THE CITY WITHOUT SIGHT

Exploring public space through the senses of the visually impaired and blind

Delft University of Technology
Redesigning the public space with the lens of the visual impaired
Design of the Urban Fabric

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Department: Urbanism

problem statement

motivation

(Sex and the City, Season 6, Episode 13, "Let There Be Light" King & Star, 2004)

definition

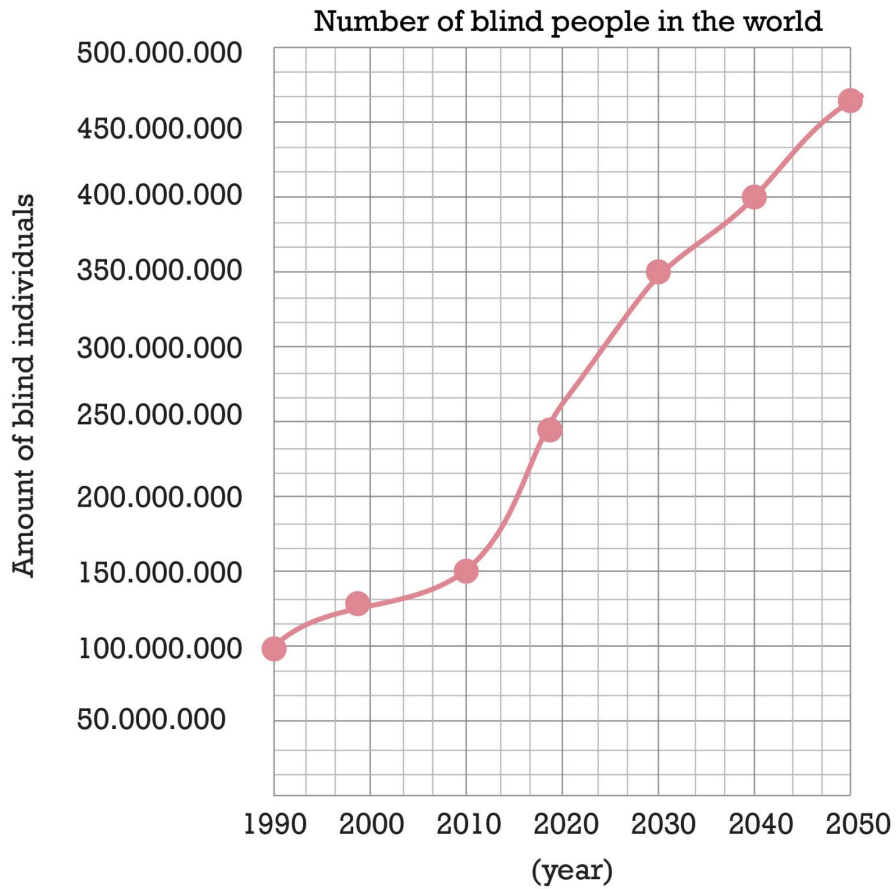
visually impaired & blind

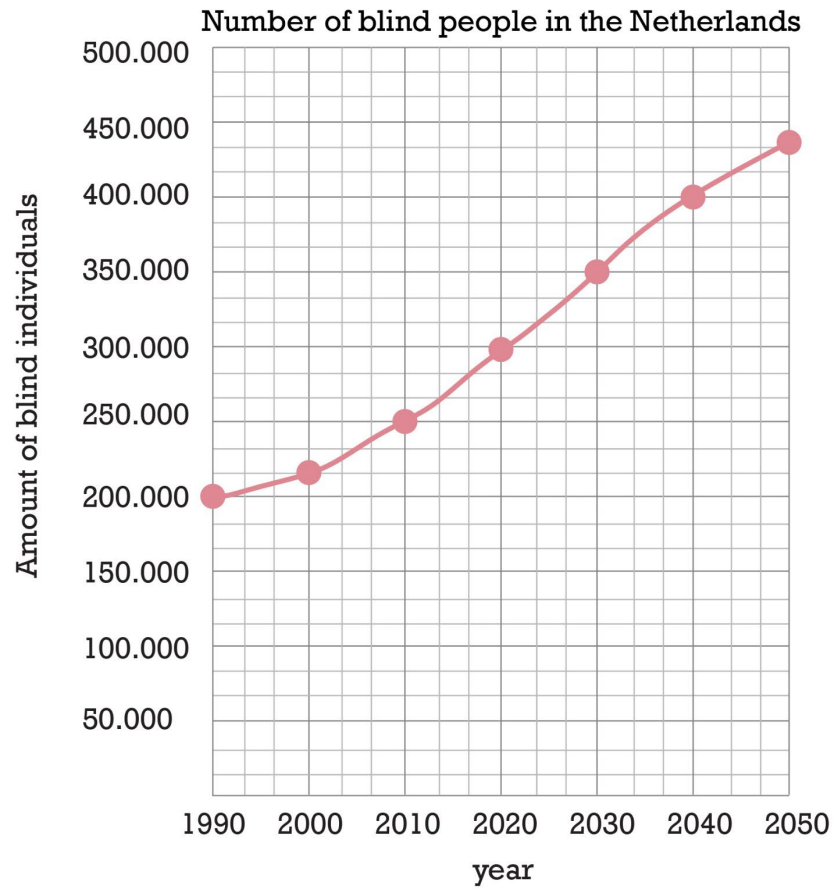
Visual impairment is a spectrum that ranges from low vision or partial sight despite correction, to complete blindness. In the Netherlands, someone is considered socially blind when their visual acuity falls below 5%.

(Trillo & Dickinson, 2012; WHO, 2025)

problem statement

motivation





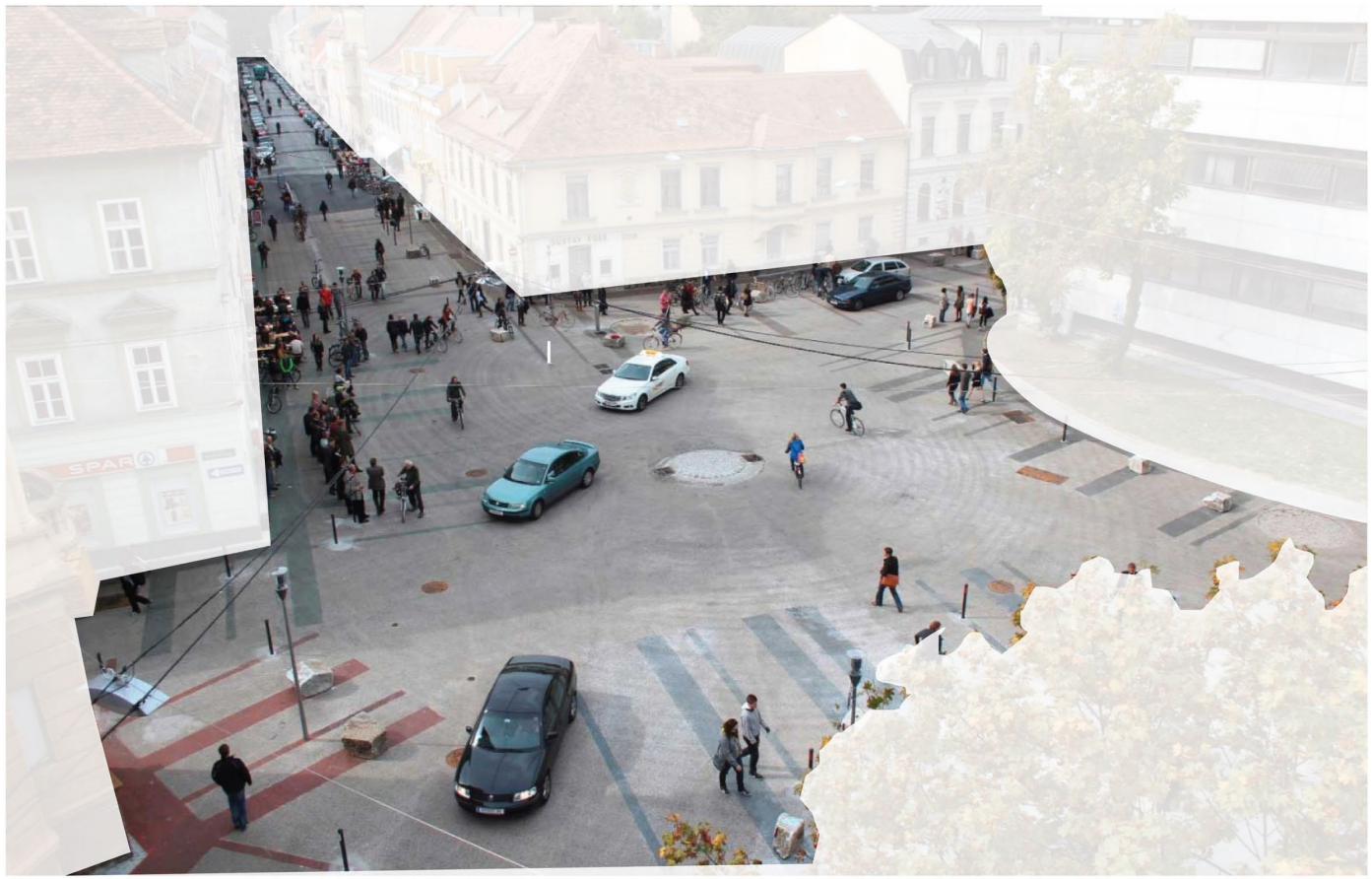
(WHO, 2025)

problematization

design blindness

environmental overstimulation

spatial chaos



(Kohlstedt, n.d.)

