USING GIS TO MAP AND MEASURE ACCESSIBILITY IN SWEDISH CITIES

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Research project

- Main project started in 2003.
- Financed by The Swedish Transport Administration
- Study of variations in spatial distribution of accessibility within cities for users with different needs and abilities
- Special focus on accessibility for children, elderly and impaired citizens
- All modes of transport

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Study area

Town	Urban population	Pedestrian network (kilometres)
Helsingborg	86 872	758
Umeå	70 844	608
Luleå	57 560	430
Falun	35 950	271
Trelleborg	24 848	202
Alingsås	22 232	200
Nynäshamn	13 294	101
Säffle	9 222	113

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Method

Using GIS to map & measure accessibility

Network analyses - using detailed multimodal networks à realistic distances and travel times

Accessibility with regard to variations in individual capacity and ability

Calculating accessibility from every home to various destinations

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GIS-model

- Pedestrian and bicycle network – based on a field survey à digital model with attributes
- Model of the public transport system – with bus stops, routes, timetables etc.
- Demographic data on real estate coordinate
- Destinations - grocery stores, pharmacy, health care, public transport etc.

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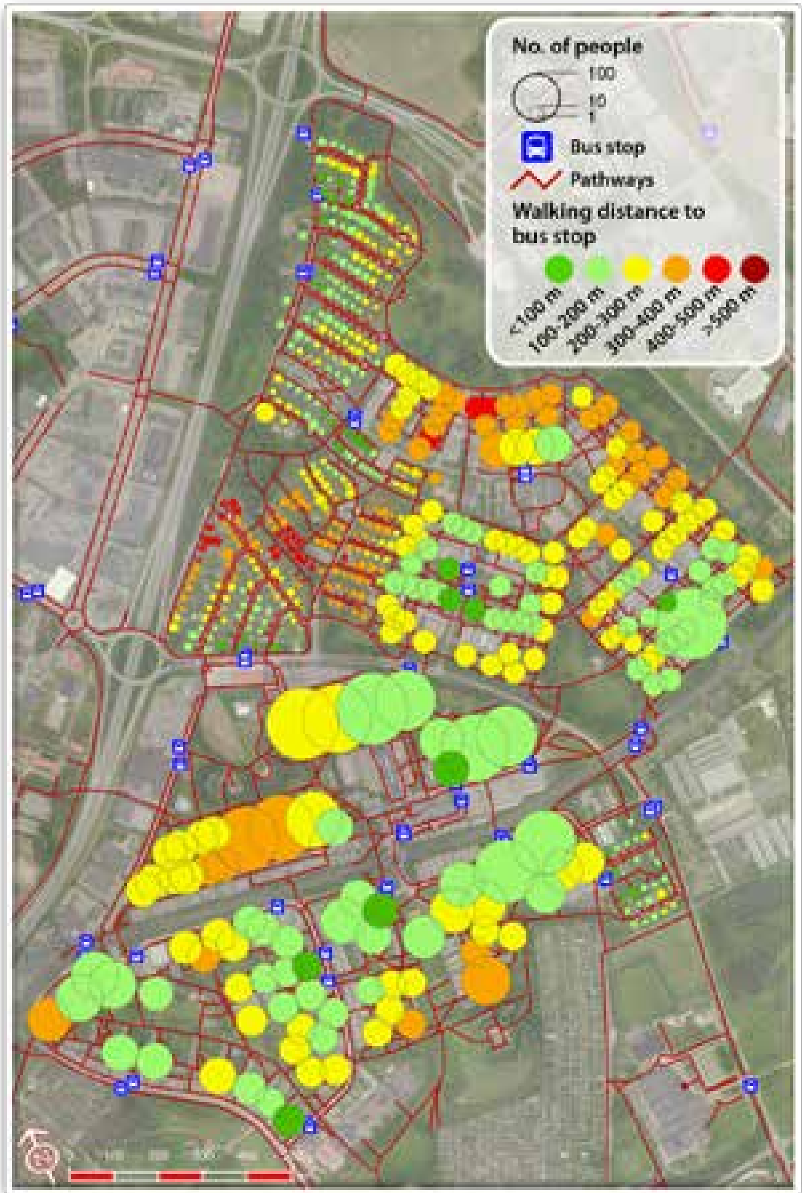
Accessibility analysis

