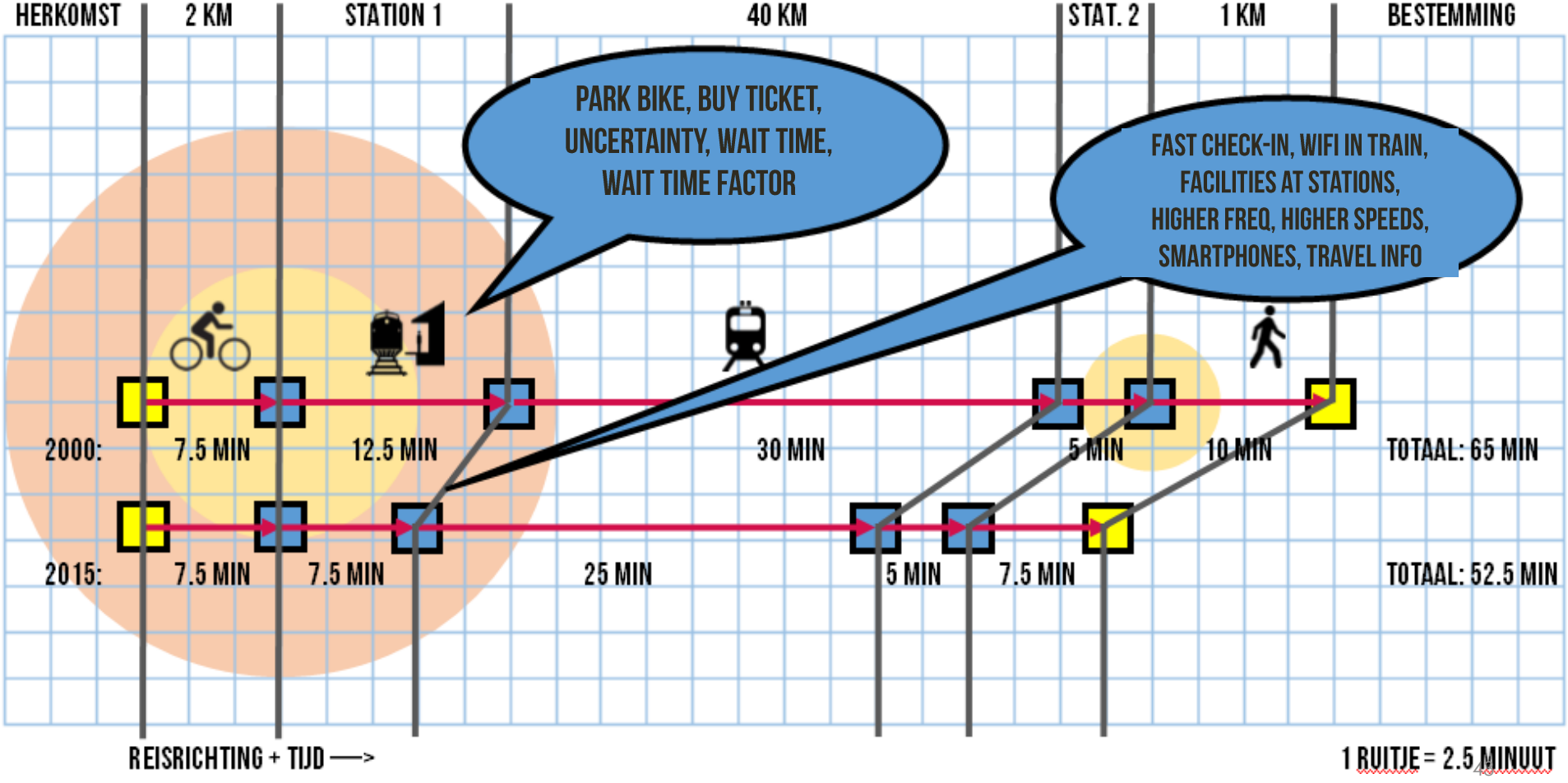
1. A SCHEMATIC DOOR-TO-DOOR JOURNEY IN 2000



TRANSIT, CITY, HUB IMPROVEMENTS IN NL ➔

2. IMPROVEMENTS '00-'15 = TIME REDUCTIONS

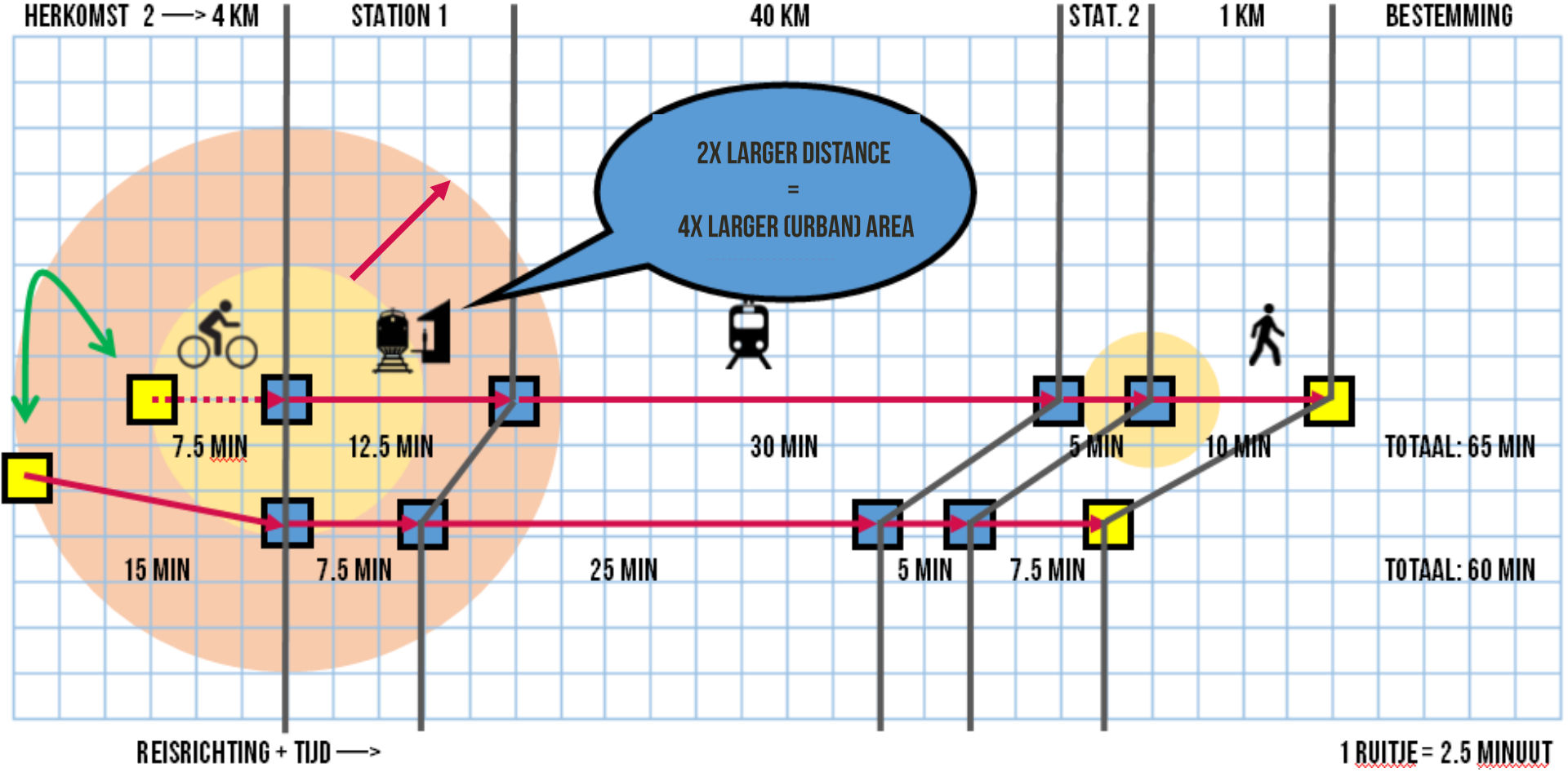
(OBJECTIVE /SUBJECTIVE / ABSOLUTE / RELATIVE)