problematization

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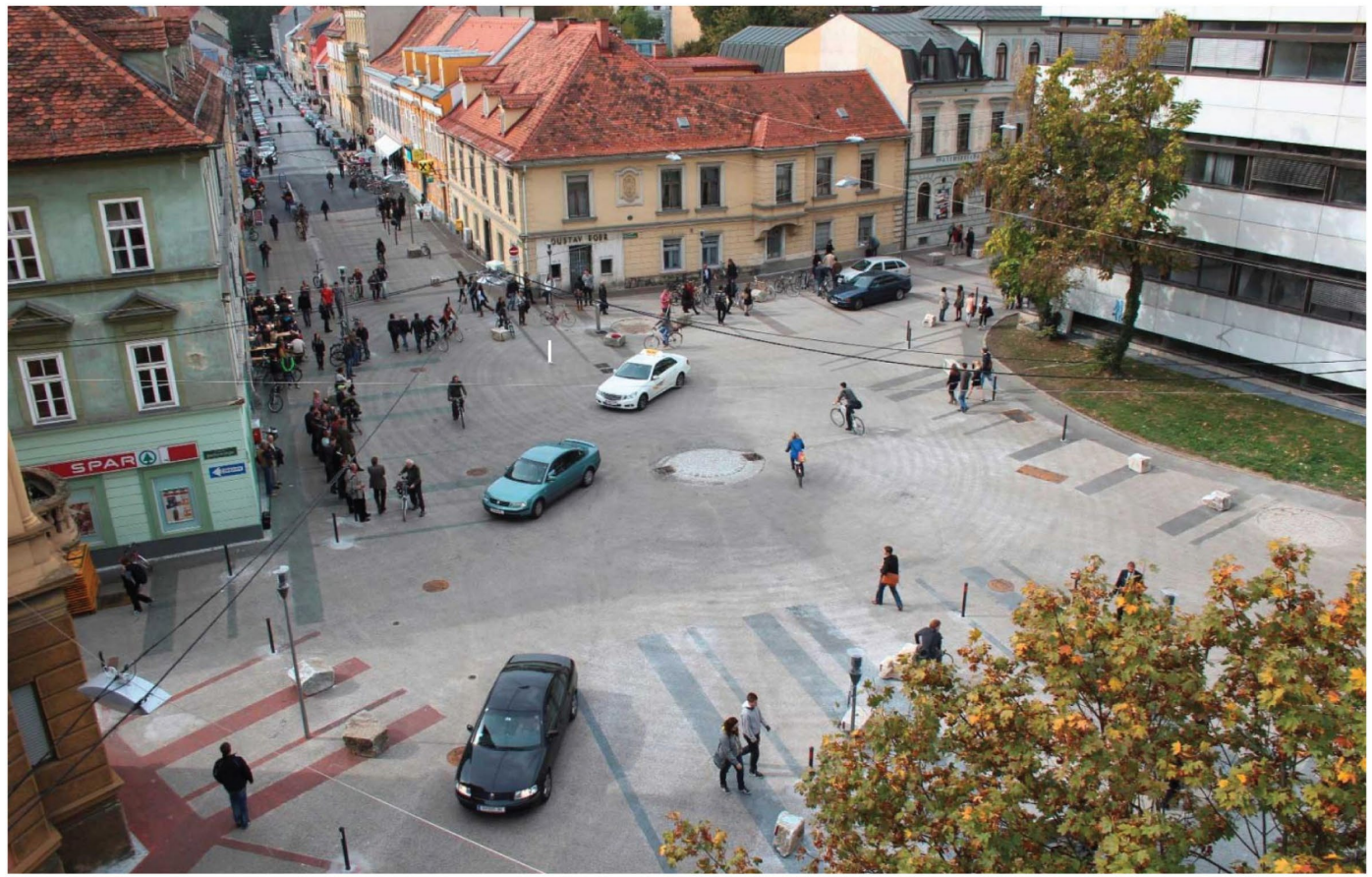
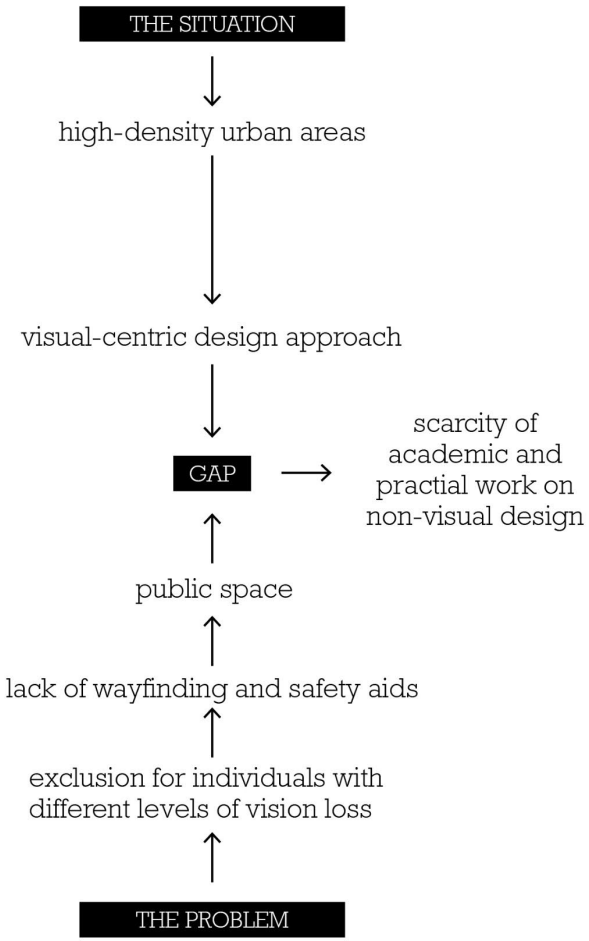
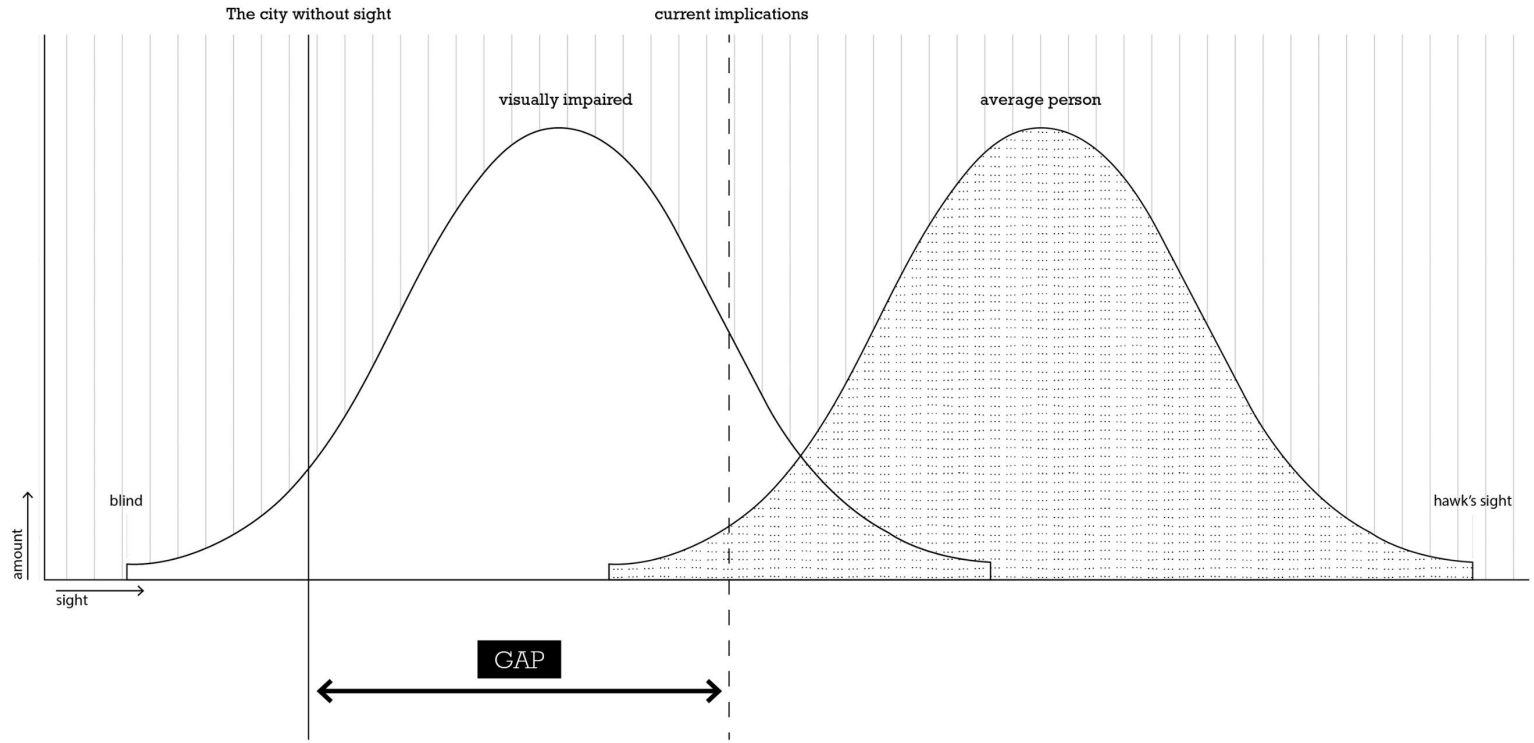


(Kohlstedt, n.d.)

problem statement

gap





problem statement

gap

THE SITUATION

high-density urban areas

visual-centric design approach

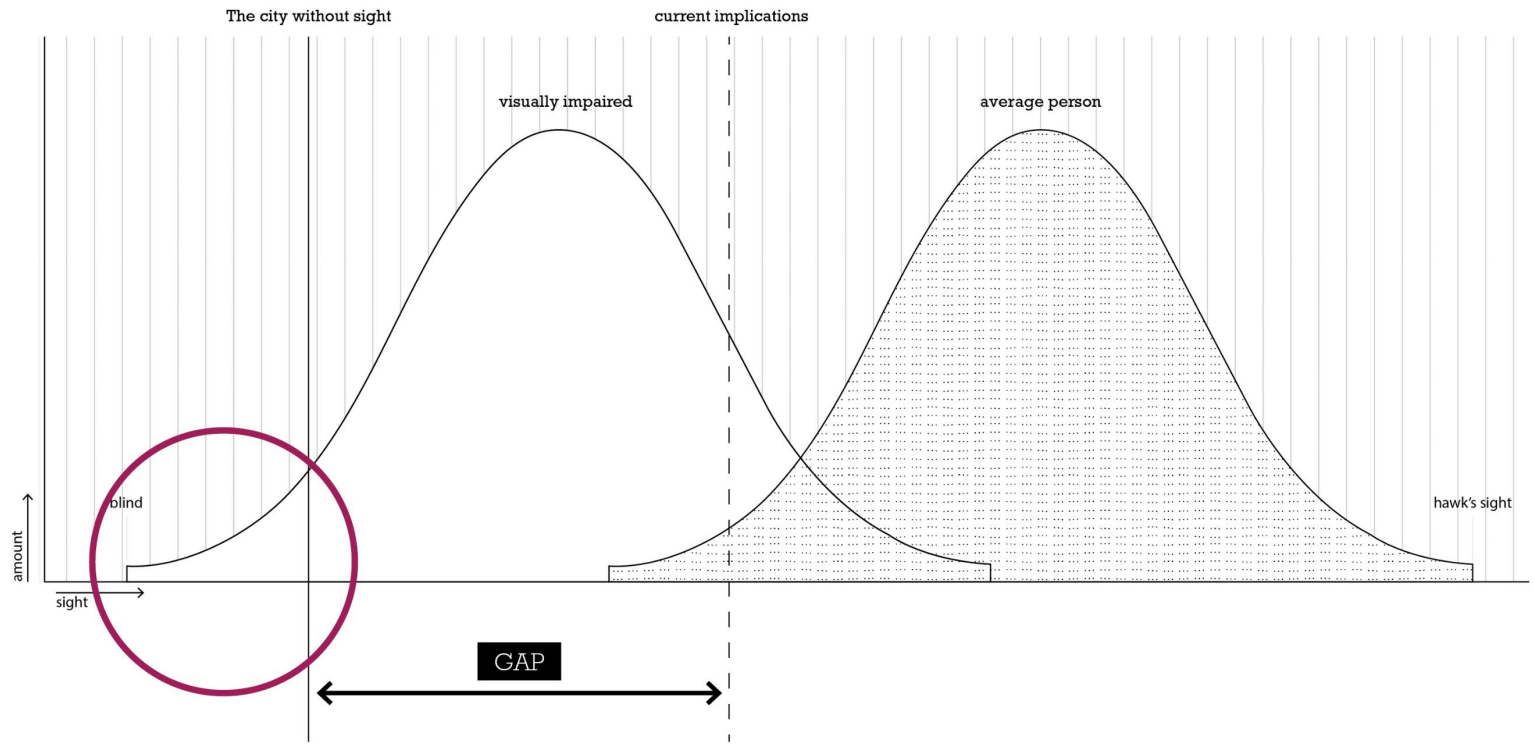
GAP → scarcity of academic and practial work on non-visual design

public space

lack of wayfinding and safety aids

exclusion for individuals with different levels of vision loss

THE PROBLEM



PROBLEMSTATEMENT

Contemporary urban environments are still designed through a visual-centric lens, offering inconsistent and insufficient non-visual cues for navigation. As a result, visual impaired and blind people encounter spatial illegibility, sensory overload and environmental chaos that restrict independence and wellbeing. These challenges stem not from vision loss itself but from the inability of public spaces to provide alternative sensory pathways.

Research

research question

spectrum of visual impairment

Which multisensory spatial design variables support wayfinding and perceptual comfort for people with different degrees of visual impairment, and how can these variables be translated into design strategies for high-density urban environments?

Research

case study

To choose the right location to design for blind people, it must be easily accessible. The location should have interesting activities to attract people to come to this (un)familiar environment

central location

The city center of this location should be most vibrant to make a challenge of this design approach. Shared spaces is a relative new concept. Creating both an interesting and challenging situation in city centers. The chosen location should be hard to avoid for the visually impaired and blind people; the center of town with a lot of amenitites.

vibrant city center

The Hague has many shared spaces, along theturfmakrt, the Spui en de Grote Marktstraat are one of the many areas where the bike, pedestrian and the occasional car is alowed. There are no differtiantes between heights or material adding up to a confusing lay-out

shared space

Since people with visual impairment don't use their vision as well. The other senses are more sensitive and trained. Within an activated sensescape where a lot of information needs to be processed through the senses to understand the situation, the challenge becomes bigger. Therefore, choosing a location with this challenge makes it interesting to see what can be done with these scapes