- Accessibility to public transport
- Safe walking to school
- Evaluating barriers
- Analysis of bottlenecks
- Accessibility for citizens with impairments

- Using different speed of mobility for different users, incl. bicyclists
- Realistic measures of time and distances



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Example: Evaluating barriers

Before: Average directness quota: 1,51

Example: Evaluating barriers

After: Average directness quota: 1,29

HELSINGBORG

Ättekulla

Directness to local destination

Directness calculated as walking distance/euclidean distance

Average directness quota in Ättekulla: **1,29**

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Directness quota

- < 1,1
- 1,1 - 1,25
- 1,25 - 1,5
- 1,5 - 1,75
- 1,75 - 2,0
- 2,0 - 2,5
- 2,5 - 3,0
- 3,0 - 3,5
- 3,5 - 4,0
- > 4,0

Shortest route by foot

0 100 200 m

Accessibility for citizens with impairments

The design of the built environment decides its usability

- Design of pathways (width, slope, pavement)
- Visual and tactile contrasts,
- Design of stairs and ramps, obstacles,
- Lights and vegetation,
- Street crossings (width of road, tactile information, contrasts, refuge islands, signals – lights and sound)

Identify usable parts of the networks

Evaluating the design of the built environment.

Using criteria for usability – different criteria for children, blind, mobility impaired.