TRANSIT, CITY, HUB IMPROVEMENTS IN NL ➔

3. STATIONS ARE REACHING OUT

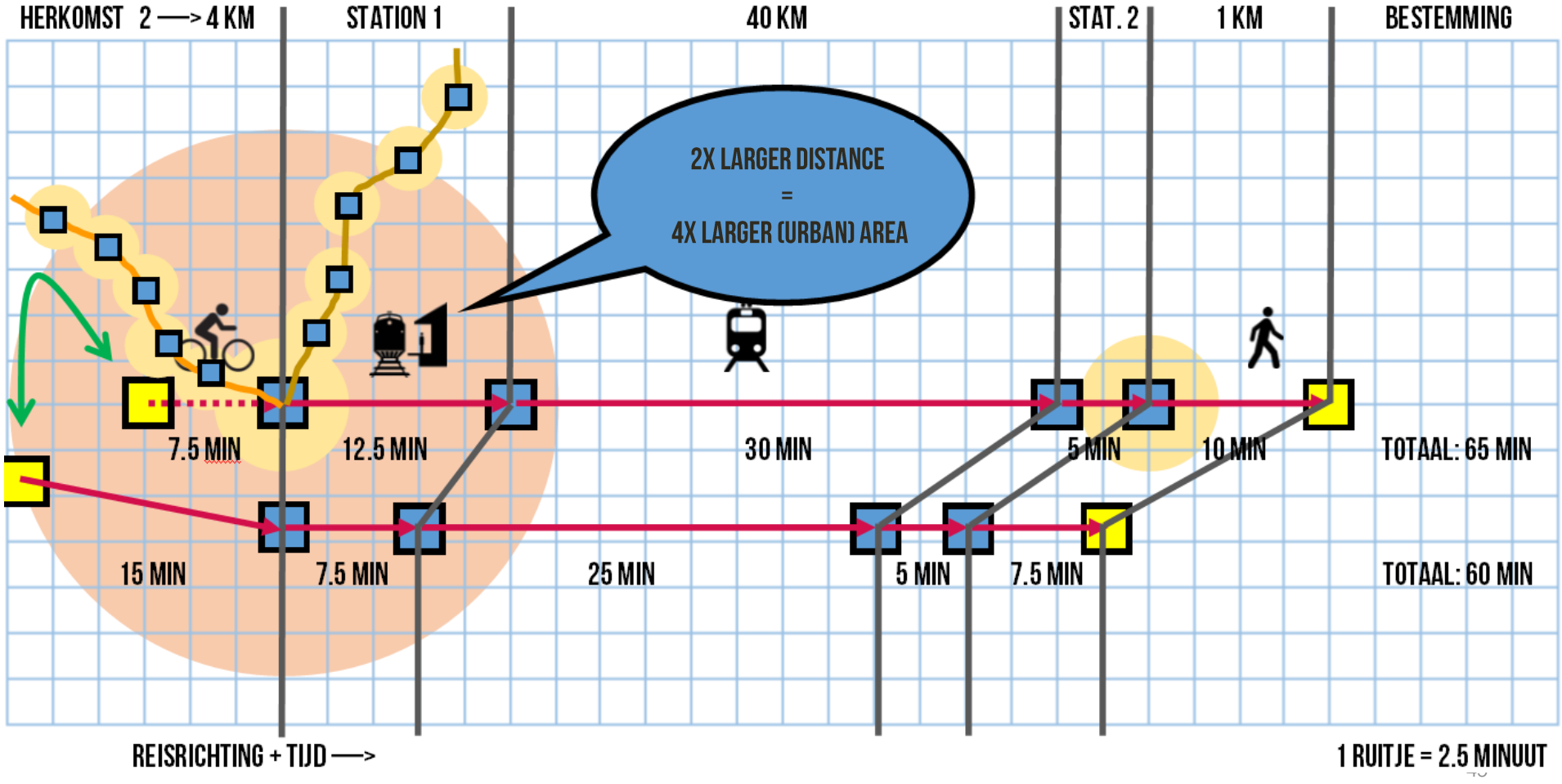
BETTER DEAL ➔ MORE INVESTMENT ON ACCESS



TRANSIT, CITY, HUB IMPROVEMENTS IN NL ➔

4. CYCLING HAS BEST CARDS IN NEW AREAS-TOD 2.0

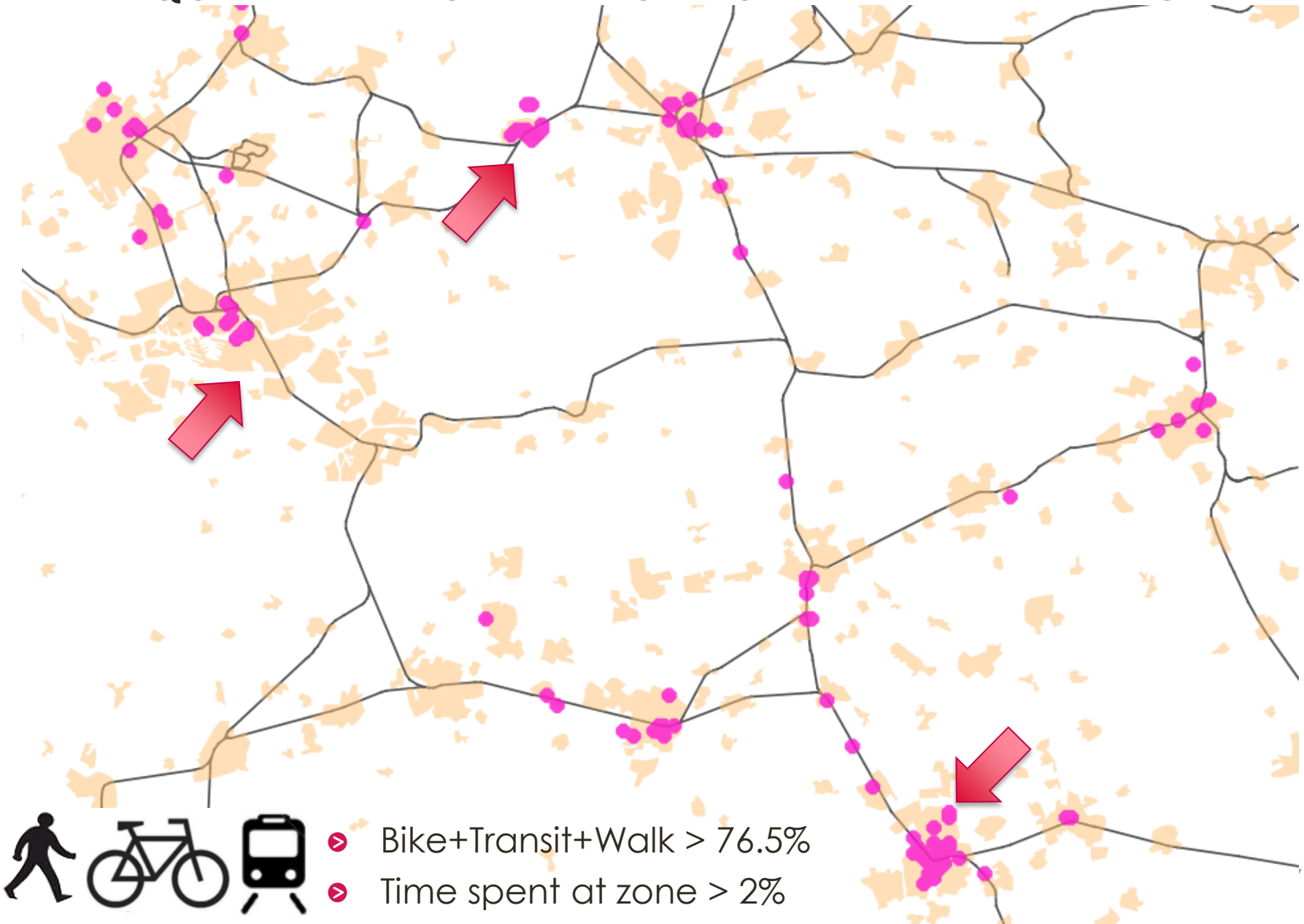
URBAN SETTING & 2-5 KM & STATION AS DESTINATION



IMPROVED TRANSIT NETWORKS:

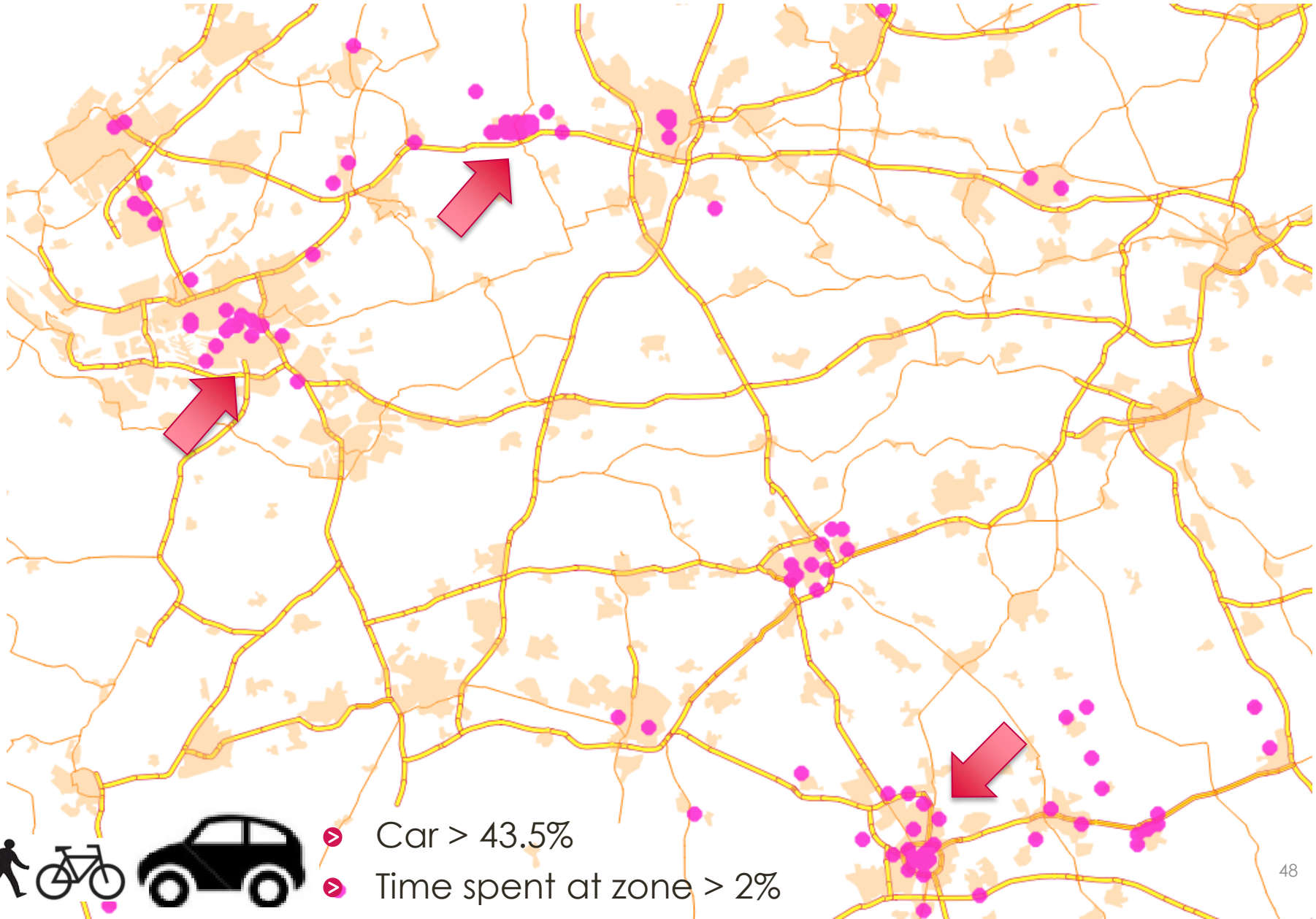
7. BIKE-TRAIN AS TOD 2.0

FREQUENTLY VISITED ZONES (BY BIKE-TRANSIT)



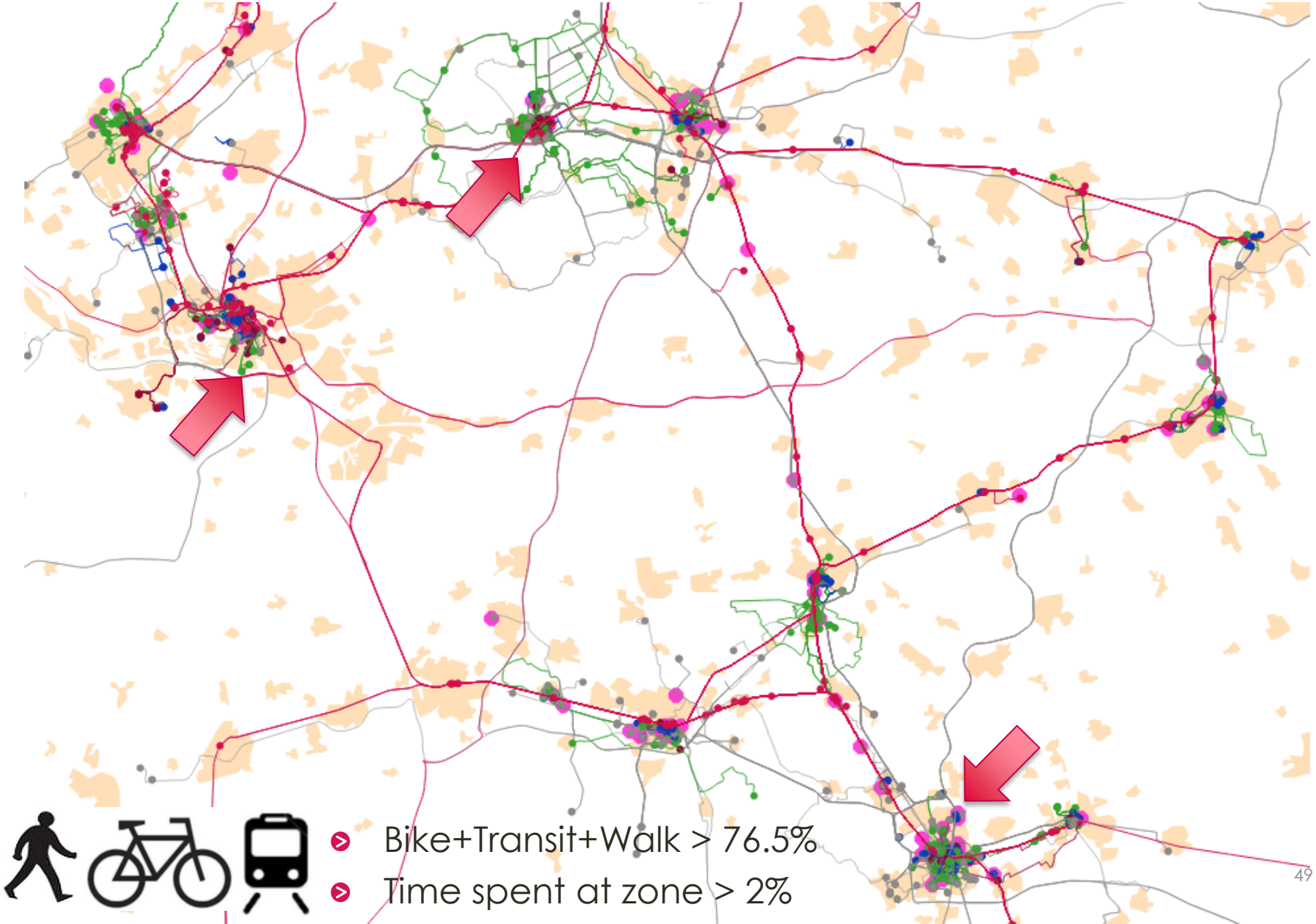
- Bike+Transit+Walk > 76.5%
- Time spent at zone > 2%

FREQUENTLY VISITED ZONES (BY CAR)