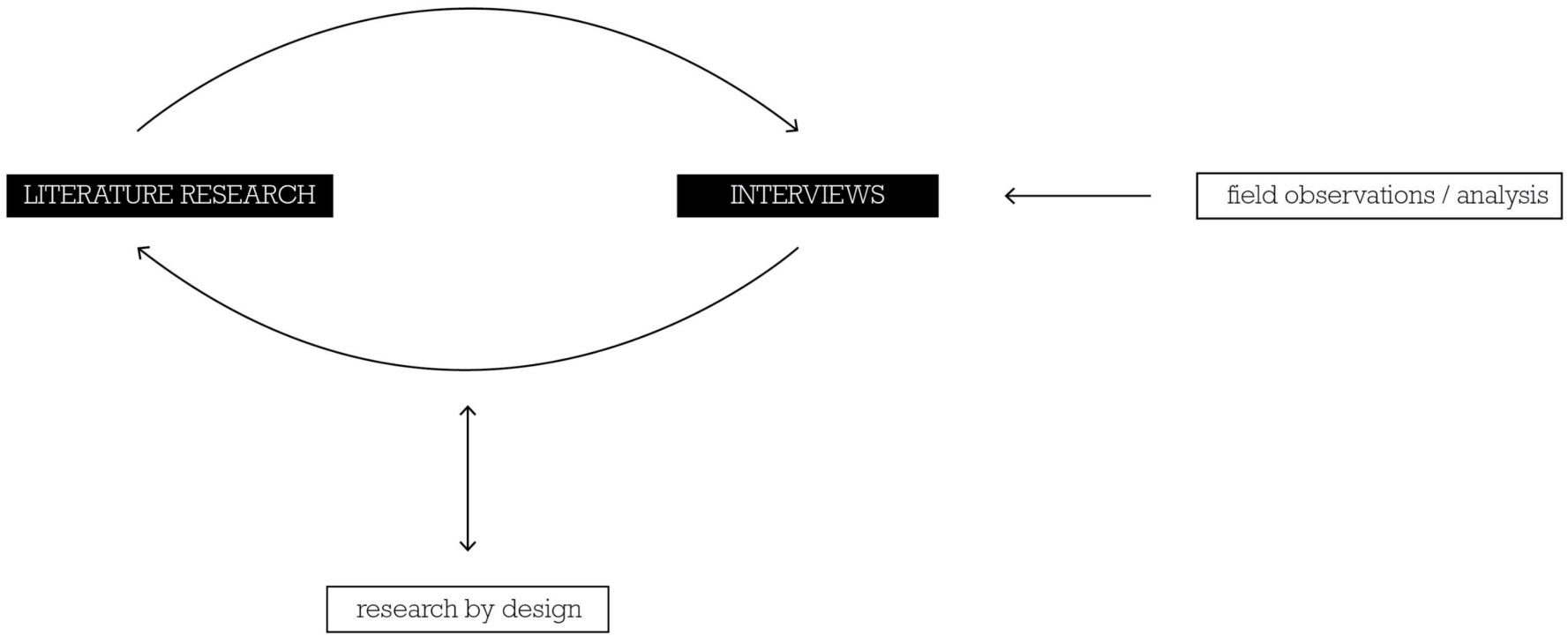
activated sensescape

This location should be accessible by public transport as well as cars so blind / visual impaired people are able to come to this place (in)dependently.

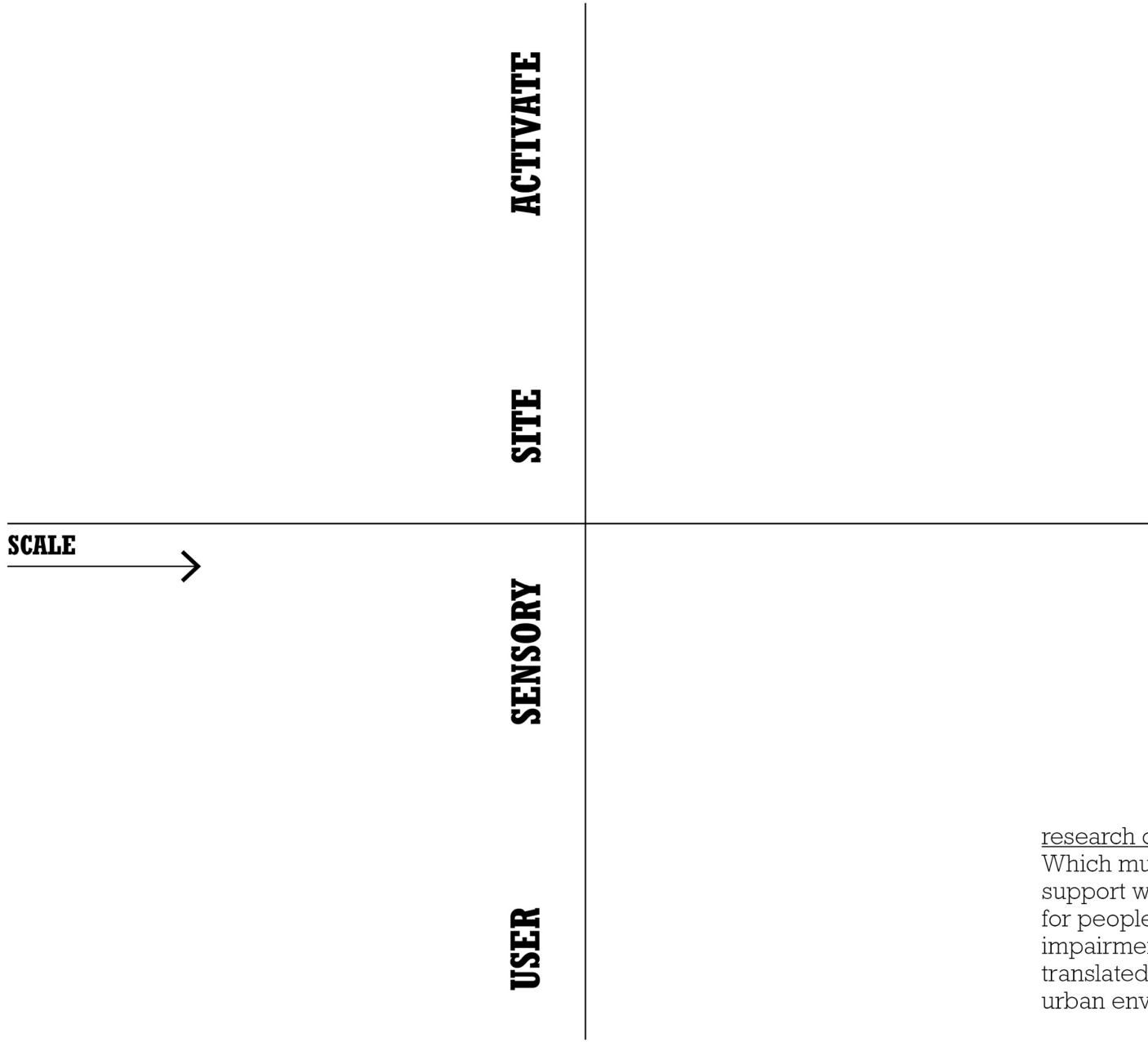
accessible by PT

Research

groundwork



Research



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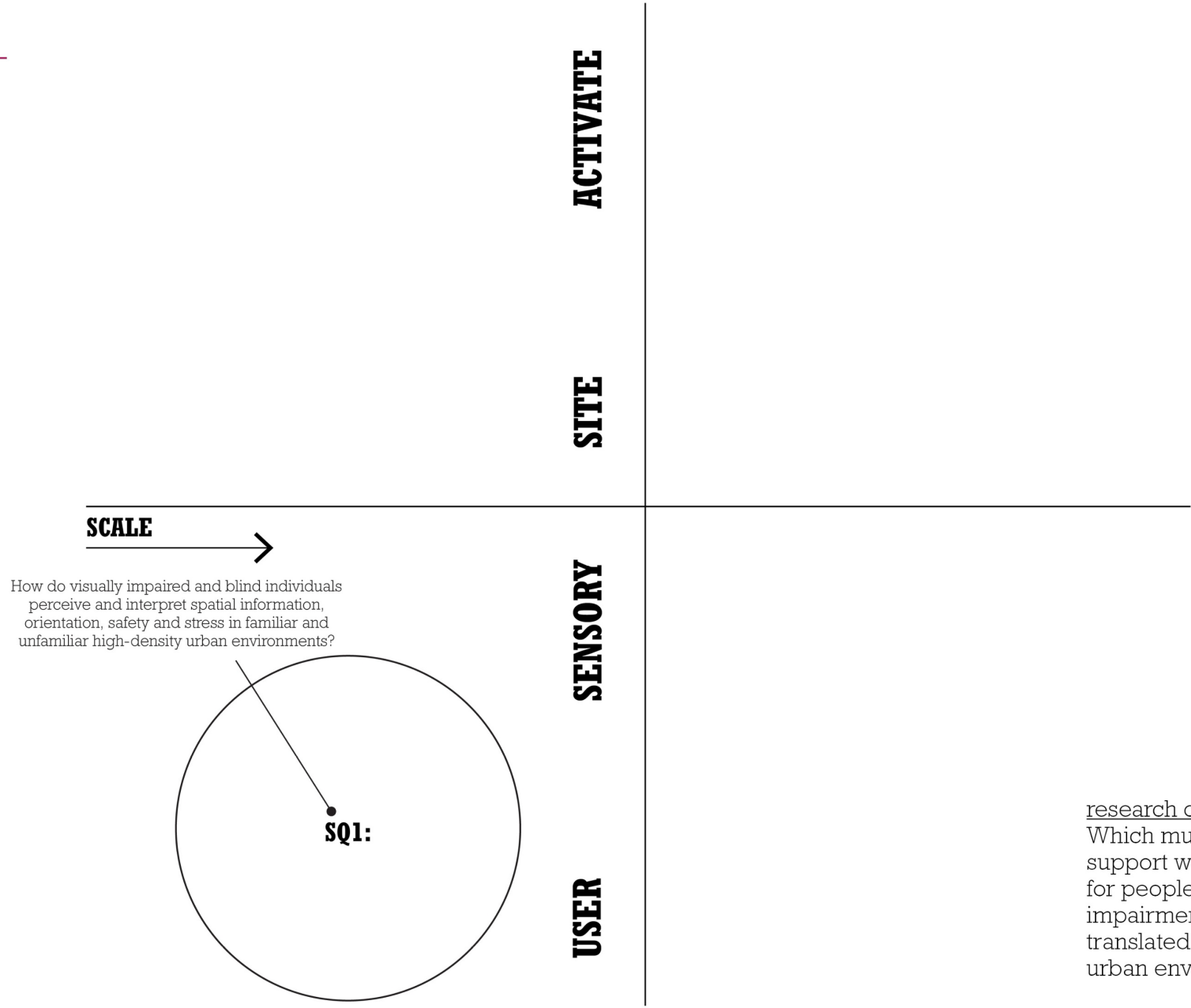

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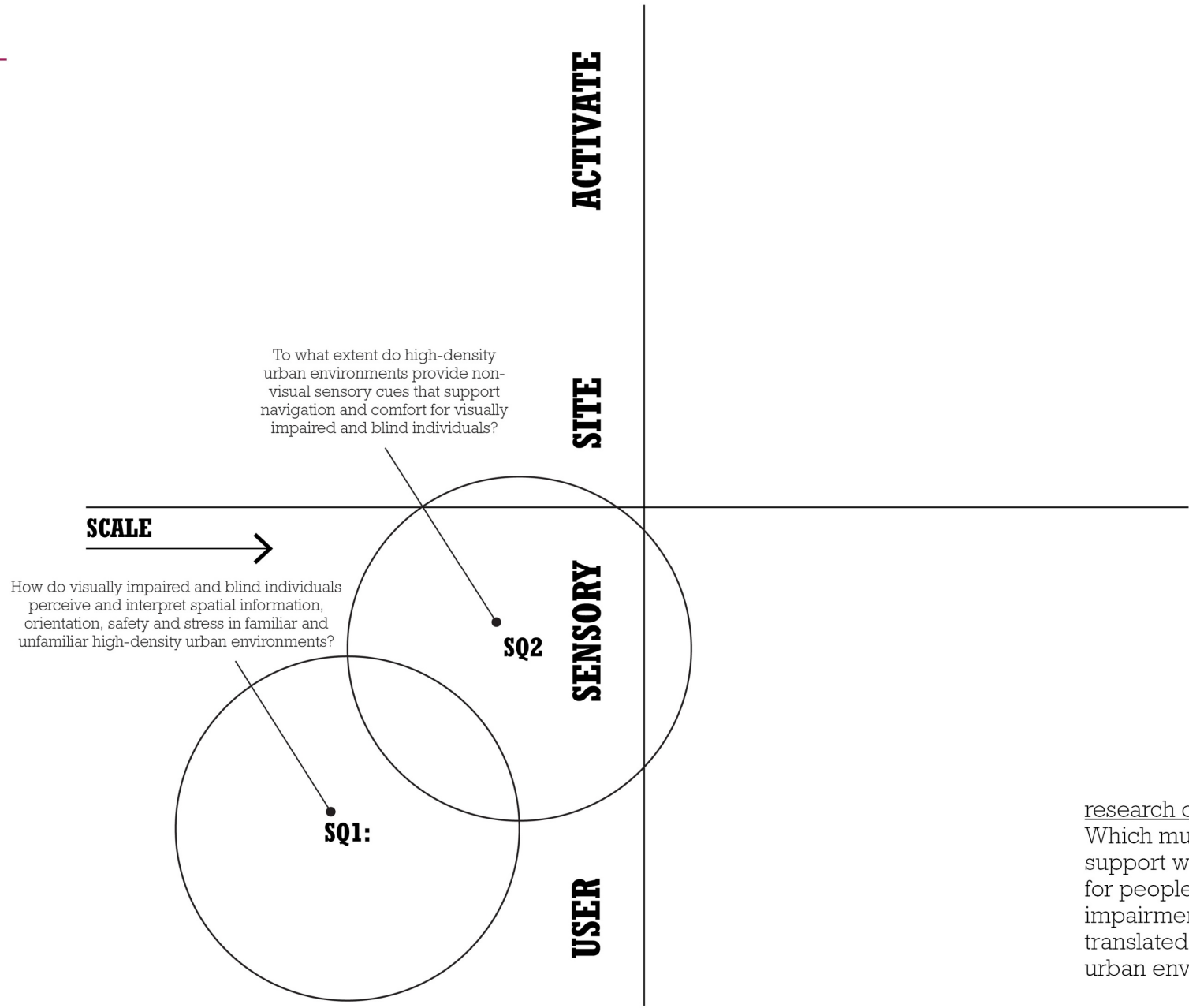