Pathways usable for wheelchair users

Other pathways

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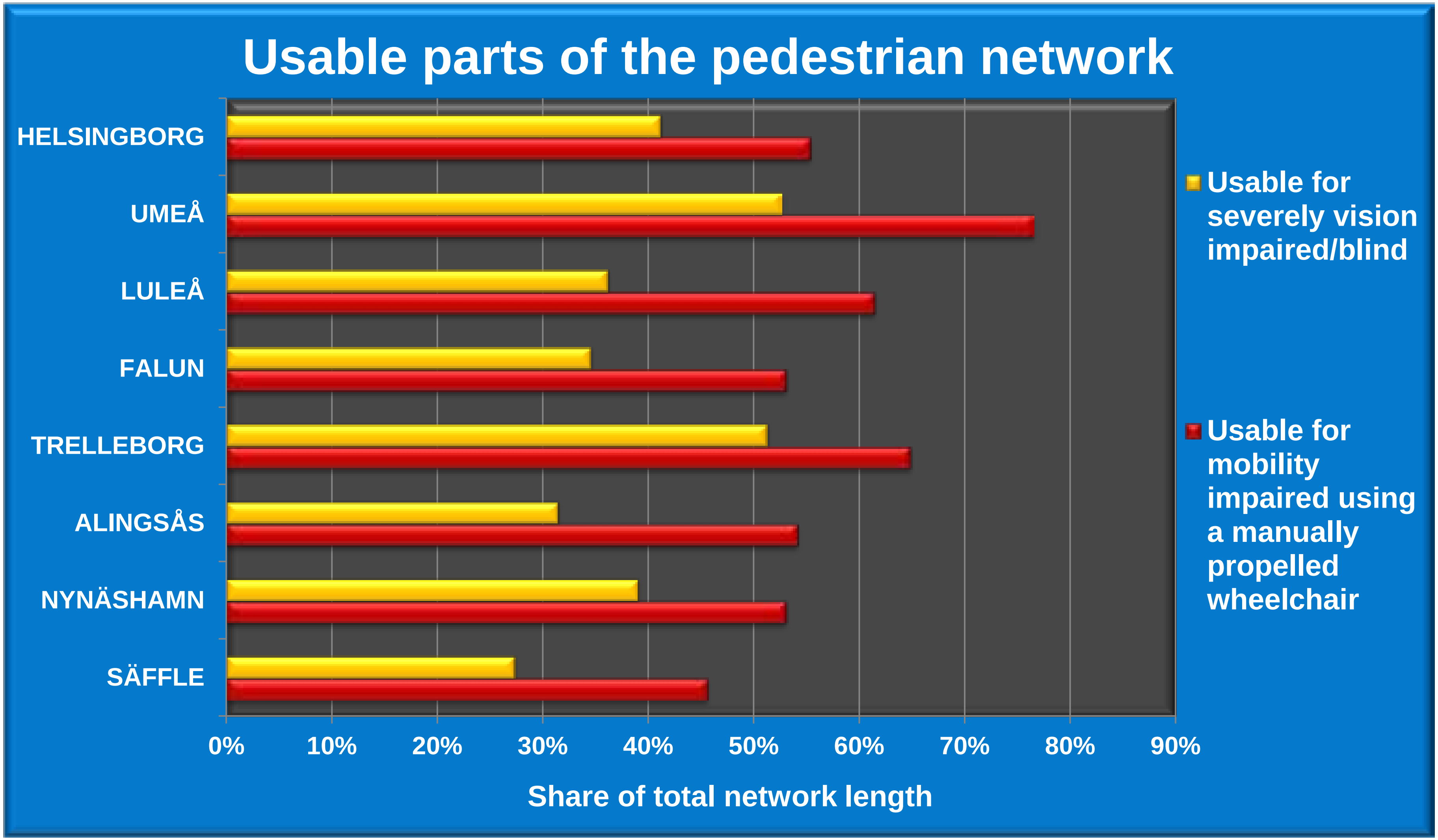
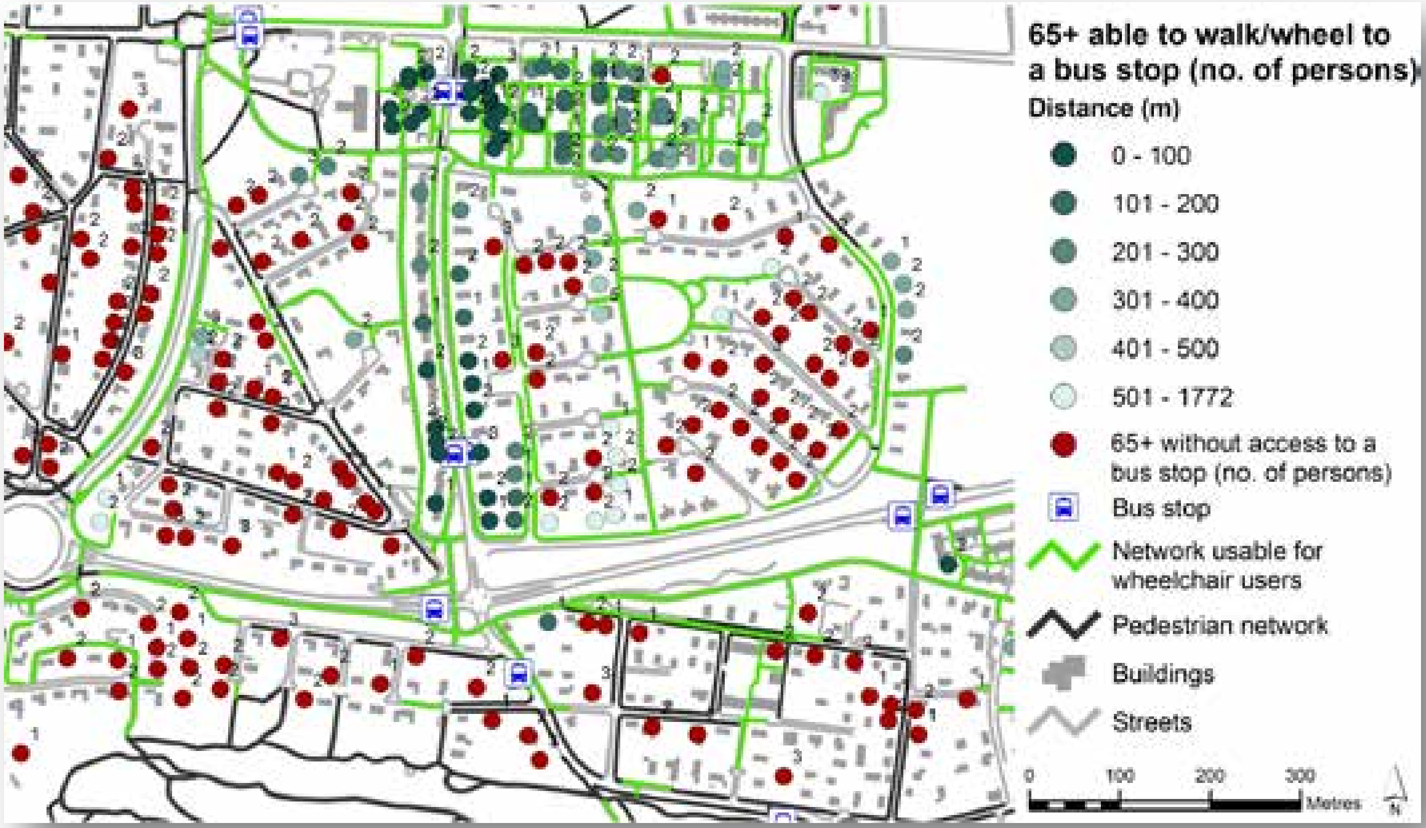