- Car > 43.5%
- Time spent at zone > 2%

BIKE-TRANSIT LANDUSE/TRANSPORT SYSTEM



- Bike+Transit+Walk > 76.5%
- Time spent at zone > 2%

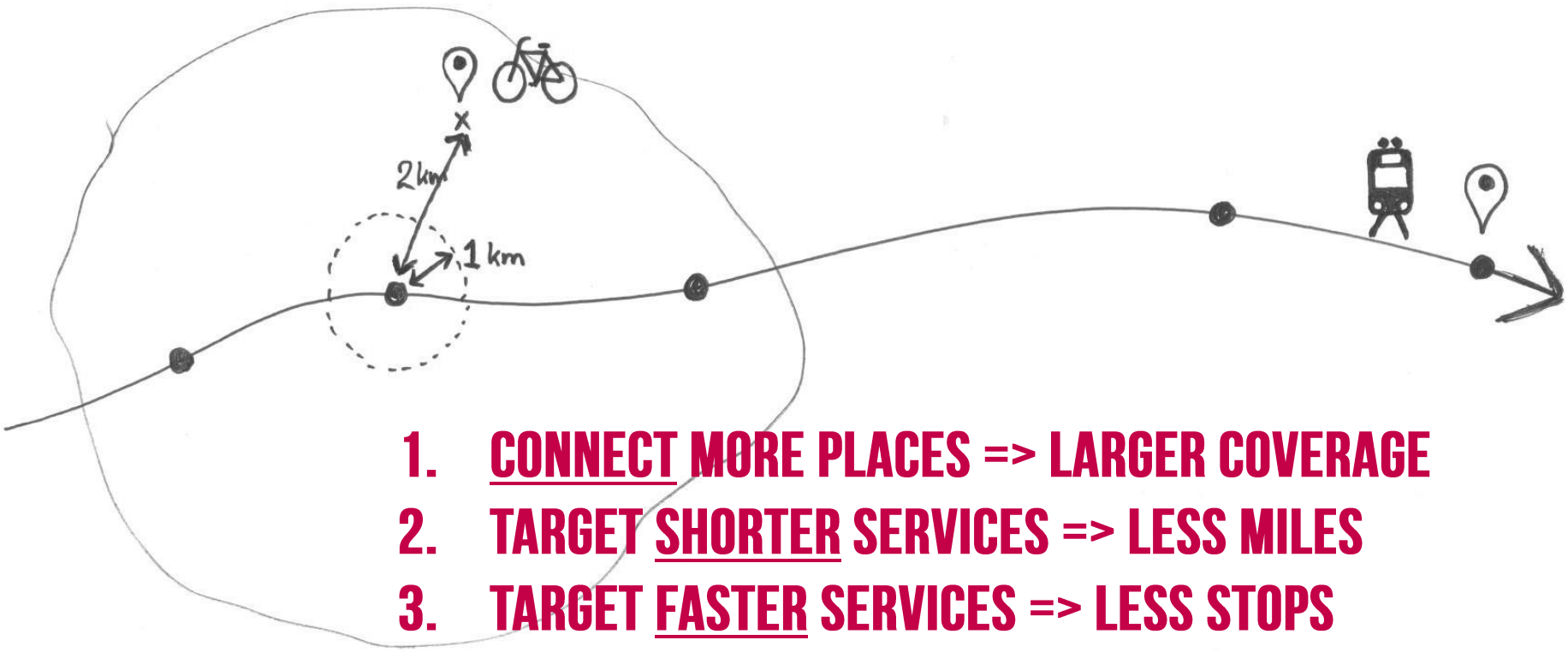
CAR-BASED LANDUSE/TRANSPORT SYSTEM

- Car > 43.5%
- Time spent at zone > 2%

IMPROVED TRANSIT NETWORKS

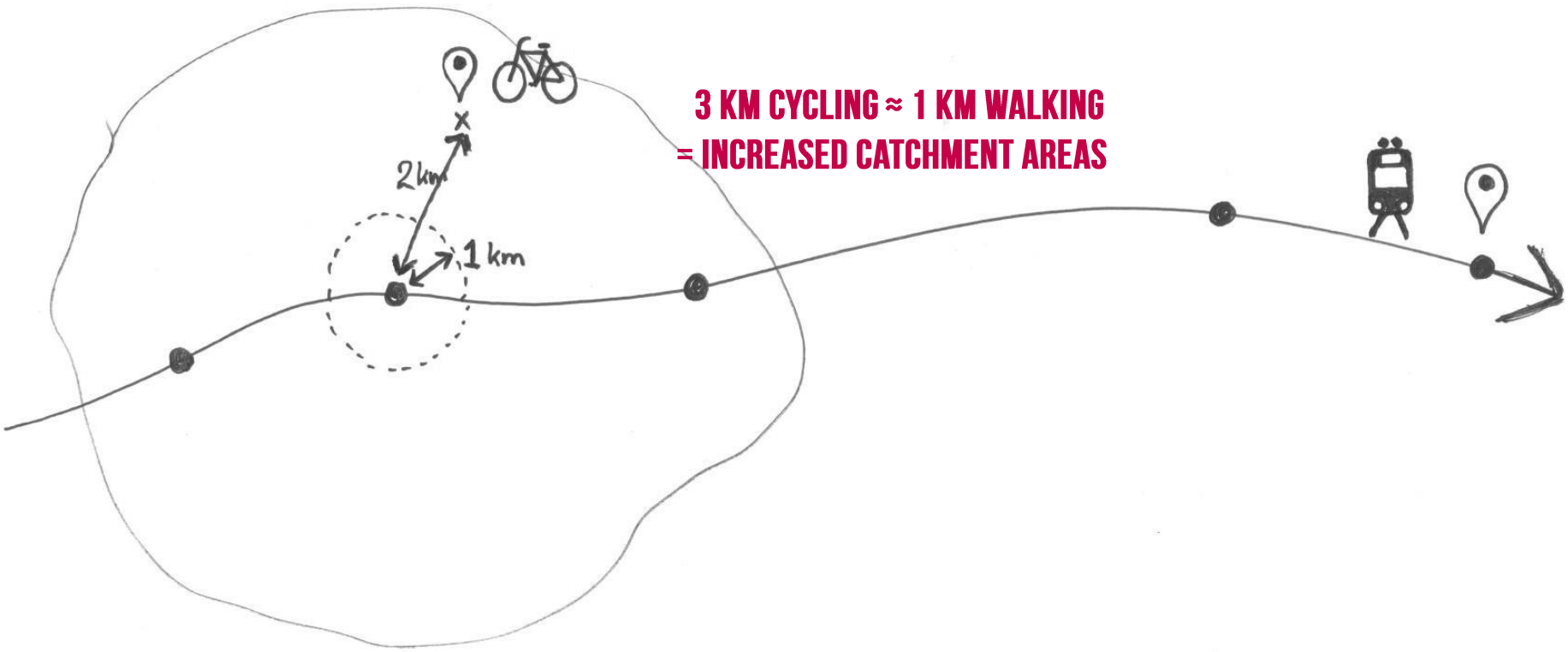
8. SYNERGY OF TRANSIT + CYCLING
SIX MECHANISMS

6 WAYS HOW CYCLING (POTENTIALLY) EXTENDS TRANSIT:



1. CONNECT MORE PLACES => LARGER COVERAGE
2. TARGET SHORTER SERVICES => LESS MILES
3. TARGET FASTER SERVICES => LESS STOPS
4. TARGET MORE FREQUENT SERVICES => LESS WAIT
5. TARGET MORE DIRECT SERVICES => LESS CHANGE
6. TARGET PREFERRED SERVICES => BETTER MATCH

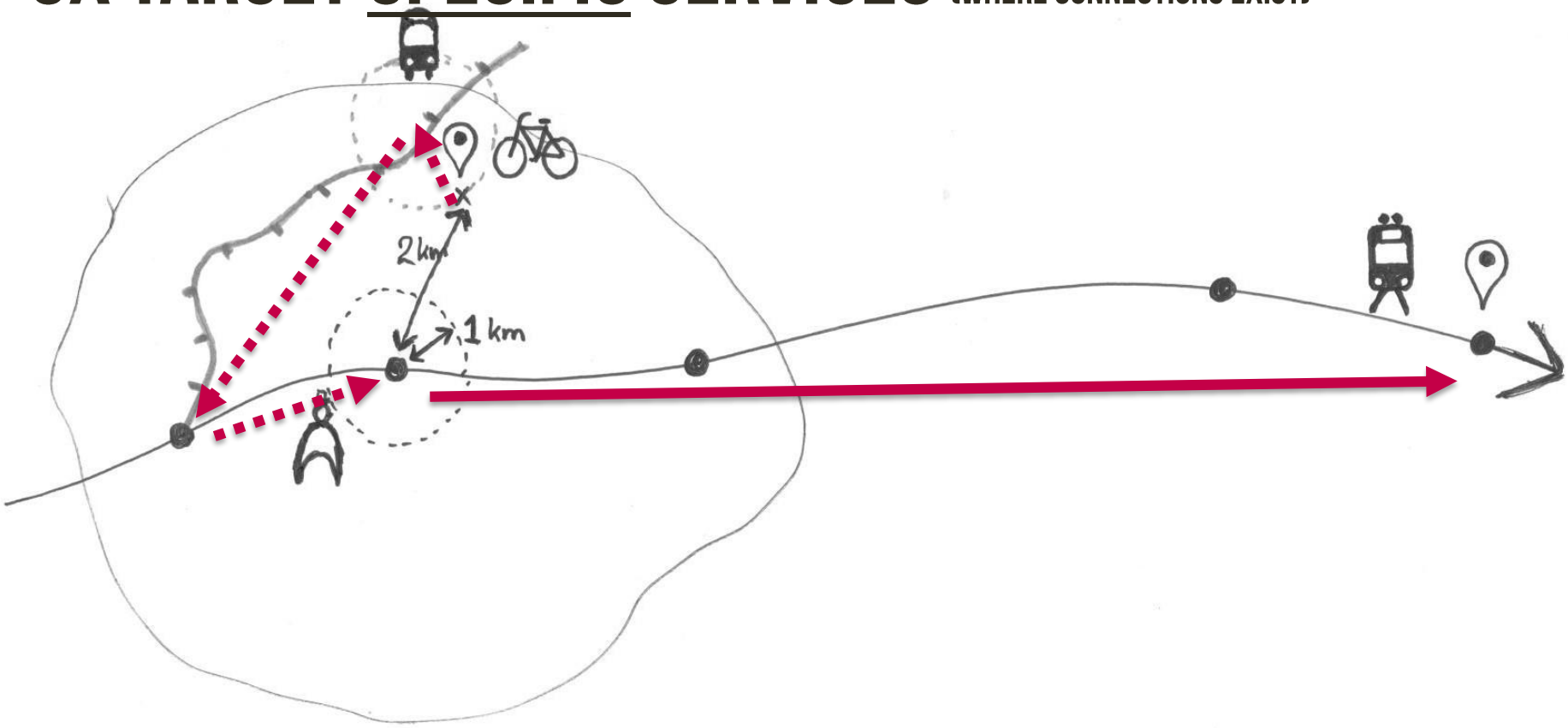
1. CONNECT MORE PLACES (WHERE CONNECTIONS DON'T EXIST)



3 KM CYCLING ≈ 1 KM WALKING
= INCREASED CATCHMENT AREAS

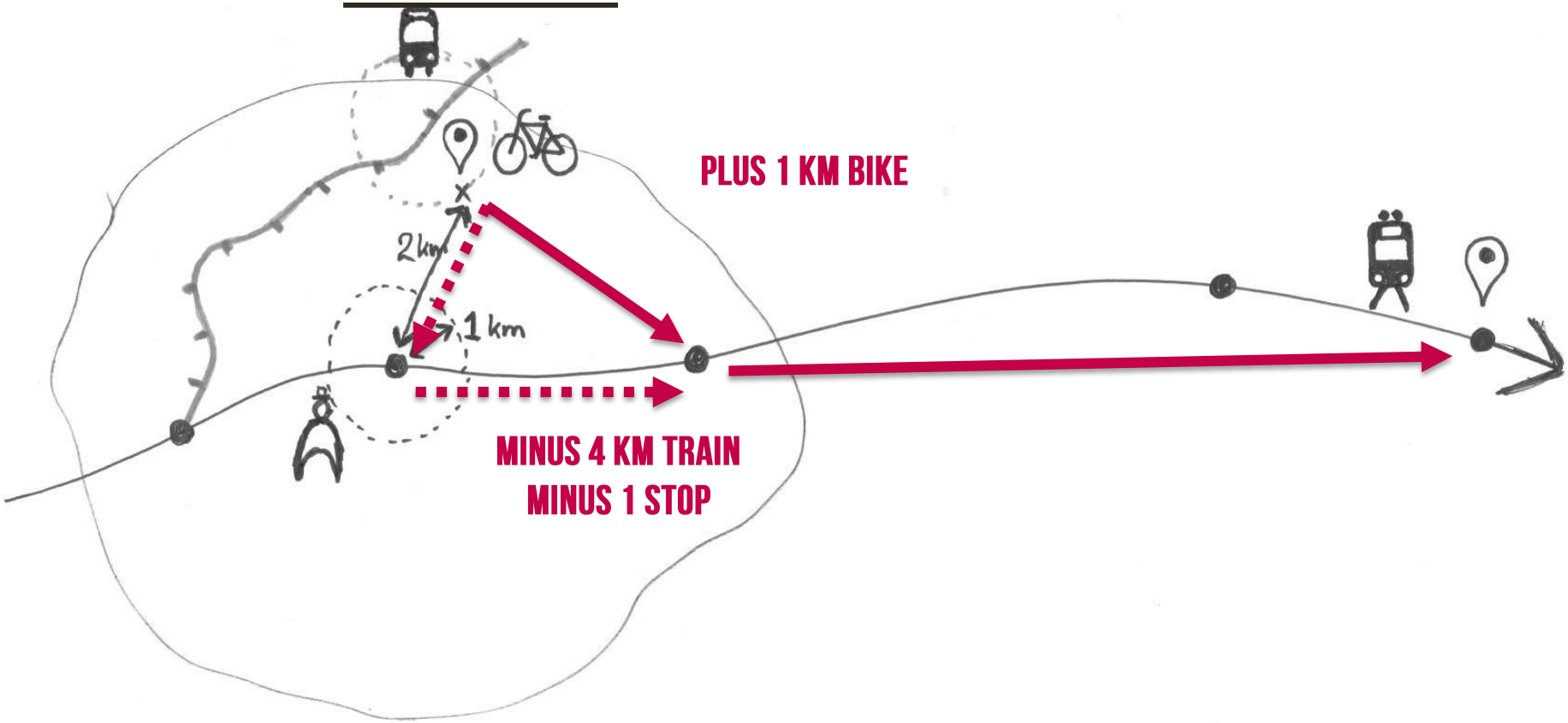
- 3x higher speed/distance = 9x larger area
- 4x higher speed/distance = 16x larger area