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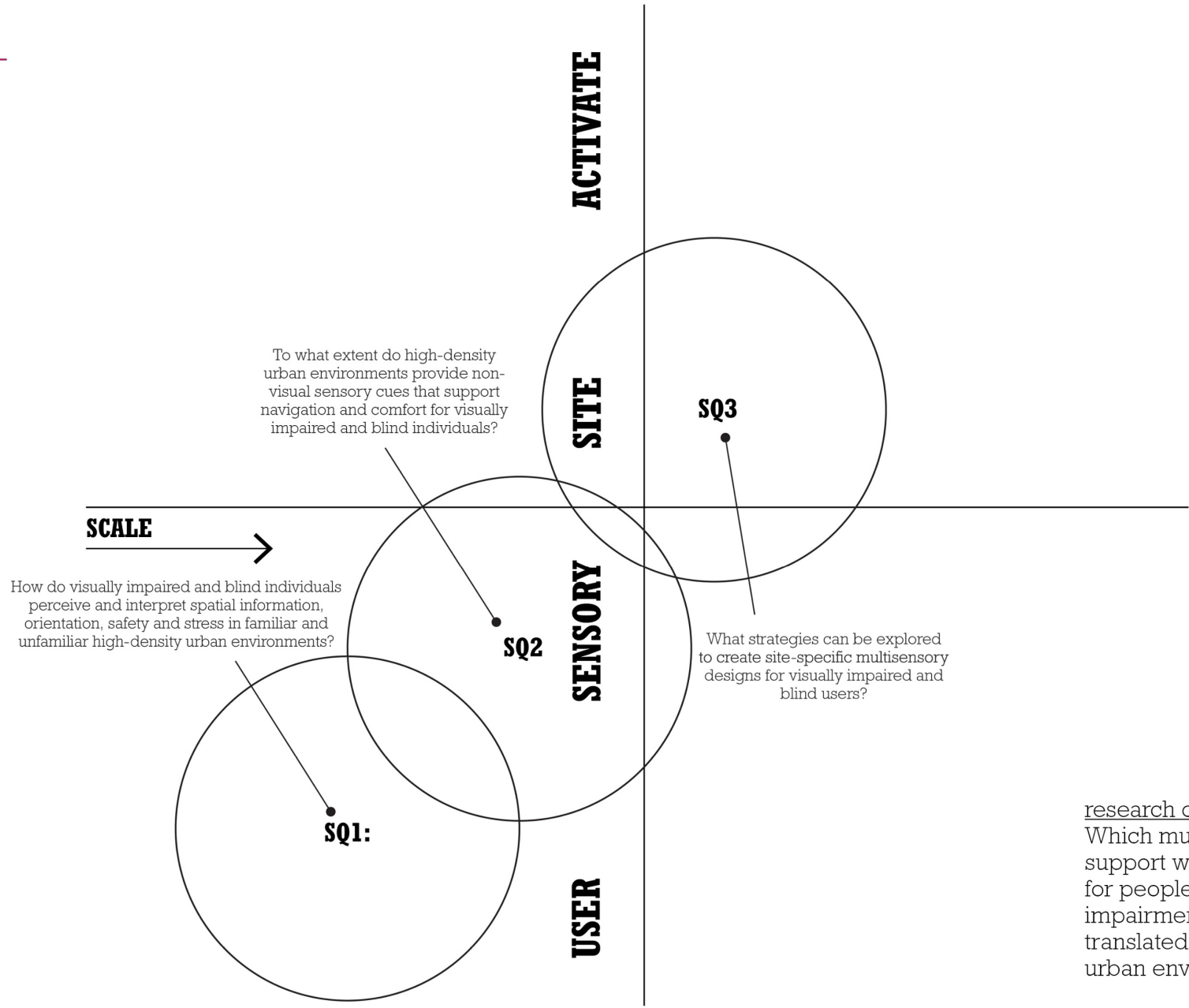

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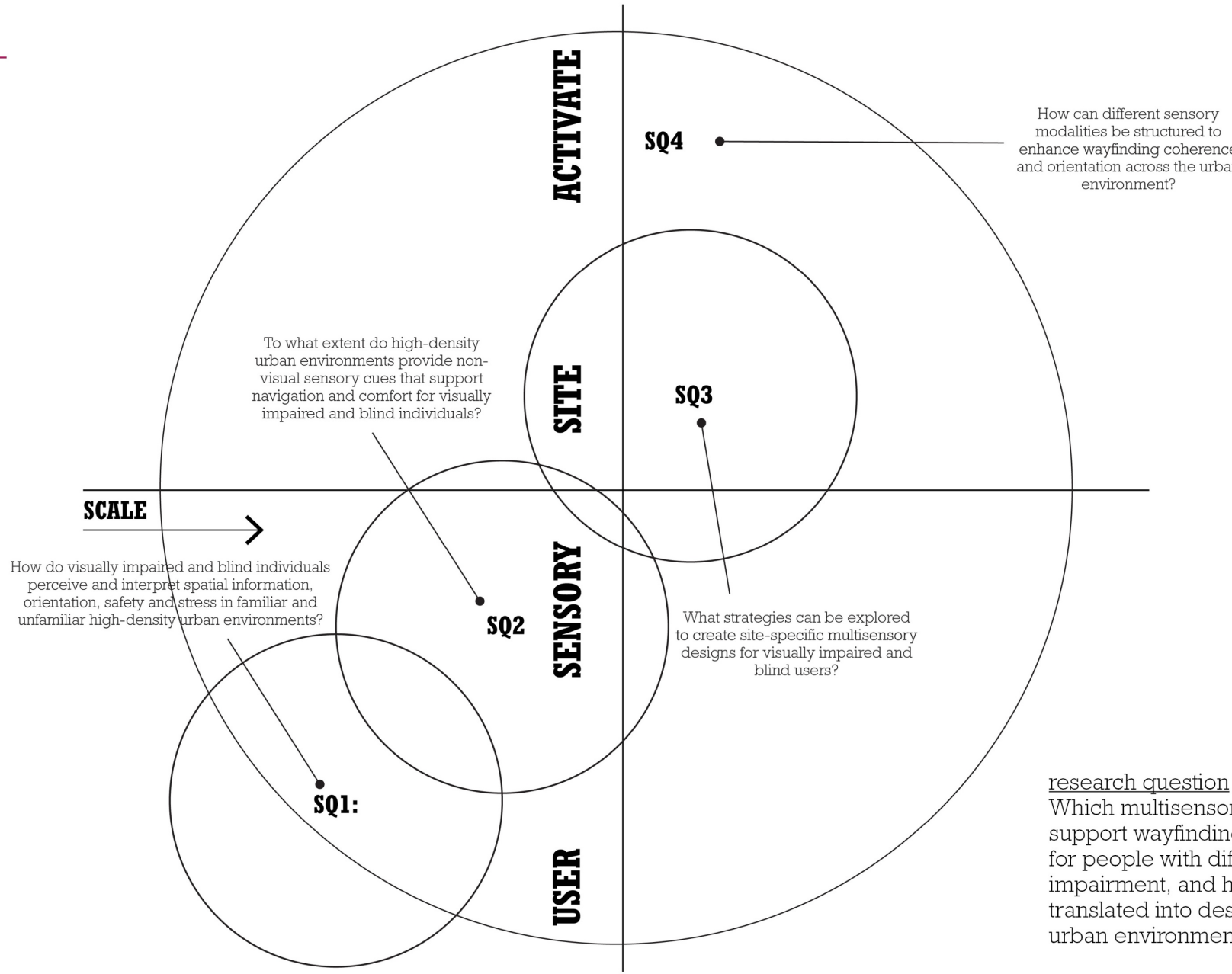

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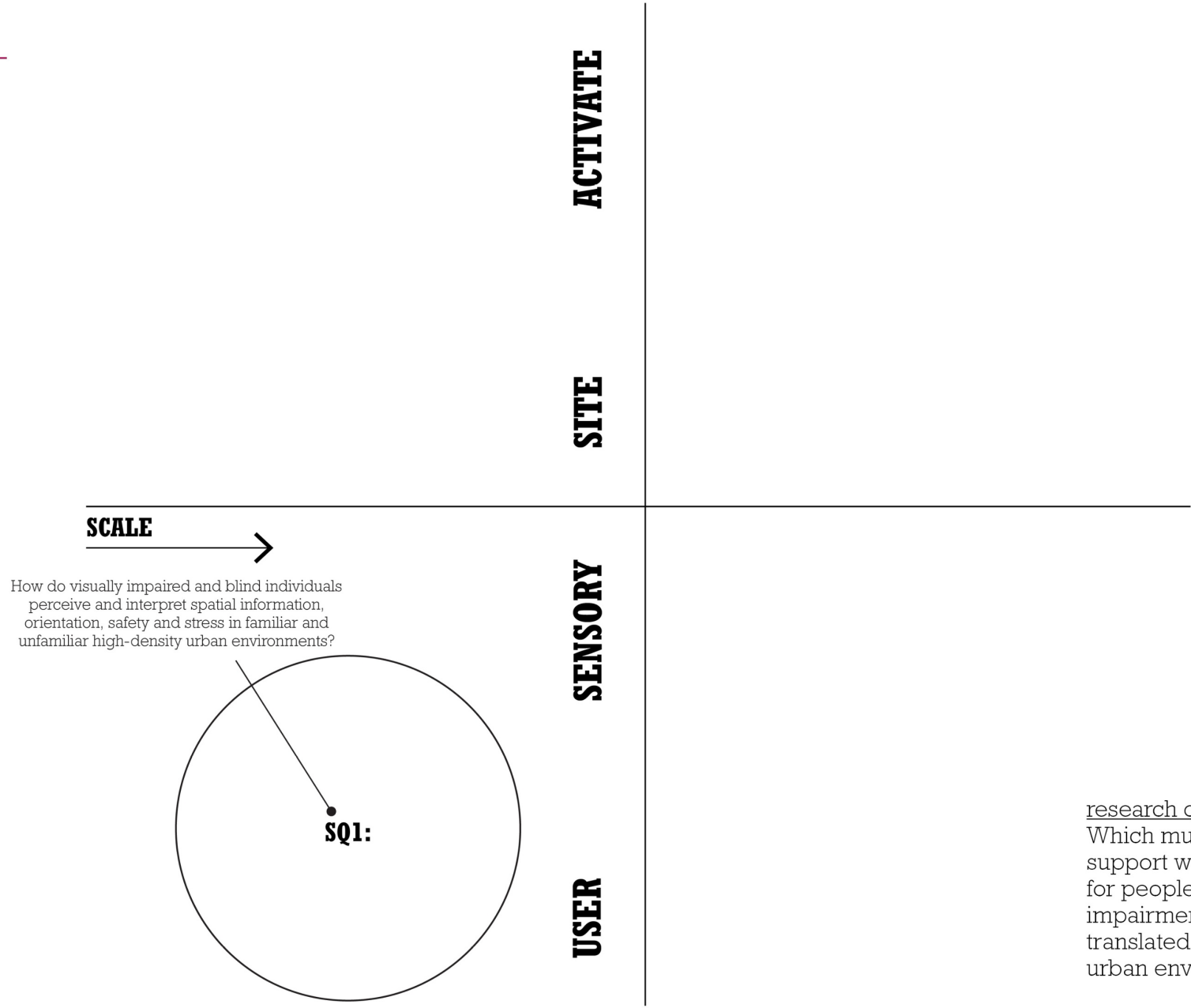

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definition

spectrum

(Perkins School for the Blind, n.d.)