Usable parts of the pedestrian network
HELSINGBORG
UMEÅ
LULEÅ
FALUN
TRELLEBORG
ALINGSÅS
NYNÄSHAMN
SÄFFLE
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
Share of total network length
Usable for severely vision impaired/blind
Usable for mobility impaired using a manually propelled wheelchair

Network analysis

Distance to nearest reachable destination via usable pathways to public transport and grocery stores.



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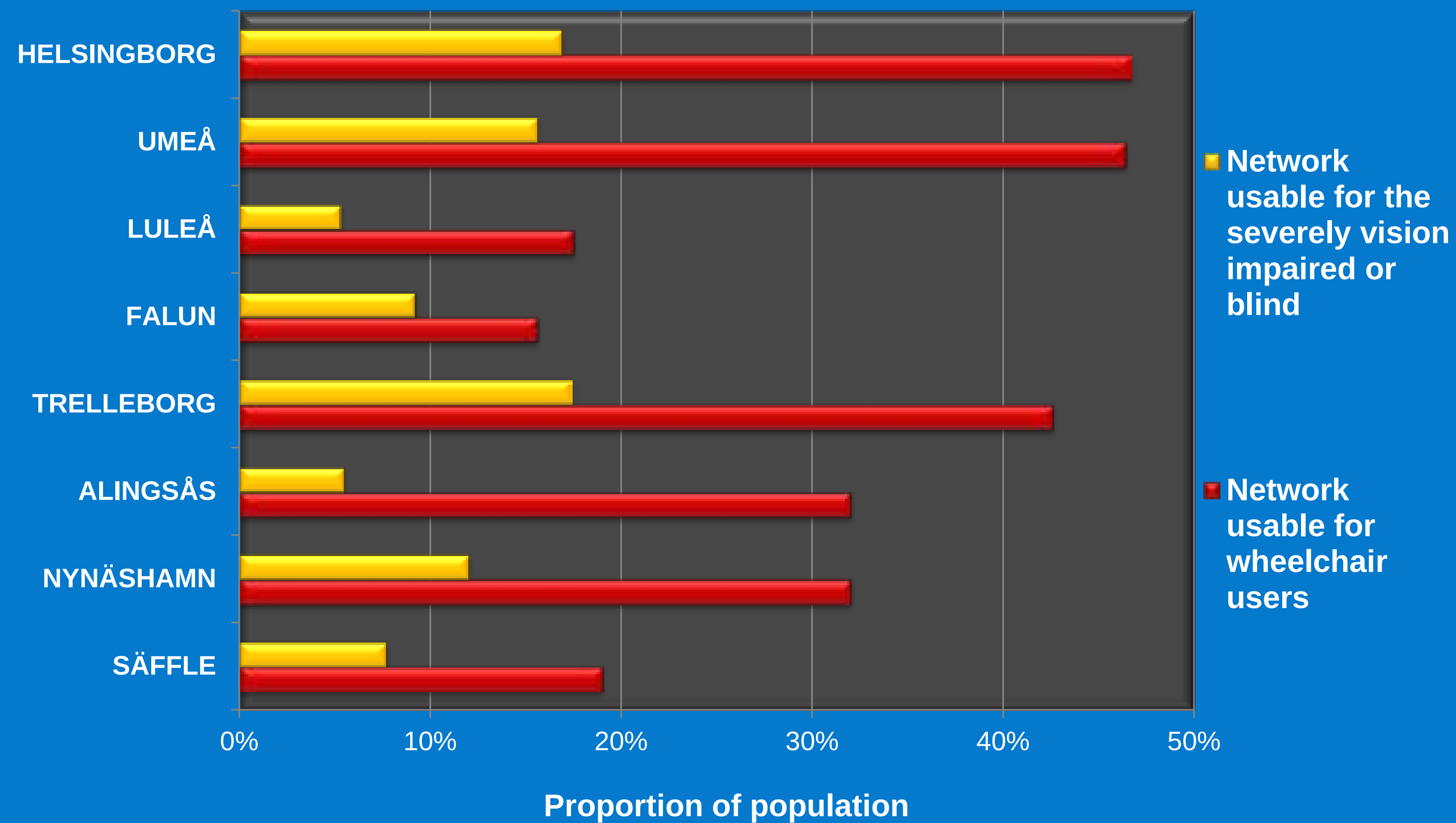
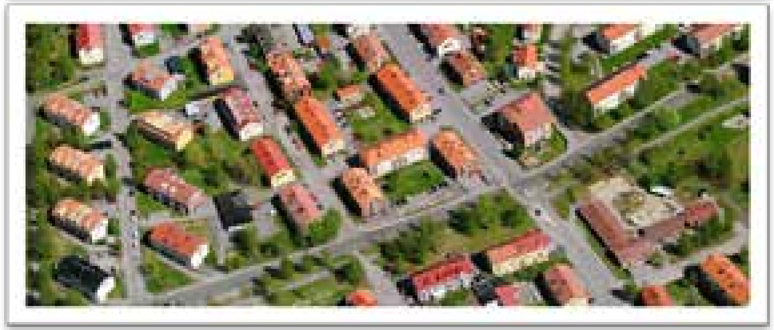
Accessibility to Public Transport (Bus Stop)