5X TARGET SPECIFIC SERVICES (WHERE CONNECTIONS EXIST)



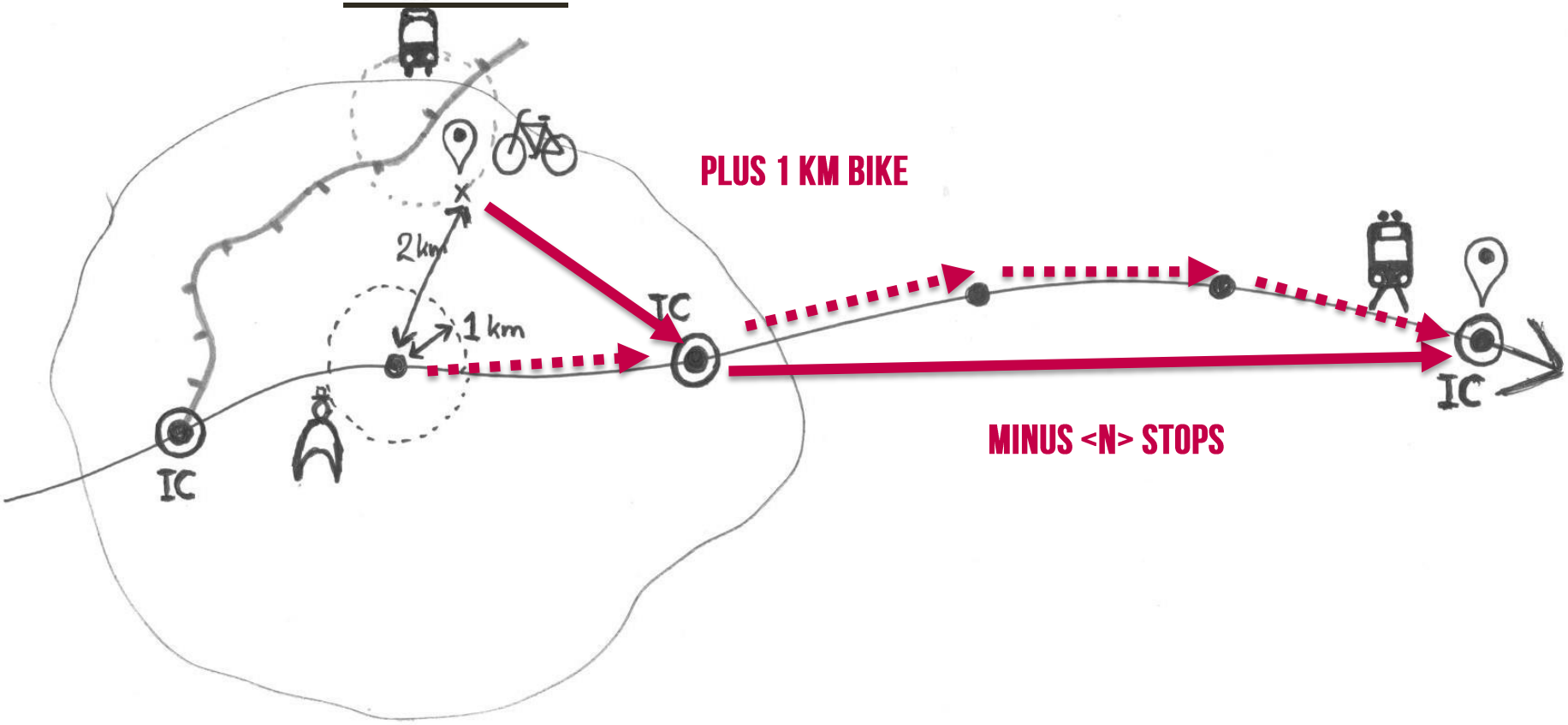
IN ANY CASE... FREEDOM OF CHOICE

2. TARGET SHORTER SERVICES



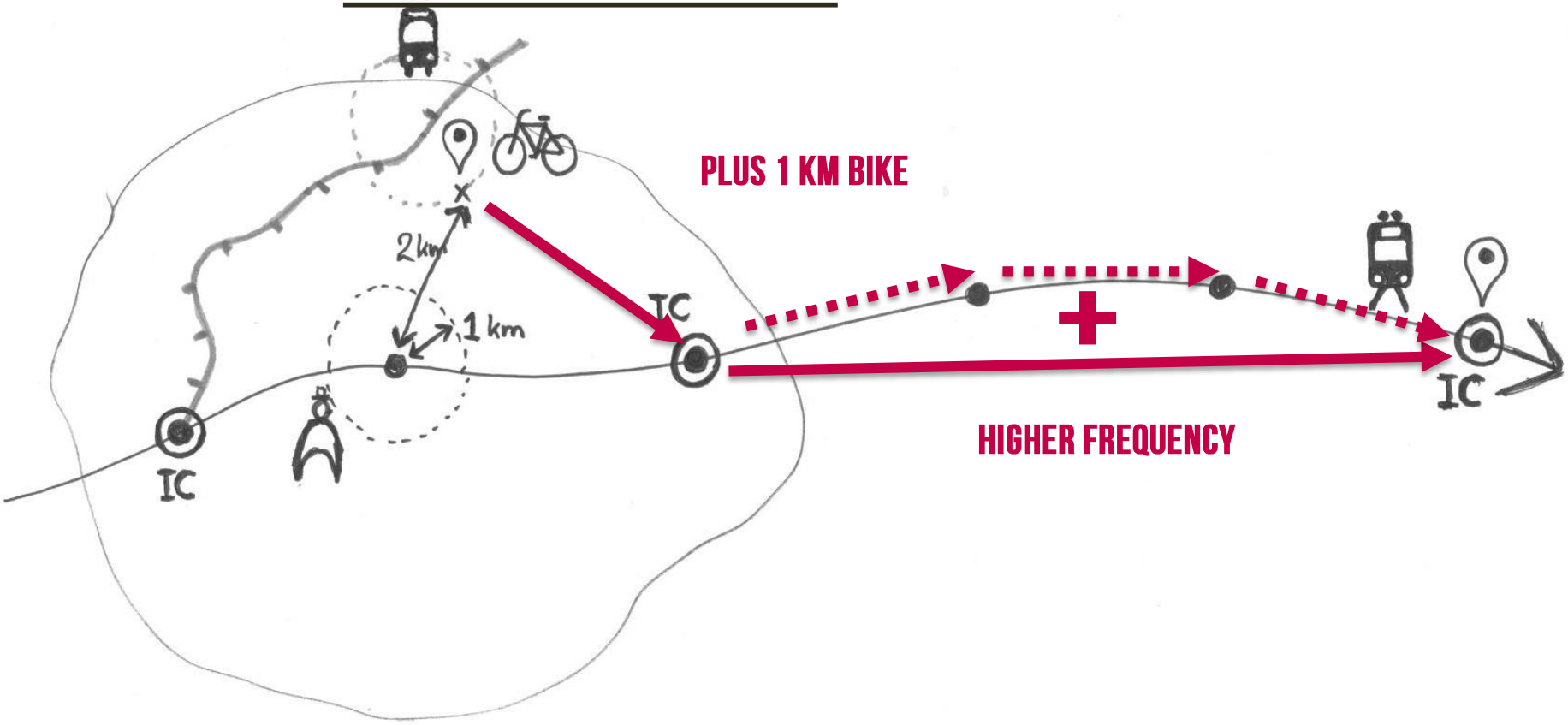
- Don't forget the diagonals

3. TARGET FASTER SERVICES



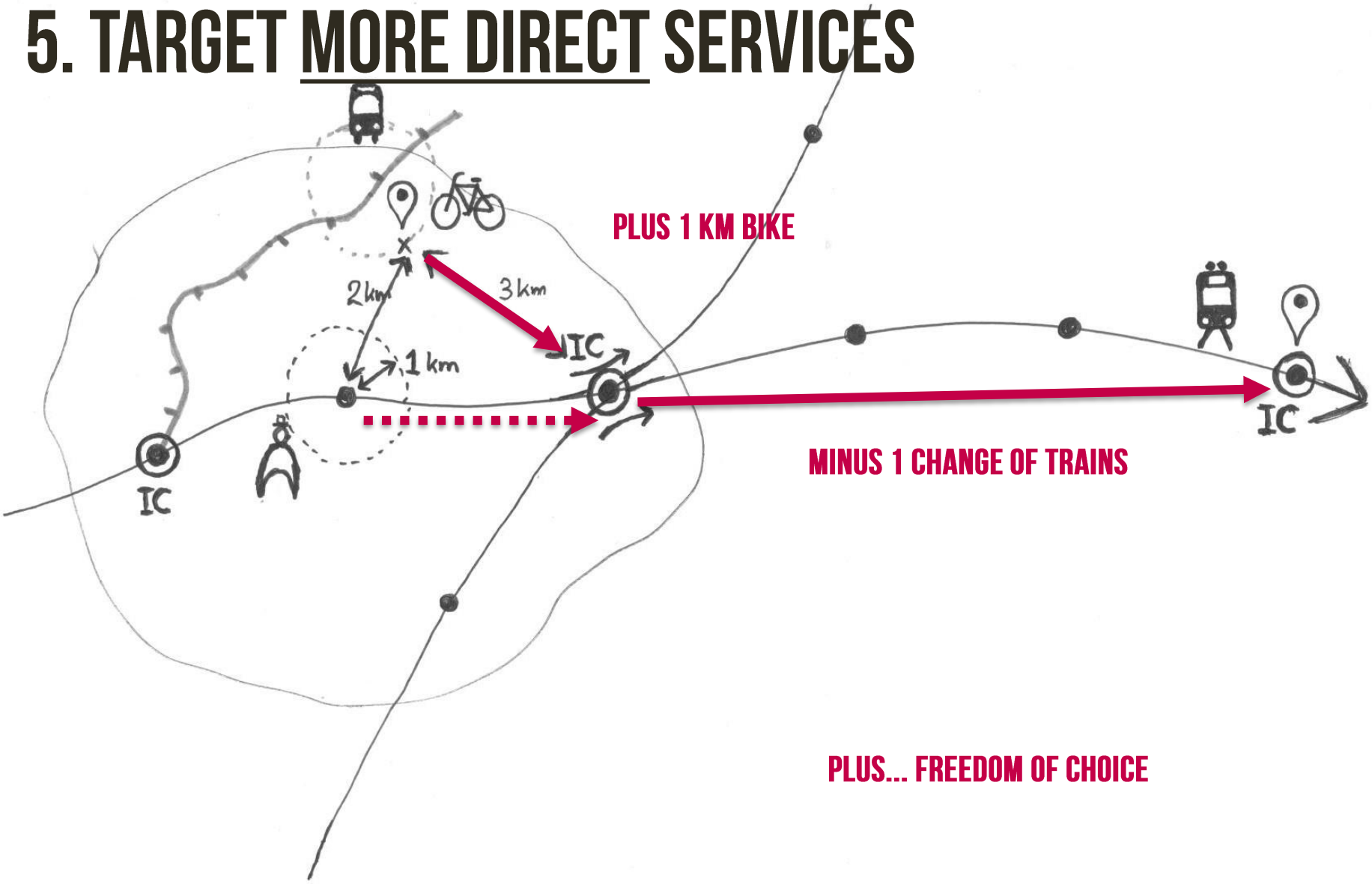
- Less stations ...and/or... faster travel times ... and/or...
- Higher comfort = lower perceived travel time

4. TARGET MORE FREQUENT SERVICES



- Higher frequency = lower wait times ...and/or...
- Better matching departure/arrival times (+return journey)