definition

cognitive mapping

Spatial understanding is commonly supported through cognitive maps, these are mental representations of spatial knowledge that enable people to navigate and recall places

(Papadopoulos et al., 2017)

orientation

literature

What are the reference points you keep in mind when finding your way between Faramarz junction and the school?			
	Blind (%)	Low-vision (%)	Total (%)
Braille pavement	33.3[2] - 8.3	66.7 - 16.7	100 - 12.5
Bakery	60 - 25	40 - 16.7	100 - 20.8
Strip Mall	50 - 8.3	50 - 8.3	100 - 8.3
Supermarket	66.7 - 16.7	33.3 - 8.3	100 - 12.5
Bank/ATM	37.5 - 25	62.5 - 41.7	100 - 33.3
School walls	66.7 - 16.7	33.3 - 8.3	100 - 12.5

Landmarks and reference points

(Afrooz et al., 2012)

orientation

literature

What problems do you have on pedestrian pathways?			
	Blind (%)	Low-vision (%)	Total (%)
unsuitable walkway	72.7 - 66.7	27.3 - 25	100 - 45.8
barrels on the pedestrian pathways	33.3 - 16.7	66.7 - 33.3	100 - 25
unsafely	100 - 8.3		100 - 4.2
lack of suitable signage for visually impaired	16.7 - 8.3	83.3 - 41.7	100 - 25

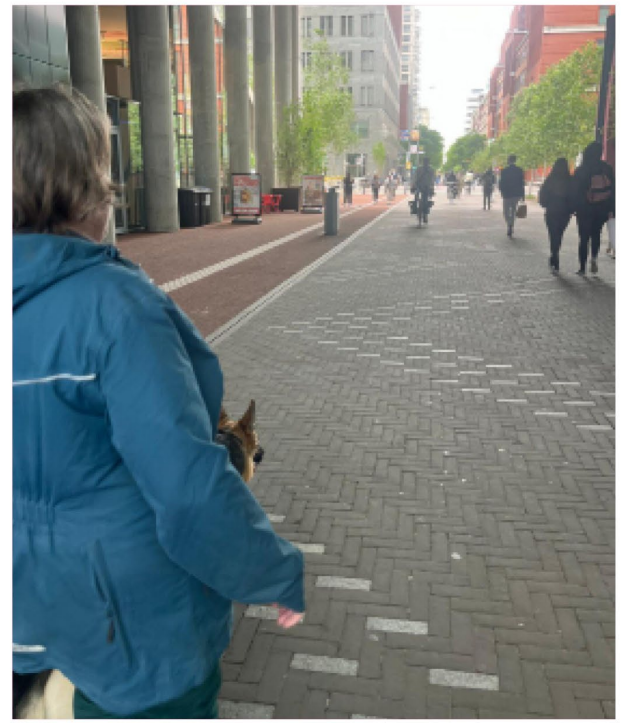
Visually impaired and problems encountered on pedestrian pathways

(Afrooz et al., 2012)

orientation

walk along in high-density cities

detoriating sight



blind since birth

partially blind

(own image, 2025)

orientation

elements for vi/b

tactile paving at crossing

contrasting colours

curbs and guides

(scent) landmarks

pavement as drain

(own image, 2025)

orientation

shared space

*“This works in small villages in Sweden, but not in big cities, read the *** manual” (Janssen, 2025).*

(own image, 2025)

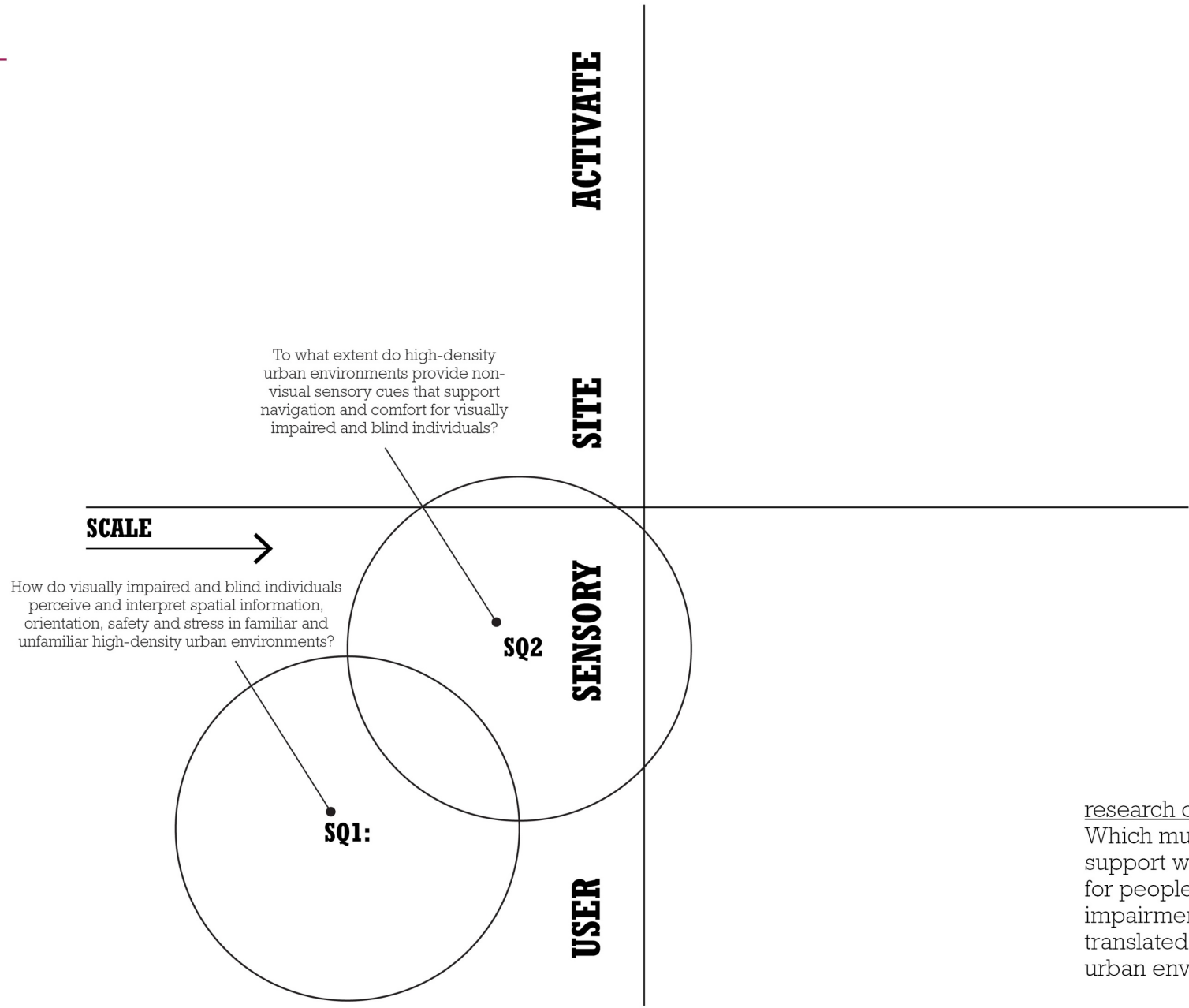
orientation

nighttime

“Visibility changes completely at night. And that doesn’t only apply to people with visual impairments.” (Janssen, 2025).

(yushotya, n.d.)

Research



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definition

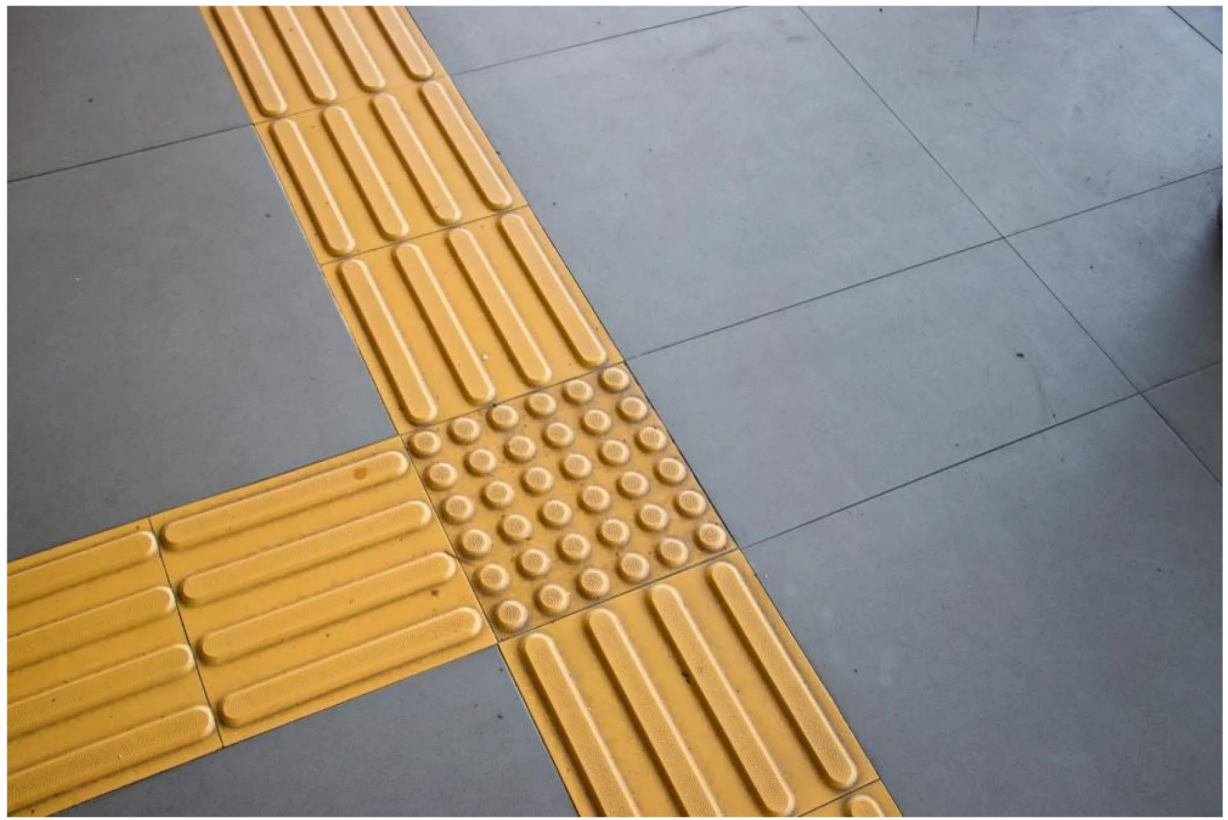
loss of sight

Brains of people who are visually impaired or blind, especially from an early age, rewires itself to strengthen other senses, such as hearing, touch, and smell, along with memory and language processing.

(National Eye Institue, 2017)

urban cue

literature

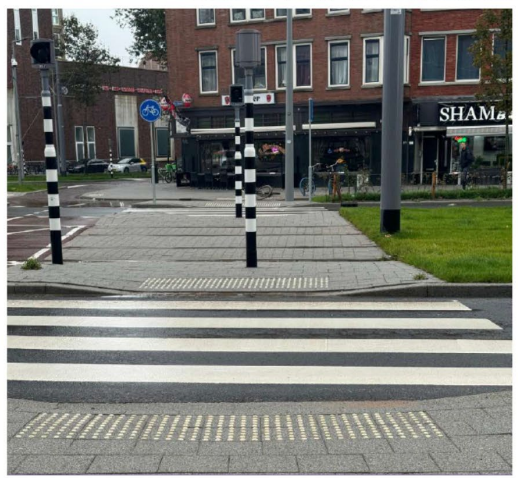


(asian concreto, 2022)

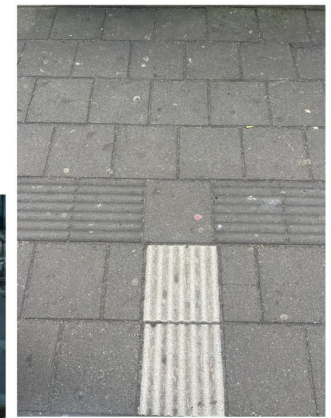
urban cue

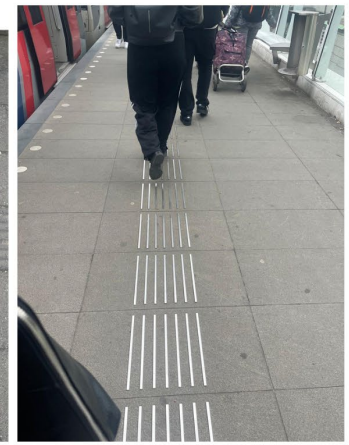
findings

plain stupid

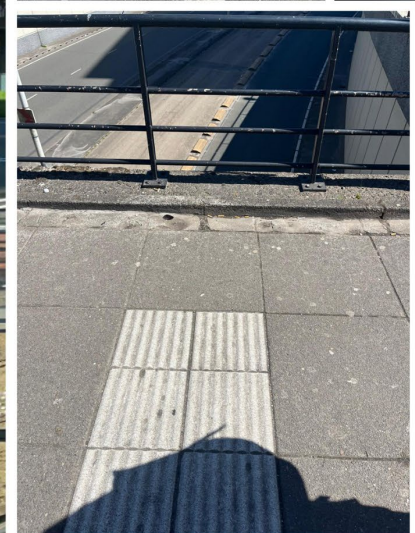


same colour





guide for all



leading nowhere

(Arttenders, 2022; own image, 2025)