Neighbourhood classification

1. SCAFT

2. Semi-central



3. Sparse areas

4. City center

5. Dense areas

6. SCAFT

Observations

SCAFT-areas

- extensive networks of continuous pathways à usable outdoor environment for mobility impaired
- Combined bicycle paths usually lack separation between cyclists and pedestrians à less suitable for blind or severely vision impaired
- Relatively few live close to a bus stop or grocery store

Observations

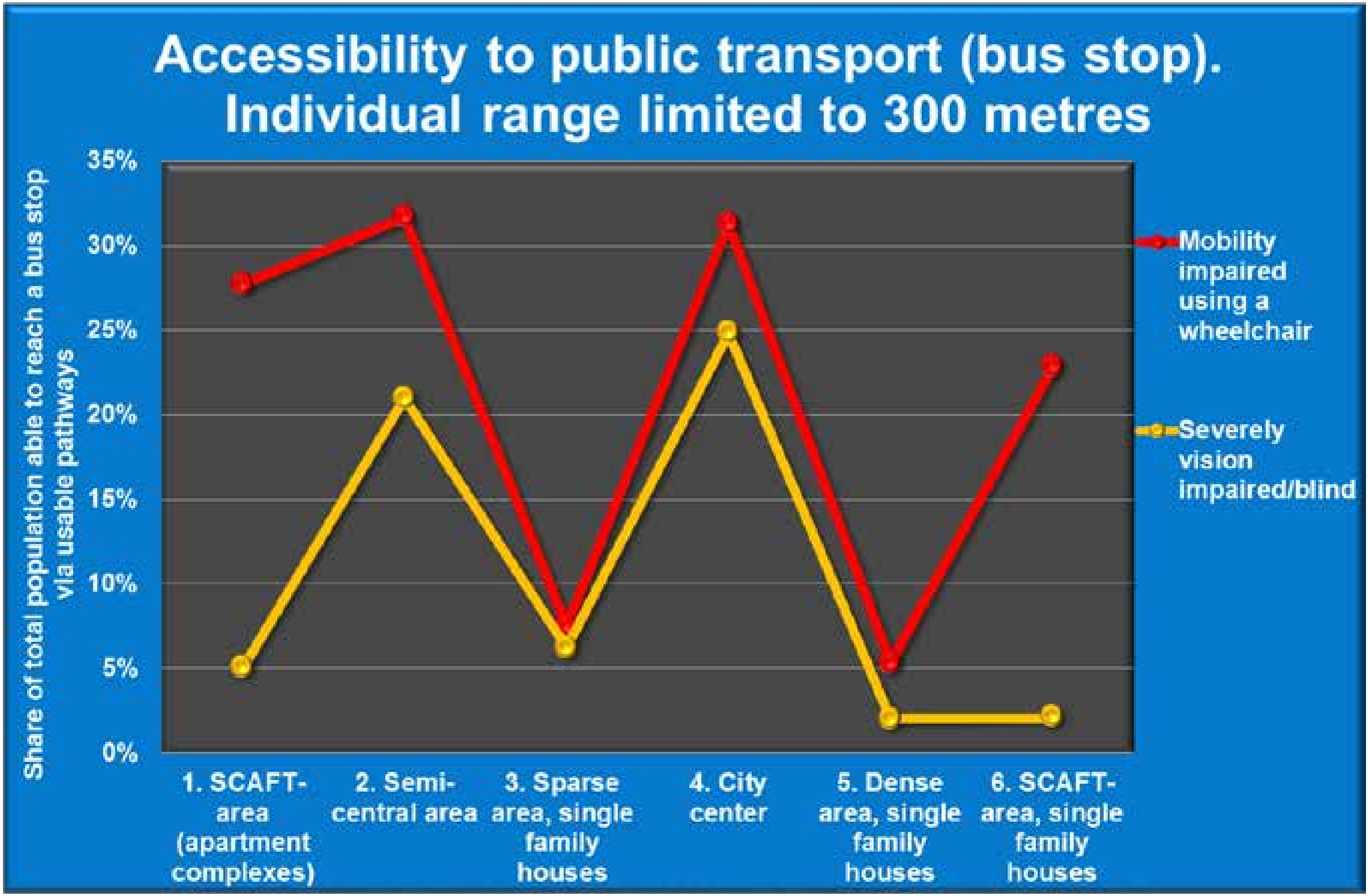
Central and Semi-central Areas

- Sidewalks in a grid network.
- High frequency of street crossings
- More space designated for pedestrians only à more suitable for blind or severely vision impaired
- High density and large supply of services à short distances and several options if one is unreachable

Observations

Areas with single family houses

- Lower density à longer distances and less supply of services
- Bus routes outside areas.
- Often no sidewalks and local streets assumed not to be walkable for the impaired
- Lack of continuous pedestrian network
- No or few street crossings


Accessibility to public transport (bus stop).
Individual range limited to 300 metres
Share of total population able to reach a bus stop via usable pathways
35%
30%
25%
20%
15%
10%
5%
0%
1. SCAFT-area (apartment complexes)
2. Semi-central area
3. Sparse area, single family houses
4. City center
5. Dense area, single family houses
6. SCAFT-area, single family houses
Mobility impaired using a wheelchair
Severely vision impaired/blind

Some conclusions

- The design of the urban environment tends to be less constraining for citizens with mobility impairments, than for severely vision impaired or blind citizens.
- Accessibility depends upon access to motorized transport à importance of usable and accessible public transport
- Accessibility for the impaired at a higher level in more densely populated towns
- Significant differences between different types of neighbourhoods
- Some differences in level of accessibility between areas of same types within a city – due to topography, relative location, supply of public transport, homogeneity, but also **not identical design**)

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THANK YOU

MORE INFORMATION:

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