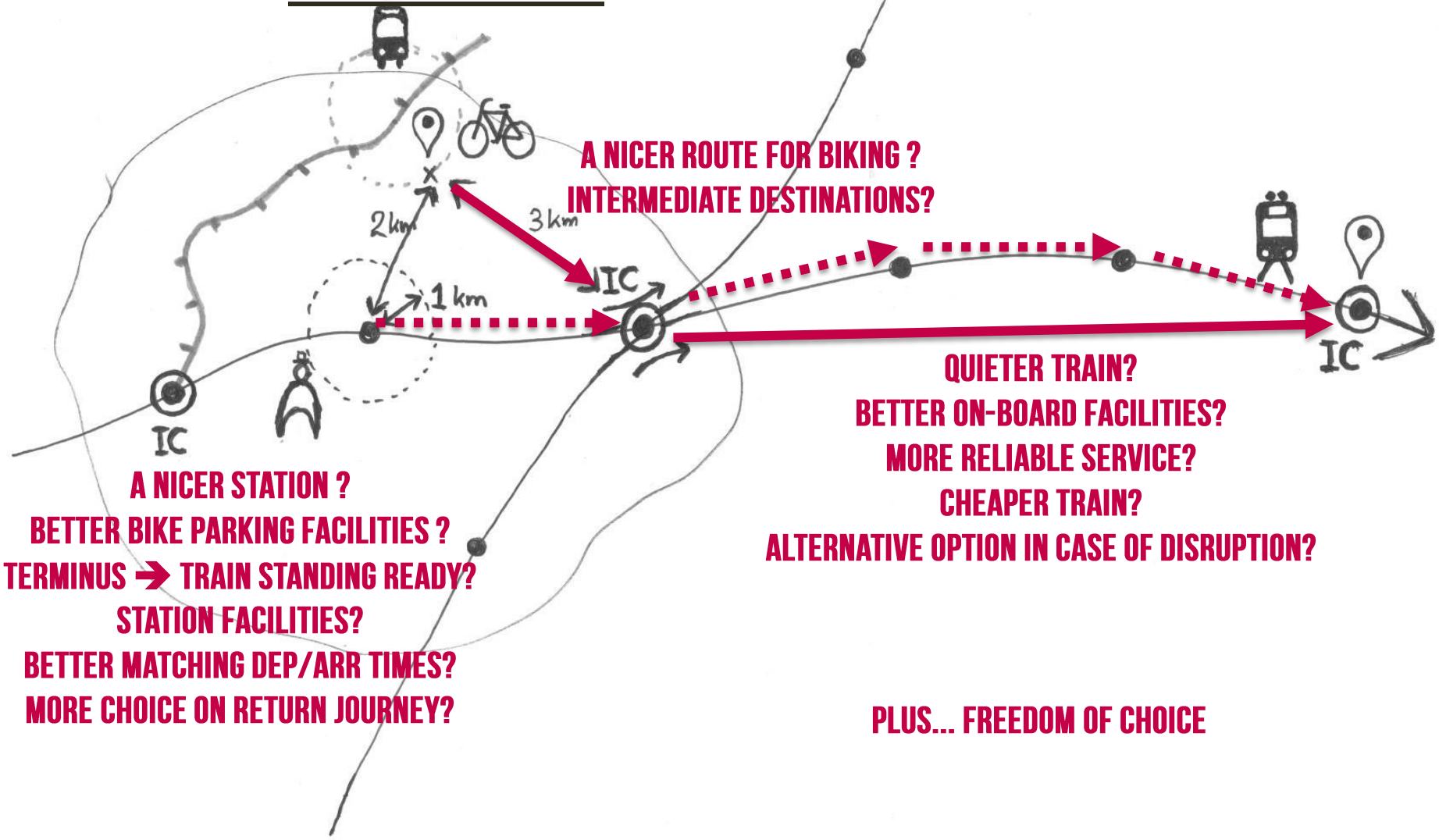
5. TARGET MORE DIRECT SERVICES



- Increased reliability & resilience
- Perceived wait/change time >> perceived travel time

6. TARGET PREFERRED SERVICES

(OR ACCESS ROUTES / OR STATIONS)



A NICER ROUTE FOR BIKING ?
INTERMEDIATE DESTINATIONS?

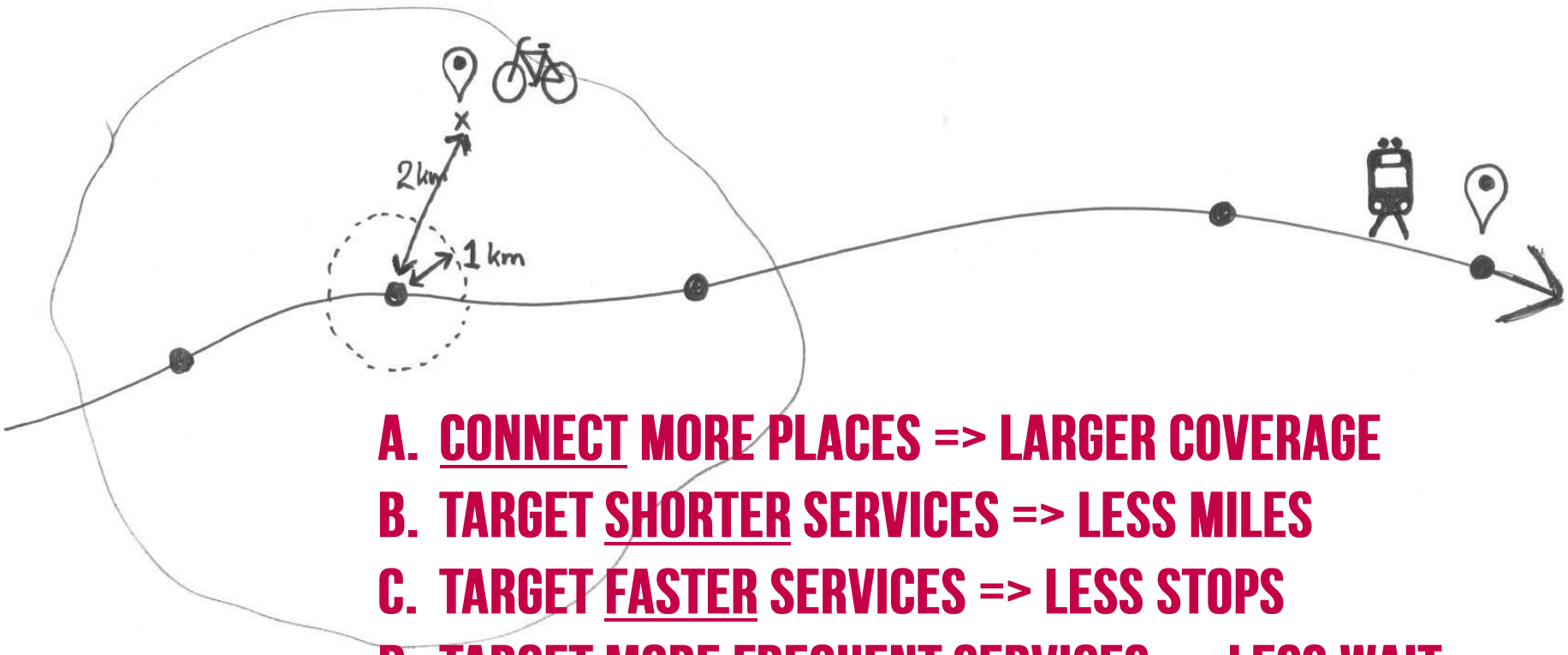
A NICER STATION ?
BETTER BIKE PARKING FACILITIES ?
TERMINUS ➔ TRAIN STANDING READY?
STATION FACILITIES?
BETTER MATCHING DEP/ARR TIMES?
MORE CHOICE ON RETURN JOURNEY?

QUIETER TRAIN?
BETTER ON-BOARD FACILITIES?
MORE RELIABLE SERVICE?
CHEAPER TRAIN?
ALTERNATIVE OPTION IN CASE OF DISRUPTION?

PLUS... FREEDOM OF CHOICE

- Minor effects perhaps... (?) But many aspects
- 'Personalising public transport'

6 WAYS HOW CYCLING (POTENTIALLY) EXTENDS TRANSIT:



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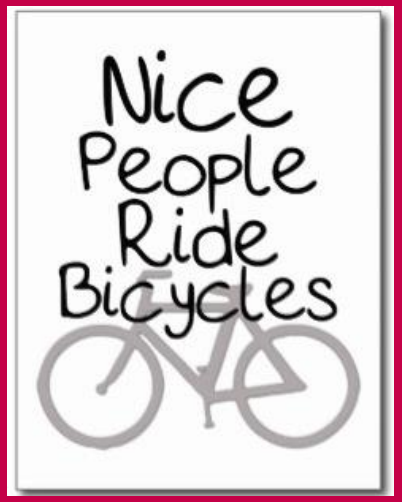
F. TARGET PREFERRED SERVICES => BETTER MATCHES