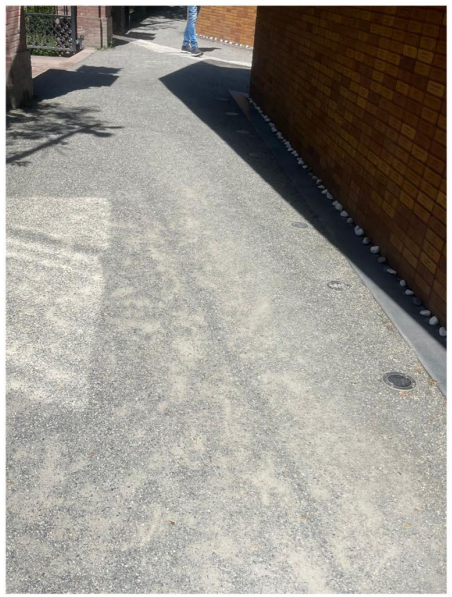
urban cue

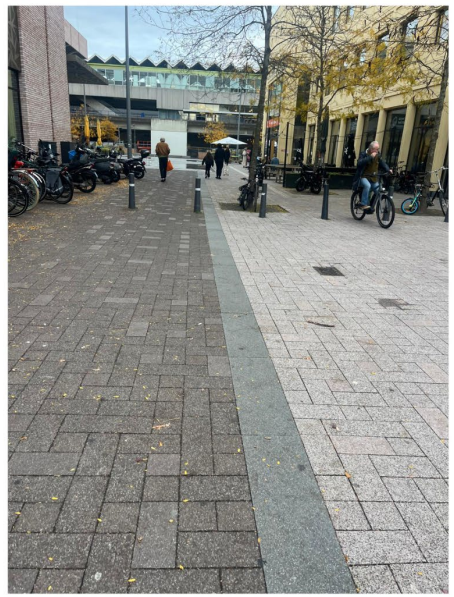
findings

natural guideline

puccini method

semi-paved and audio feedback





paved and contrast

(Puccini, 2025; own image, 2025)

urban cue

touch, sound and scent

audio guide

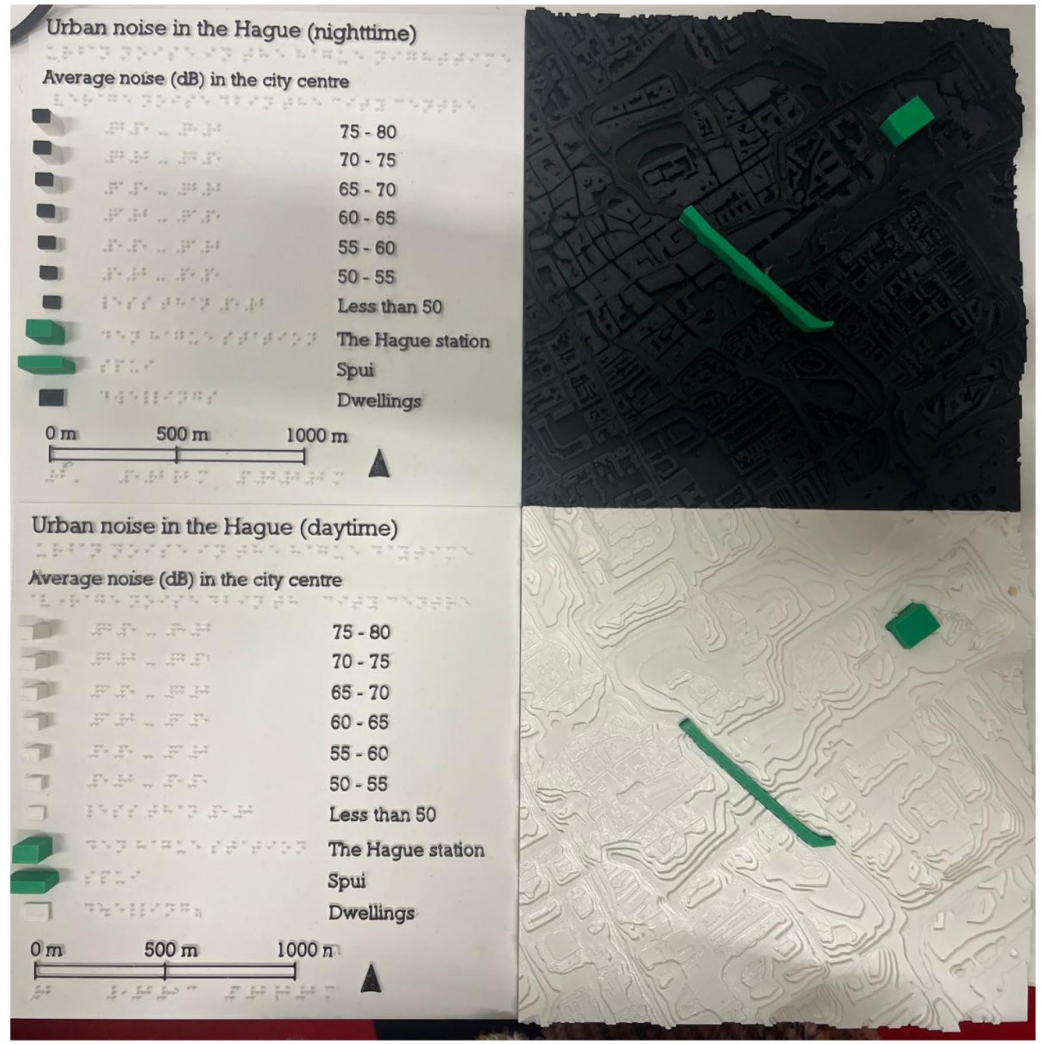
scent guideline

implemented widely

(Omroep Brabant, 2022; own image, 2025)

urban cue

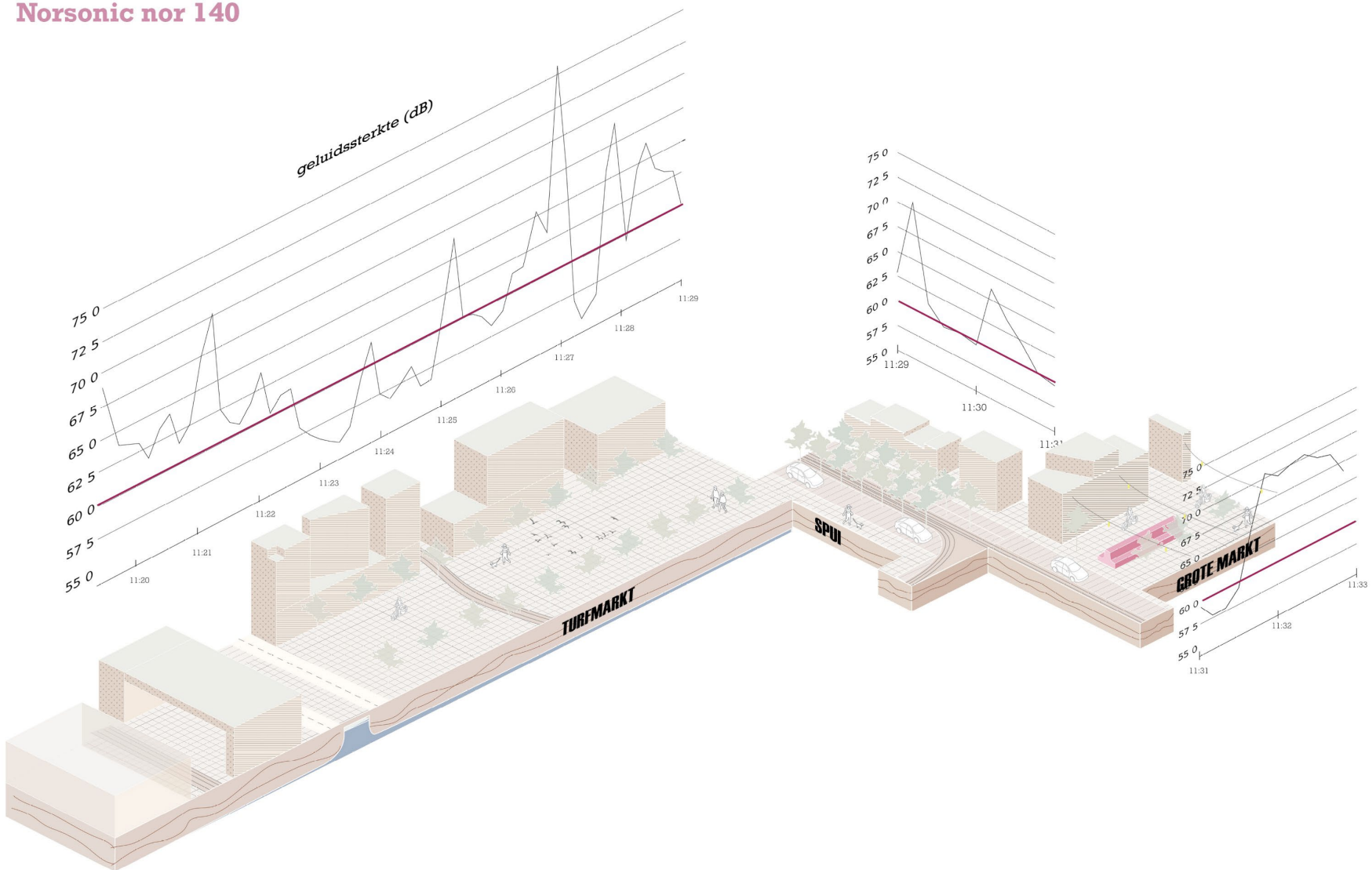
tactile map

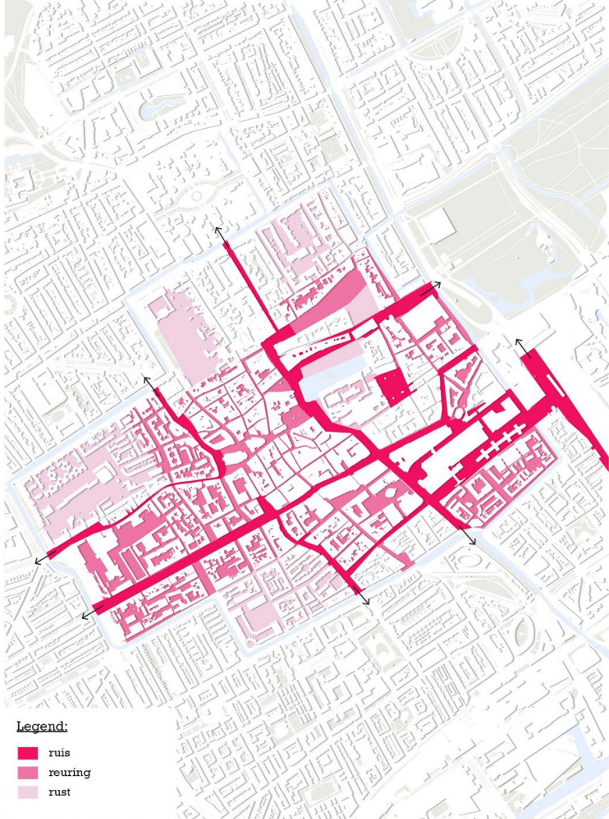


(Vogelaar, 2018)

urban cue

Norsonic nor 140

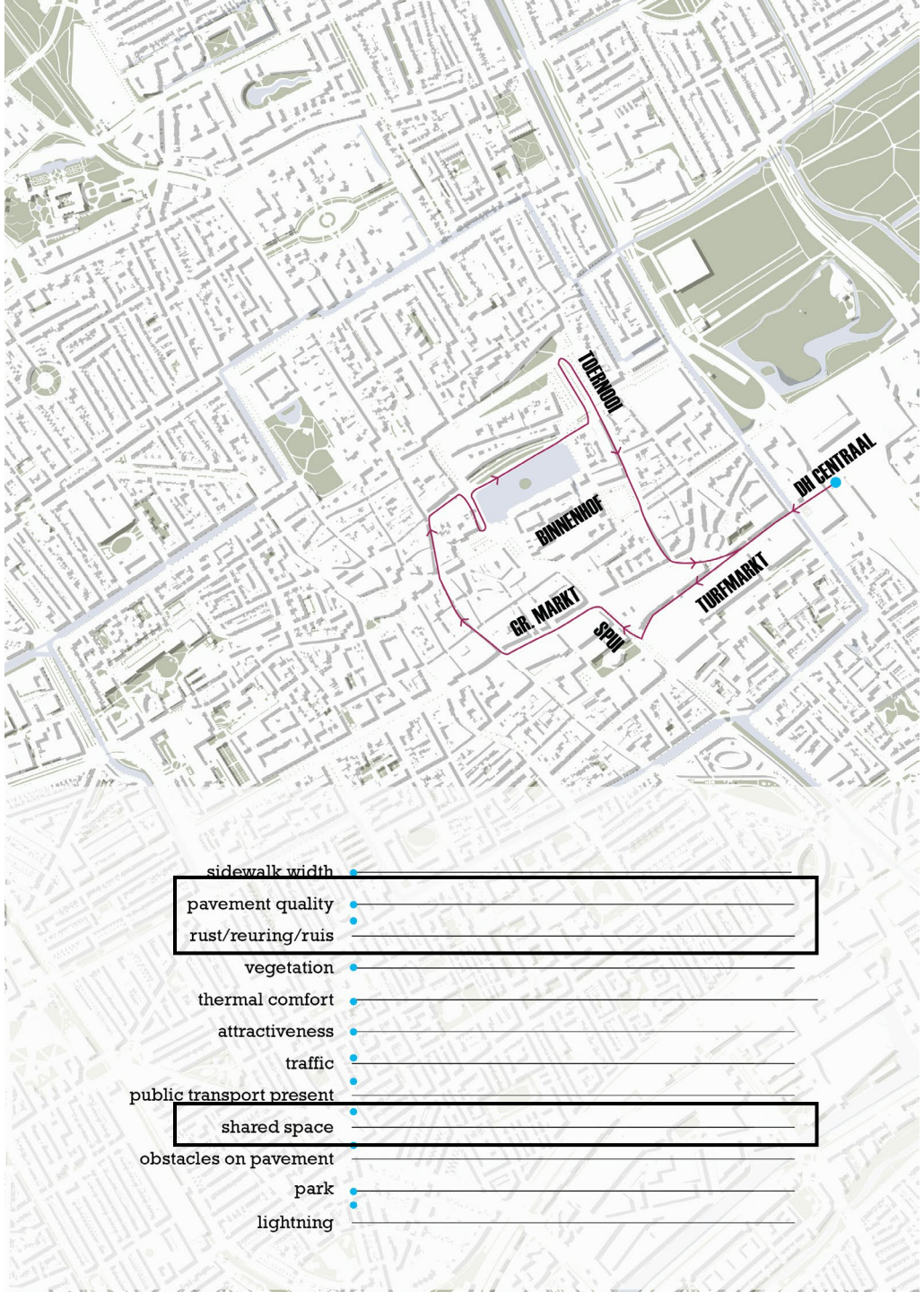




(van Kempen et al., 2014)

urban cue

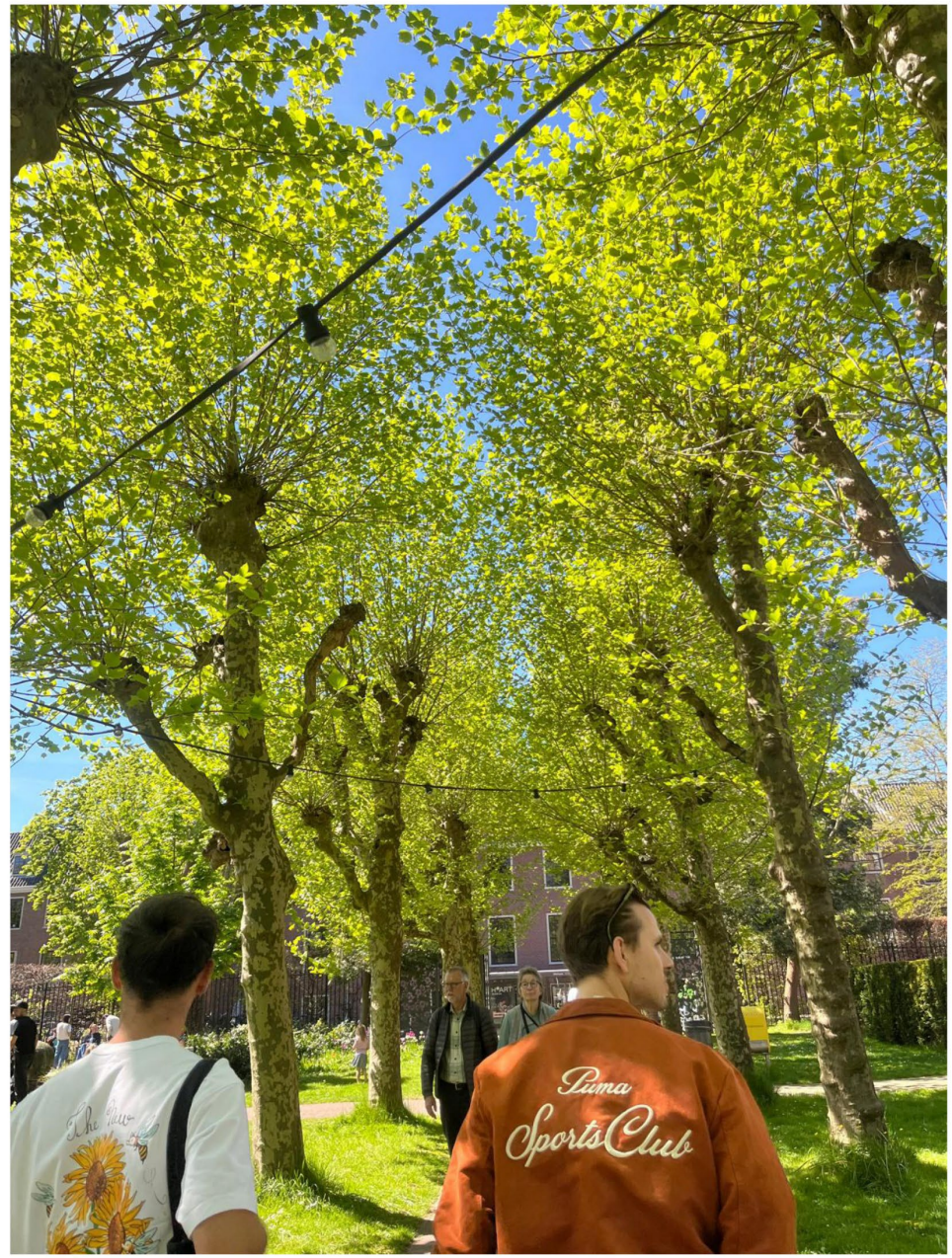
The Hague



(own work, 2025)

urban cue

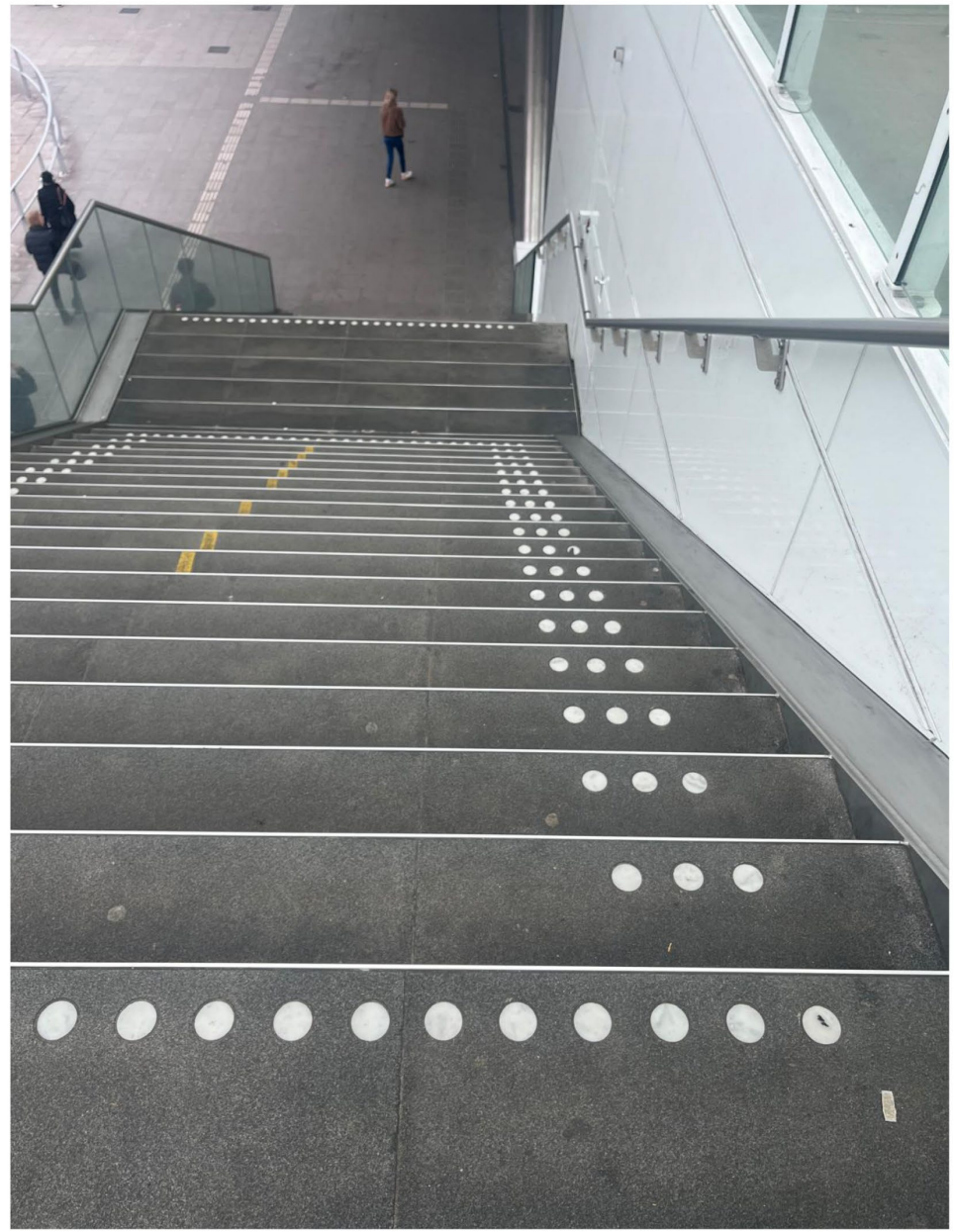
A calm place



"My favourite places are the calm ones, few cars, no big crowds, just a pleasant background ruis. Where you are surrounded by vegetation, a water fountain and the background noise of people talking."
(Smit, 2025)