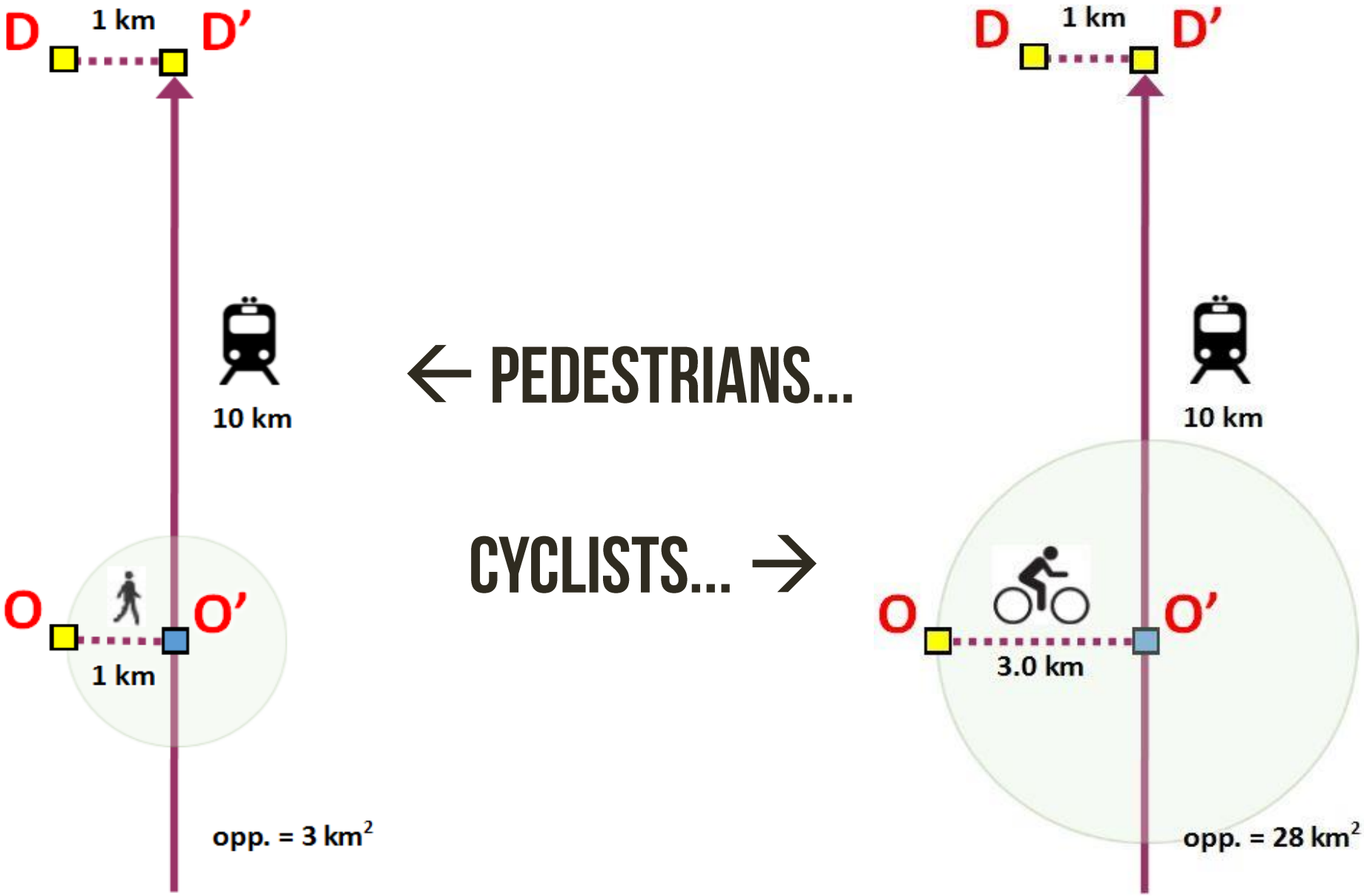
IMPROVED TRANSIT NETWORKS

9. CYCLING CATCHMENT AREAS ARE COMPLEX

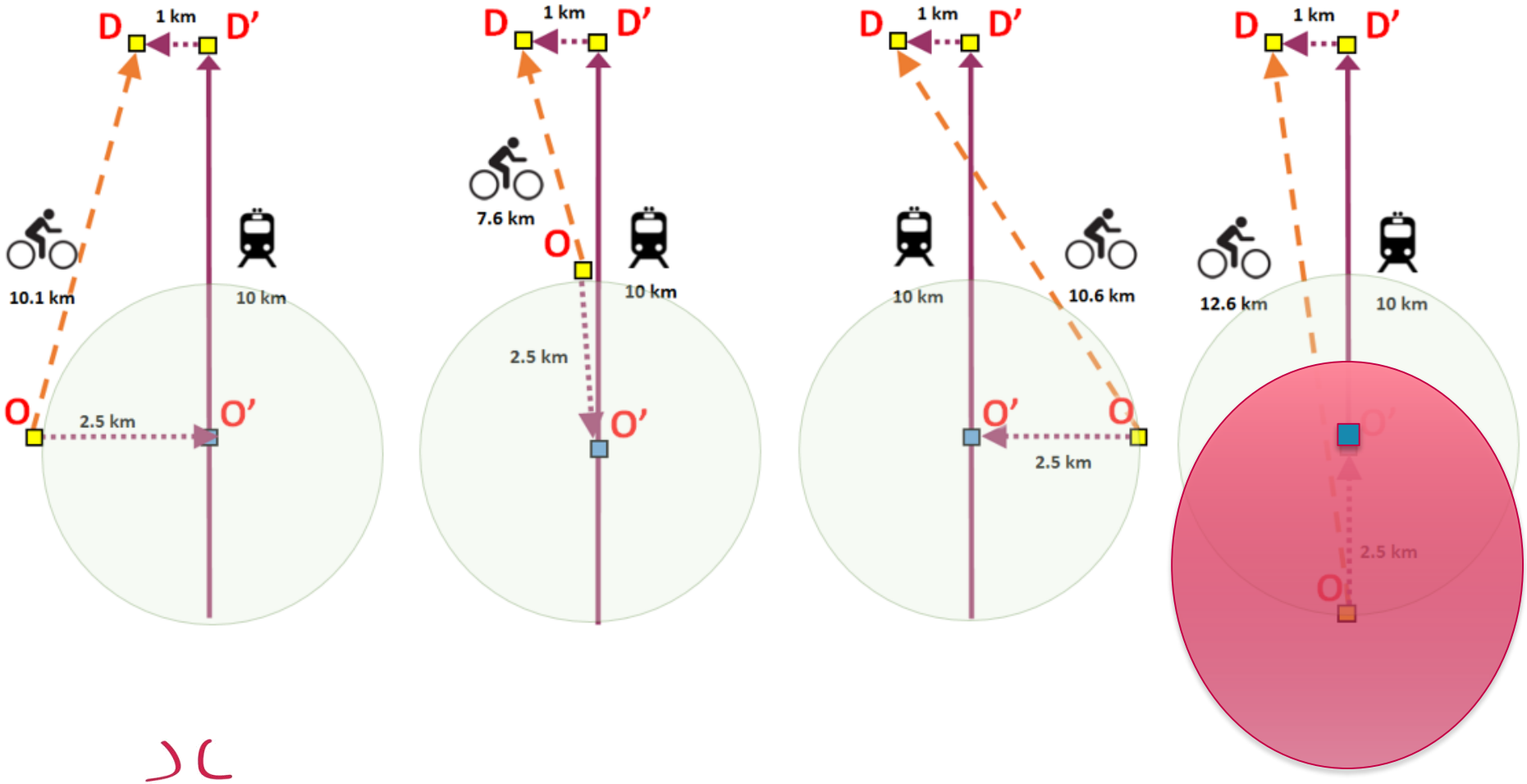
➔ TOPOLOGY MATTERS !



CYCLING CATCHMENT AREAS ARE COMPLEX



CYCLING CATCHMENT AREAS ARE COMPLEX

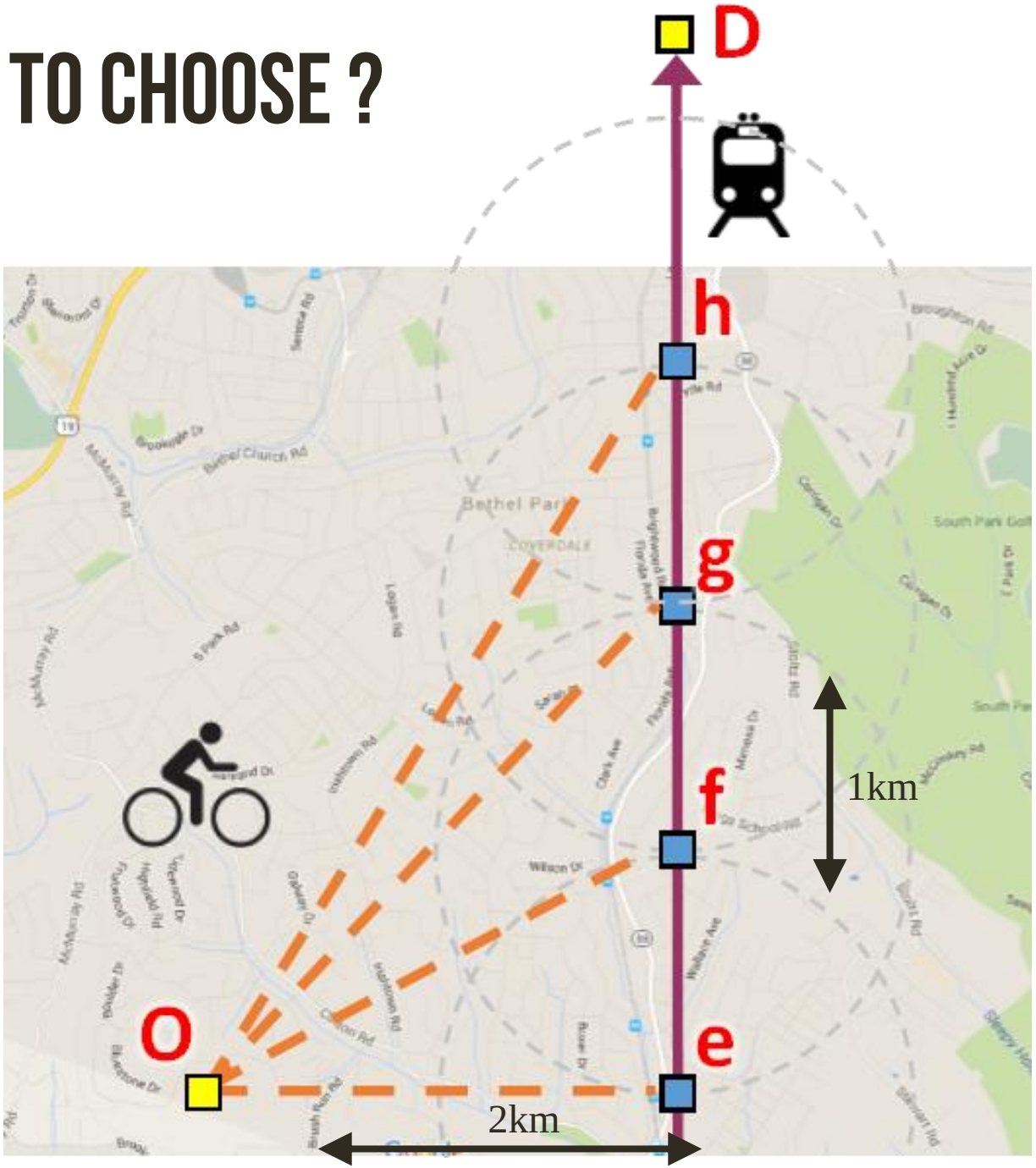


STUDIO BEREIKBAAR

WHICH STATION TO CHOOSE ?

HOW DOES A CYCLIST CHOOSE BETWEEN STATIONS?

... AND DIFFERENT SO FROM A PEDESTRIAN?



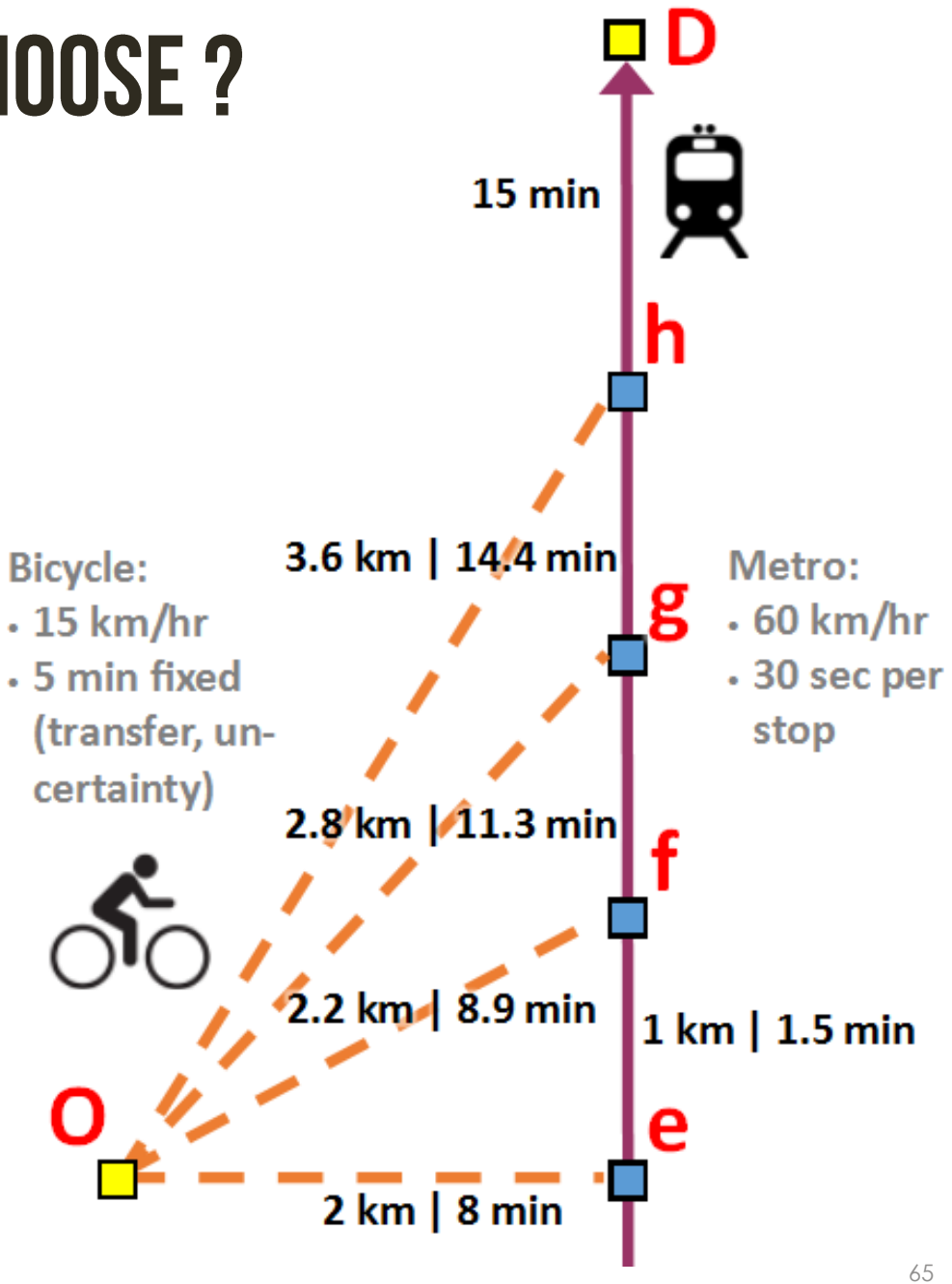
STUDIO BEREIKBAAR

WHICH STATION TO CHOOSE ?

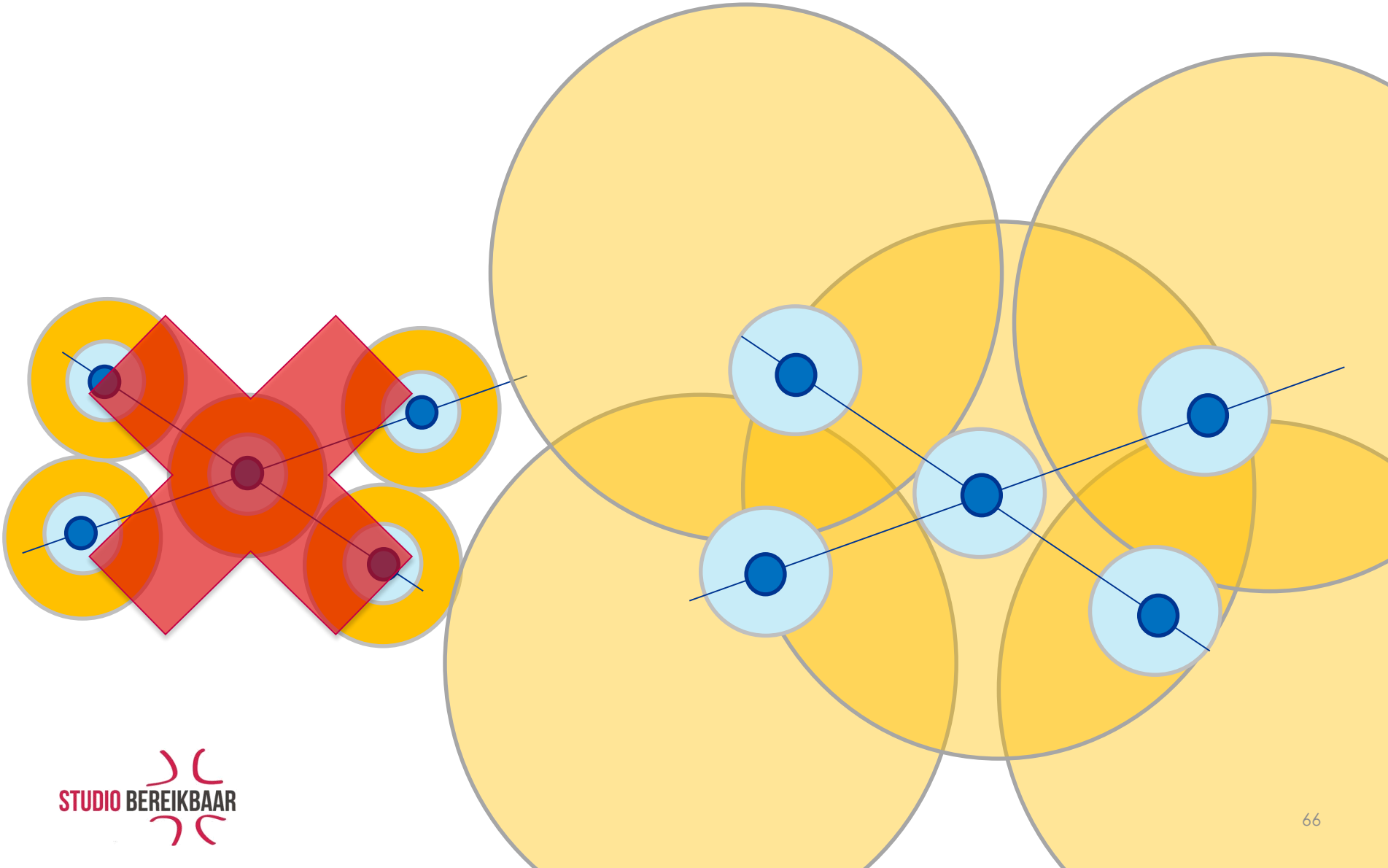
VIA	O->F	O->G	O->H	O->D
H			14.4	34.4
G		11.3	17.8	32.8
F	8.9	15.4	16.9	31.9
E	14.5	16.0	17.5	32.5

FOR A CYCLIST ALL STATIONS ARE THE SAME IN TRAVEL TIME!

BIKE-TRAIN = FLEXIBILE IN STATION CHOICE



CYCLING CATCHMENT AREAS ARE COMPLEX

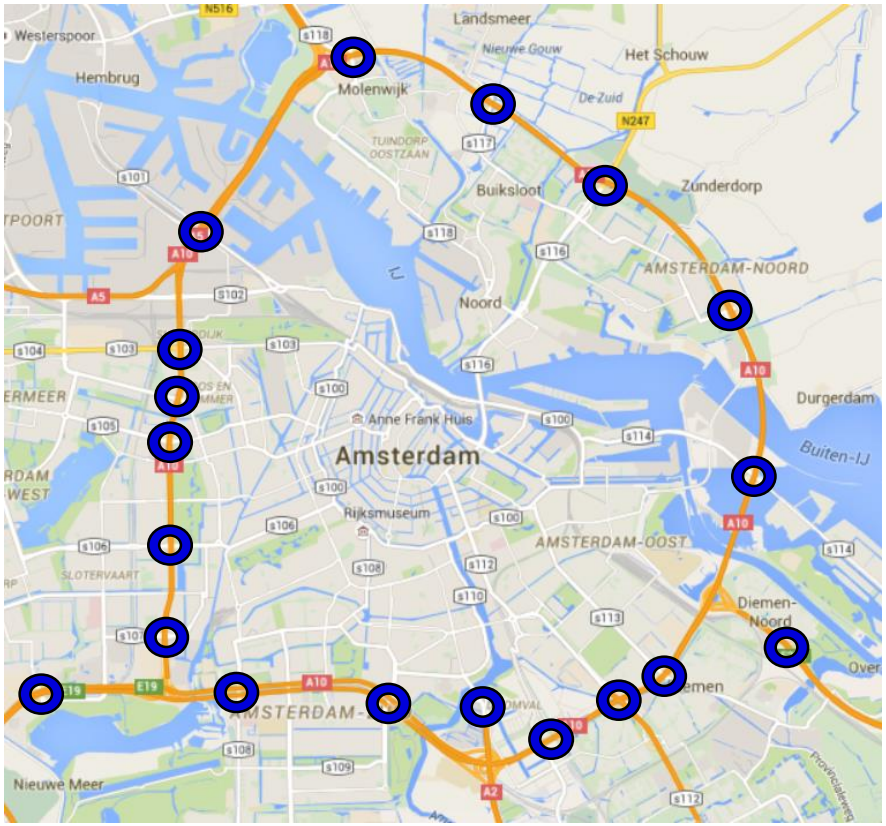


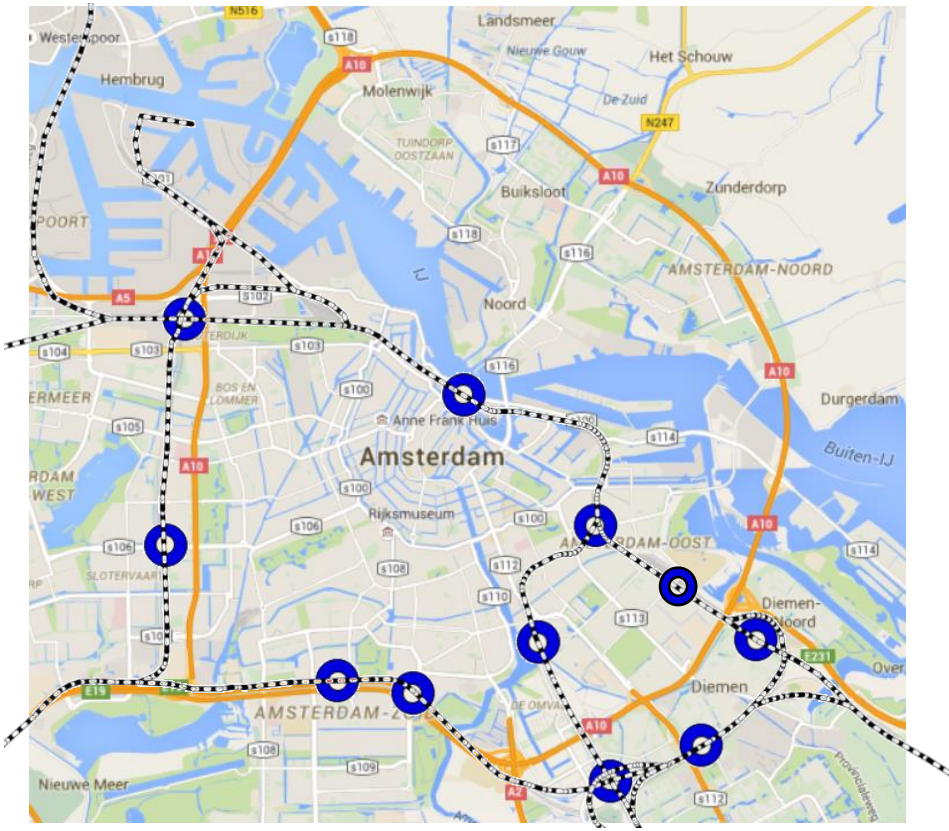
STUDIO BEREIKBAAR

CYCLING CATCHMENT AREAS ARE COMPLEX

(NOT UNLIKE ROAD NETWORKS)

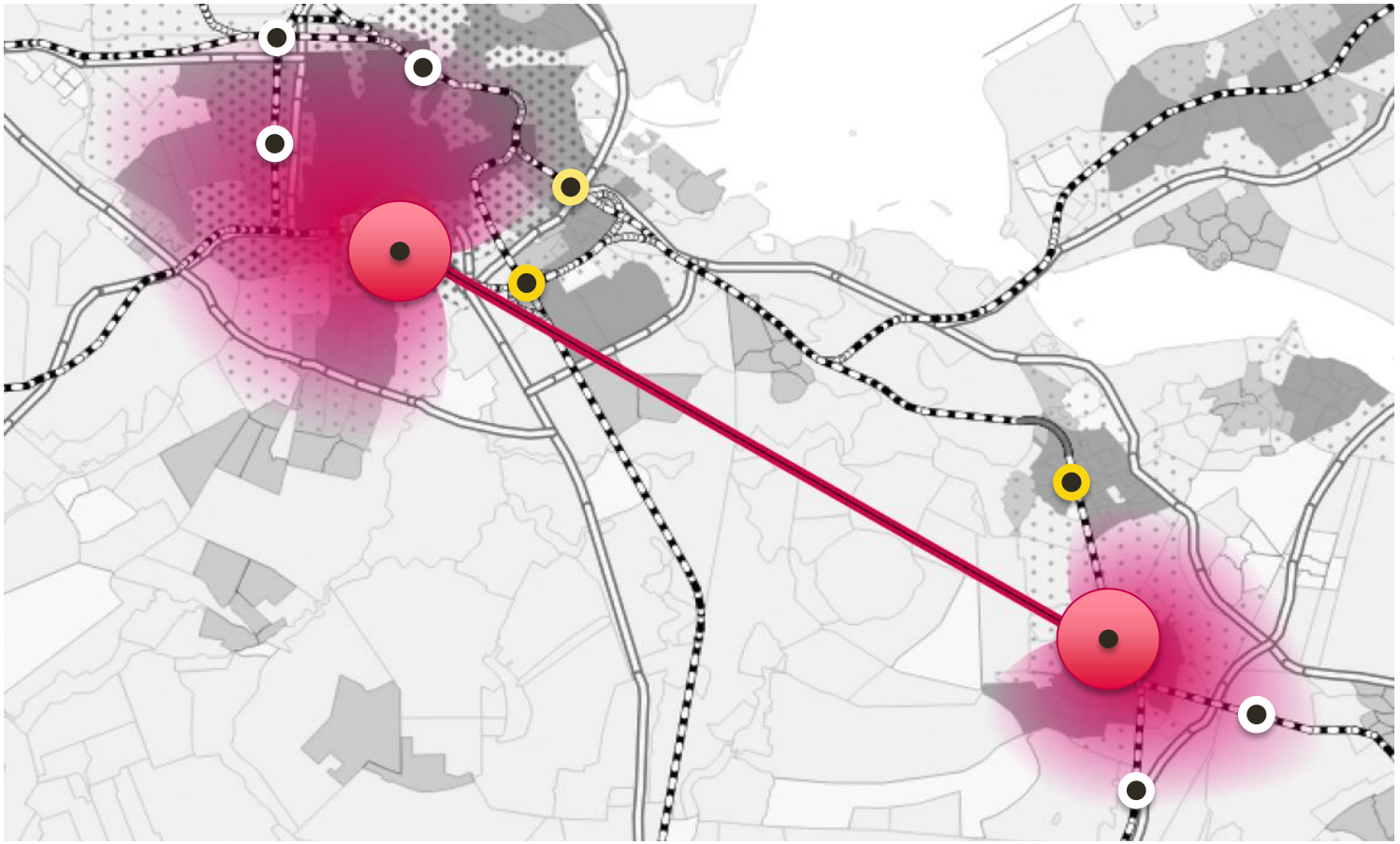
↓ ENTRY/EXIT HIGHWAY RAMPS





ACCESS/EGRESS STATIONS ↑

CYCLING CATCHMENT AREAS ARE COMPLEX



STUDIO BEREIKBAAR

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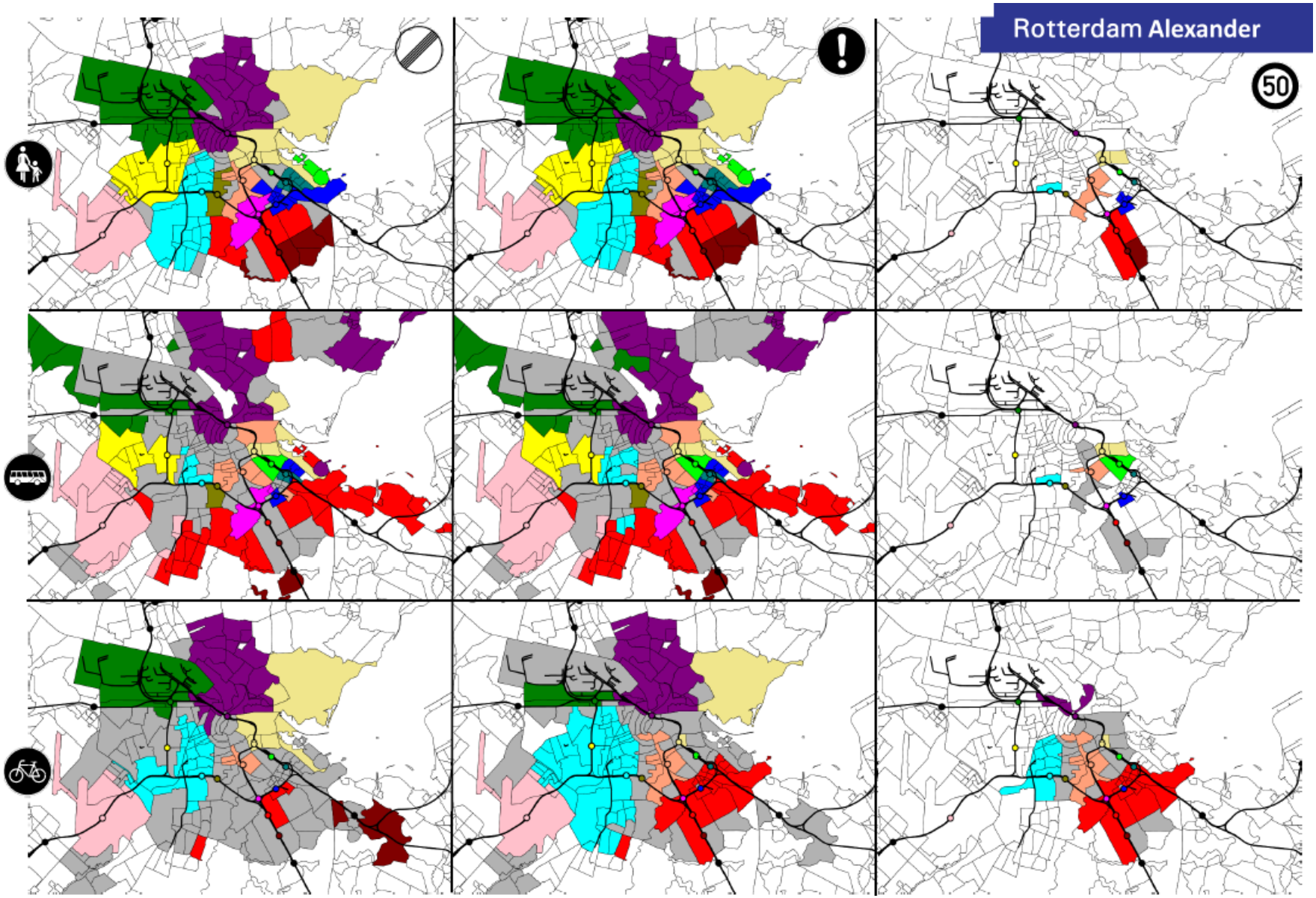

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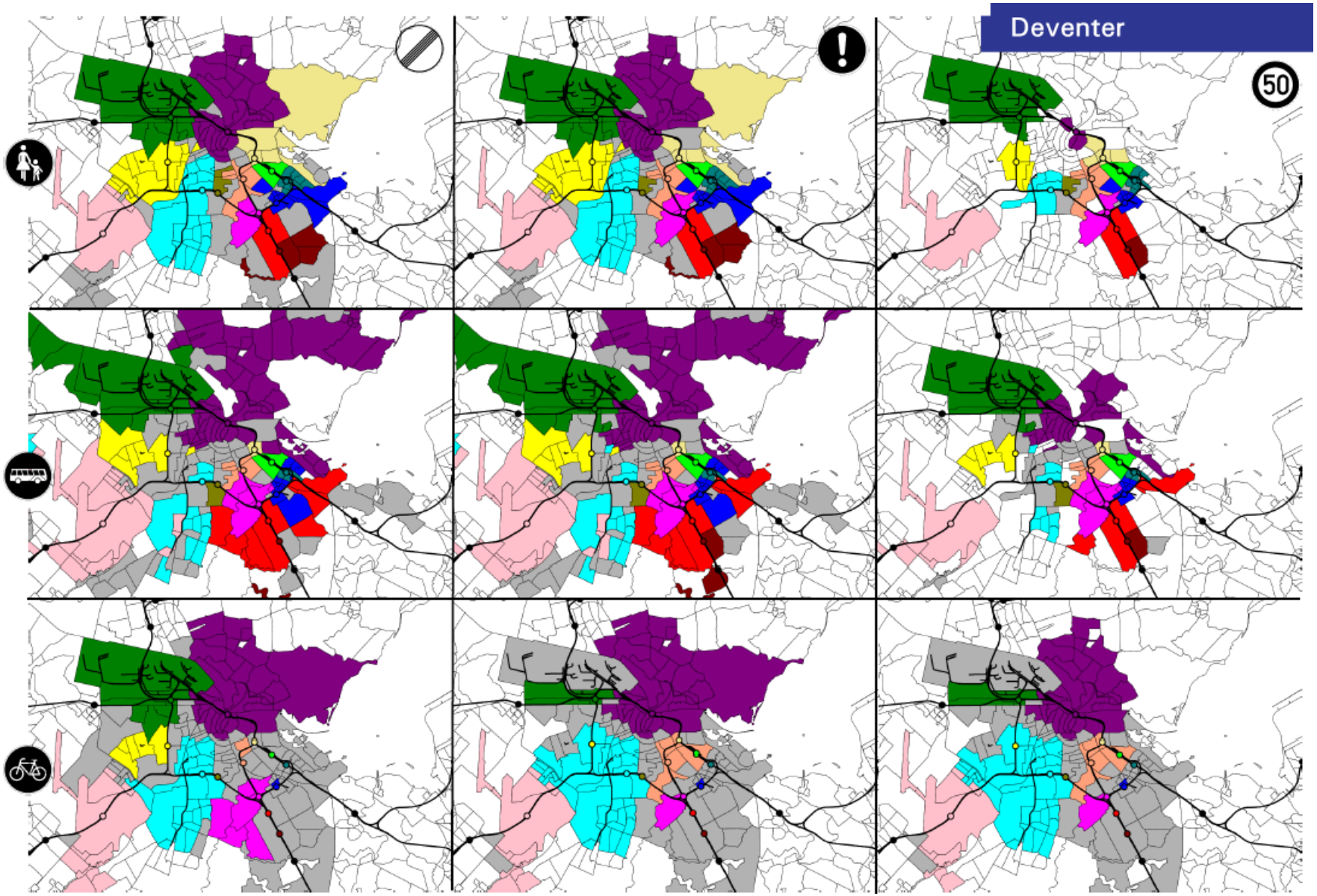

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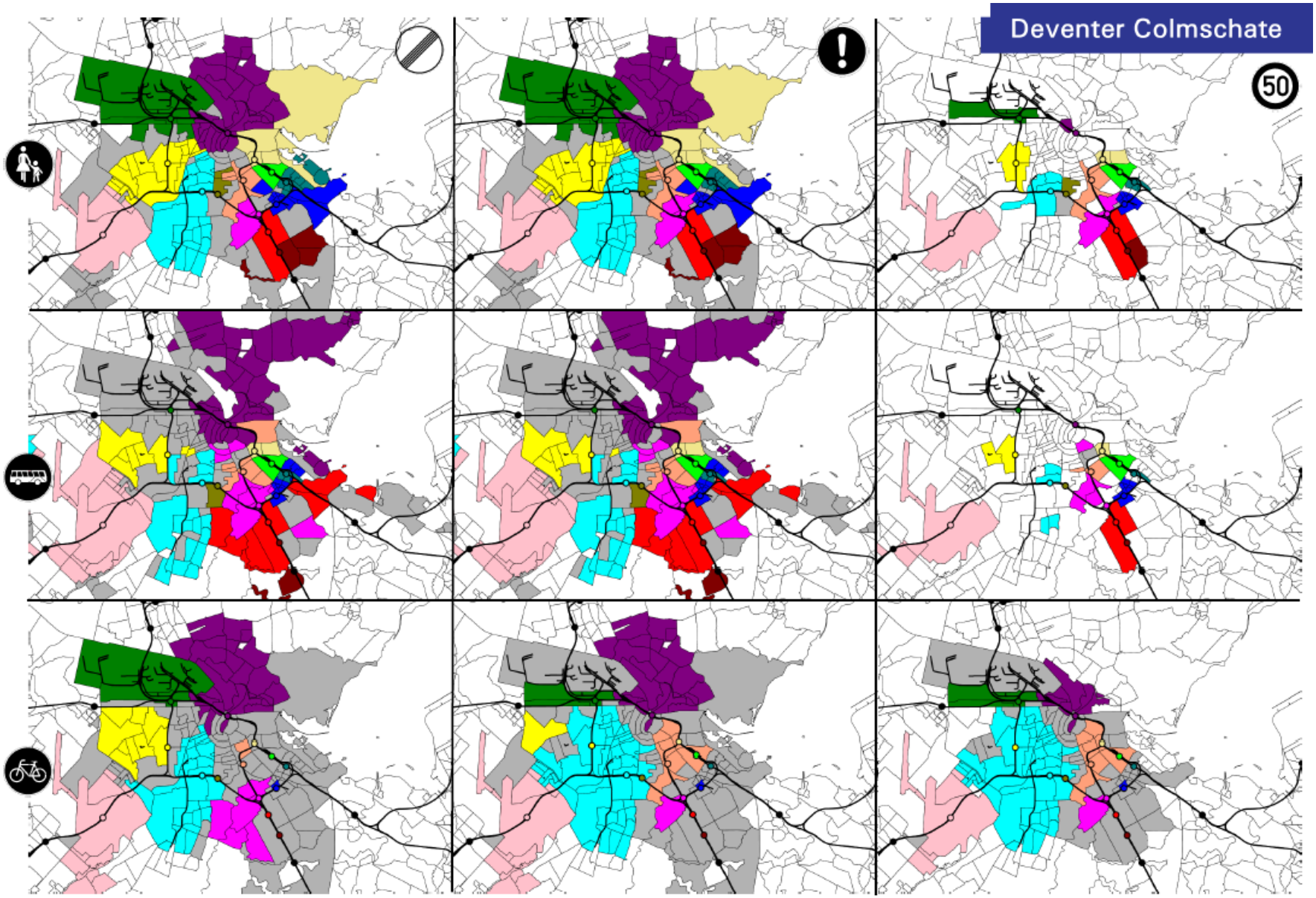

IMPROVED TRANSIT NETWORKS AND HOW CYCLING MIGHT BE PART OF THAT; PLANNED VS. UNPLANNED

10. CONCLUSION

IN SUMMARY:

STUDIO BEREIKBAAR

- BIKE+TRAIN+WALK ≠ 3 SINGULAR MODALITIES
  - TRANSIT + BIKE + WALK = INTEGRATED MOBILITY SYSTEM
  - CYCLING CATCHMENT AREAS ARE COMPLEX (AND ANYTHING BUT CIRCULAR)
- TRANSIT SERVICES ACCESSED BY CYCLING :
  - GO FURTHER (+36%) IN ROUGHLY SAME TIME
  - CONNECT PEOPLE FROM FURTHER AWAY FROM STATIONS (3X DISTANCE = 9X AREA)
  - SKIP TRANSIT SERVICES (SLOW, INDIRECT) → A SYSTEM CHEAPER TO OPERATE?
  - INCREASE CATCHMENT AREAS OF FAST, DIRECT SERVICES → CONCENTRATED FLOWS
- IMPROVEMENTS IN TRANSIT, CITIES, HUBS → BETTER BUSINESS CASE FOR BIKE-TRAIN
- HIGHEST 40% CYCLING LEVELS RELATE TO +65% HIGHER TRANSIT USE & CAR-USE -50%
  - STRONGER AND ATTRACTIVE URBAN SYSTEMS & TRANSIT SYSTEMS → 'TOD 2.0'