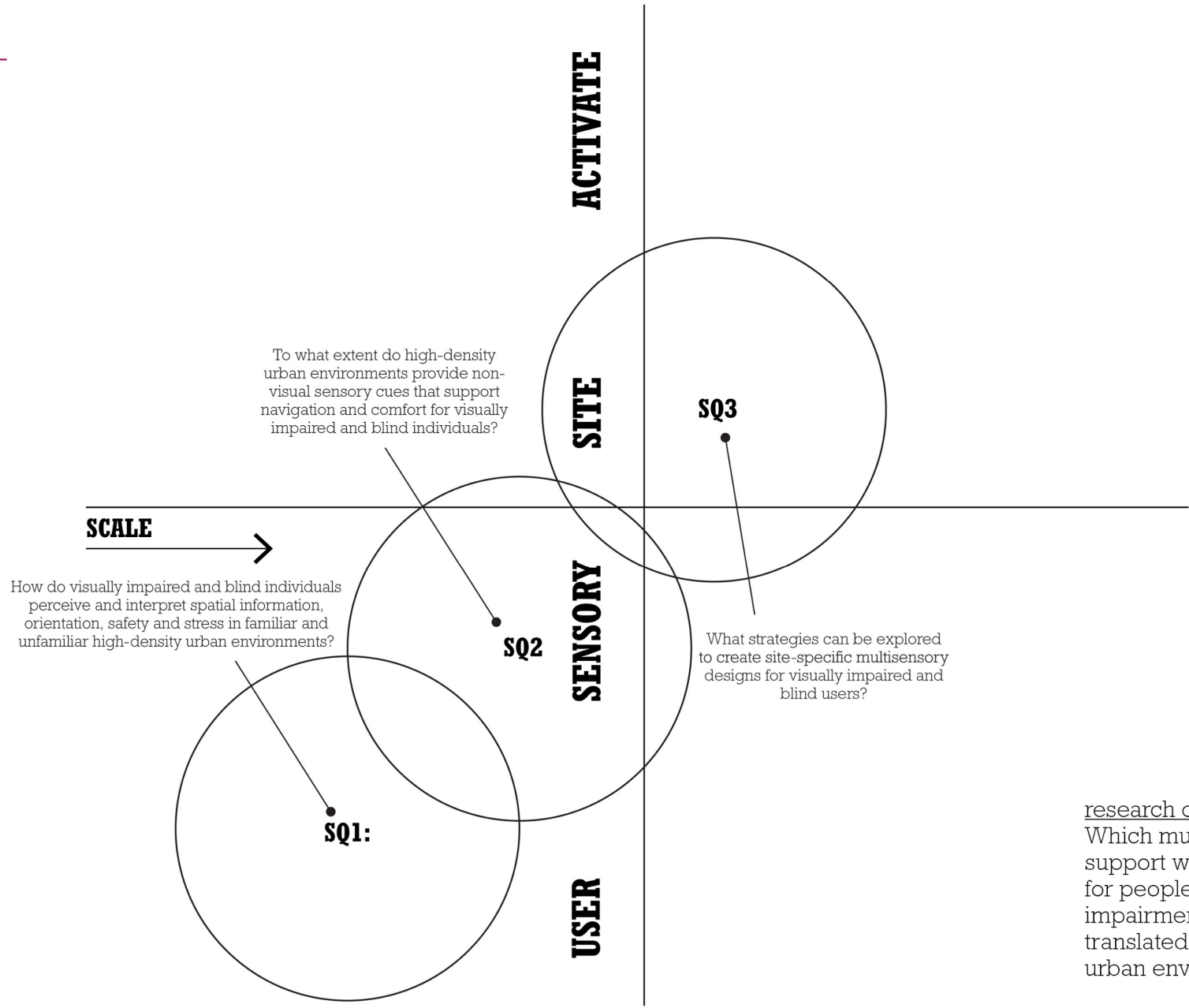
urban cue

rhyhm and predictability



“Rhythm in steps or paths helps a lot. When things repeat consistently, I don’t need to scan as much.”
(Smit, 2025)

Research



research question

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definition

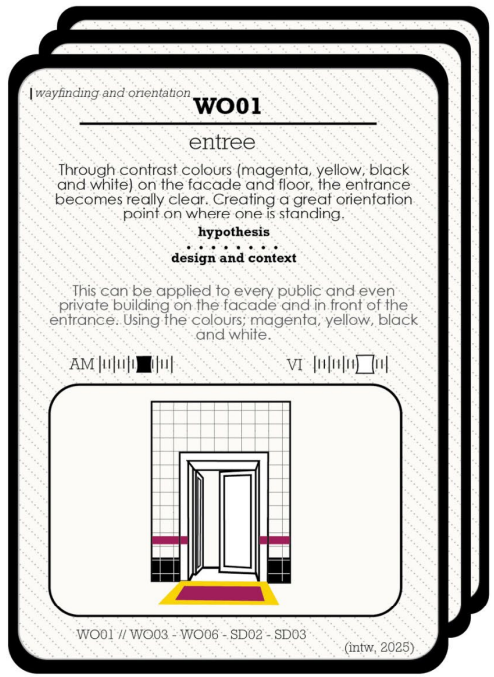
pattern language

A language for a design problem shaped by patterns that are interlinked and mutually referential, either supporting or conflicting each other. Describing the core of the solution to a problem in a way that it can be used a million times over without ever doing it the same way twice.

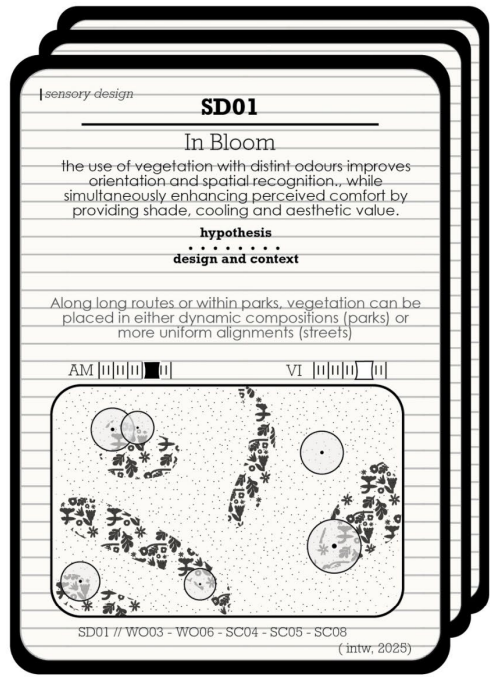
(Alexander et al., 1977)

The Pattern

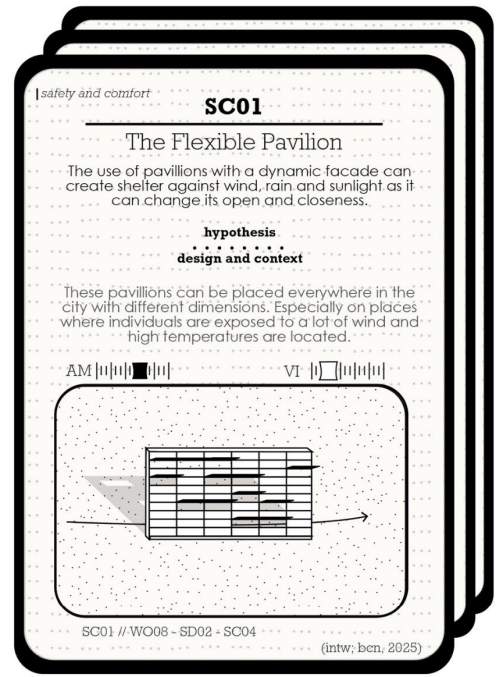
the categories



design blindness



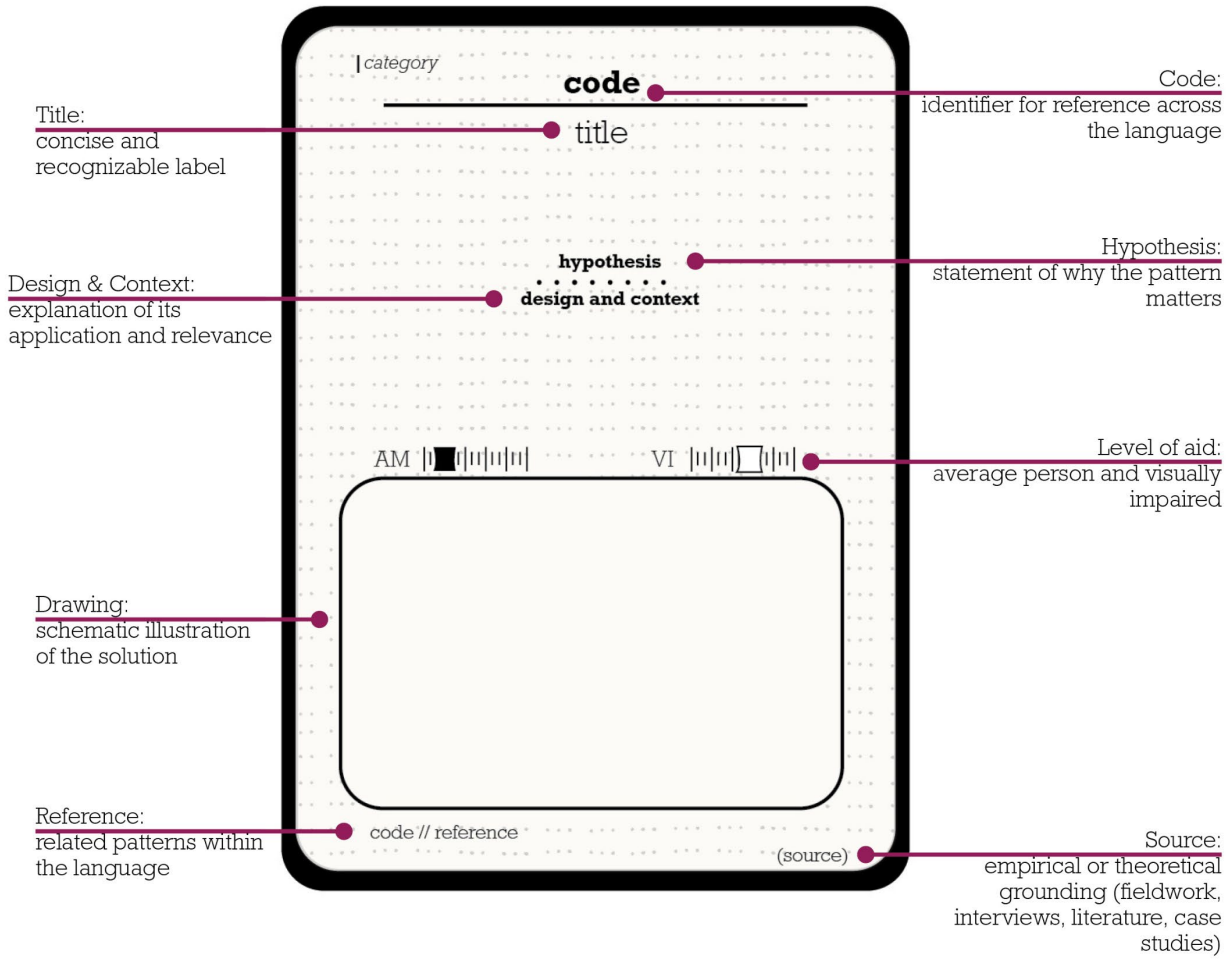
environmental overstimulation



spatial chaos

The Pattern

lay-out



pattern language

inspiration

wayfinding and orientation

WO10

Don't Mind the Gap

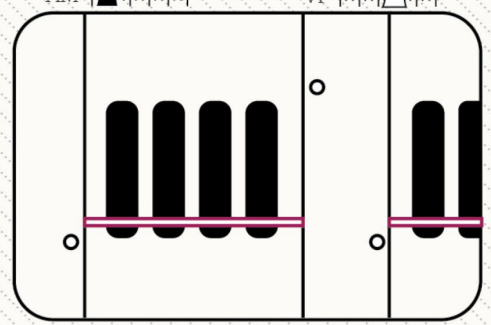
When a small gutter would be placed at the crossing, the guidestick can follow this small gutter, which ensures the safety and right orientation to cross.

hypothesis

design and context

This design can be used at big and small crossings. The gutter should be quite shallow and wide enough to prevent a hook

AM VI



WO10 // WO03 - WO09 - SC02 - SC09

(intw, 2025)

wayfinding and orientation

WO05

Magnifier

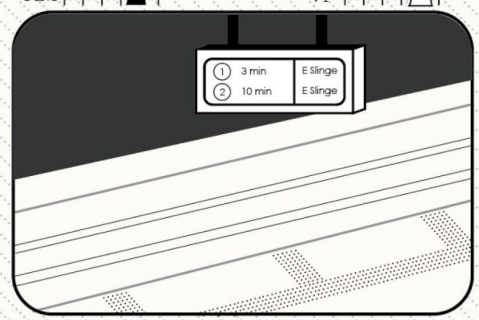
A big screen with clear big letters on what transport is arriving in what time and what transport is next. Furthermore, if the transport stops at the same location, the entrances will be easier to locate

hypothesis

design and context

This can be applied to every possible transport, train, tram, metro, bus, even taxi stands.

AM VI



WO05 // WO06 - WO07

(intw; bcn; jpn, 2025)

wayfinding and orientation

WO01

entree

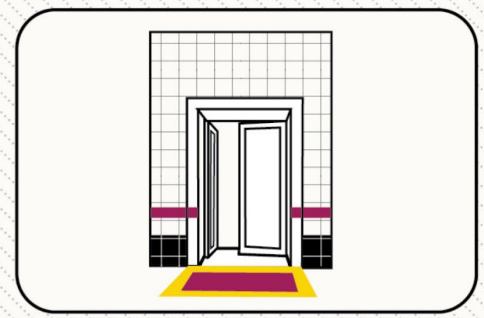
Through contrast colours (magenta, yellow, black and white) on the facade and floor, the entrance becomes really clear. Creating a great orientation point on where one is standing.

hypothesis

design and context

This can be applied to every public and even private building on the facade and in front of the entrance. Using the colours; magenta, yellow, black and white.

AM VI

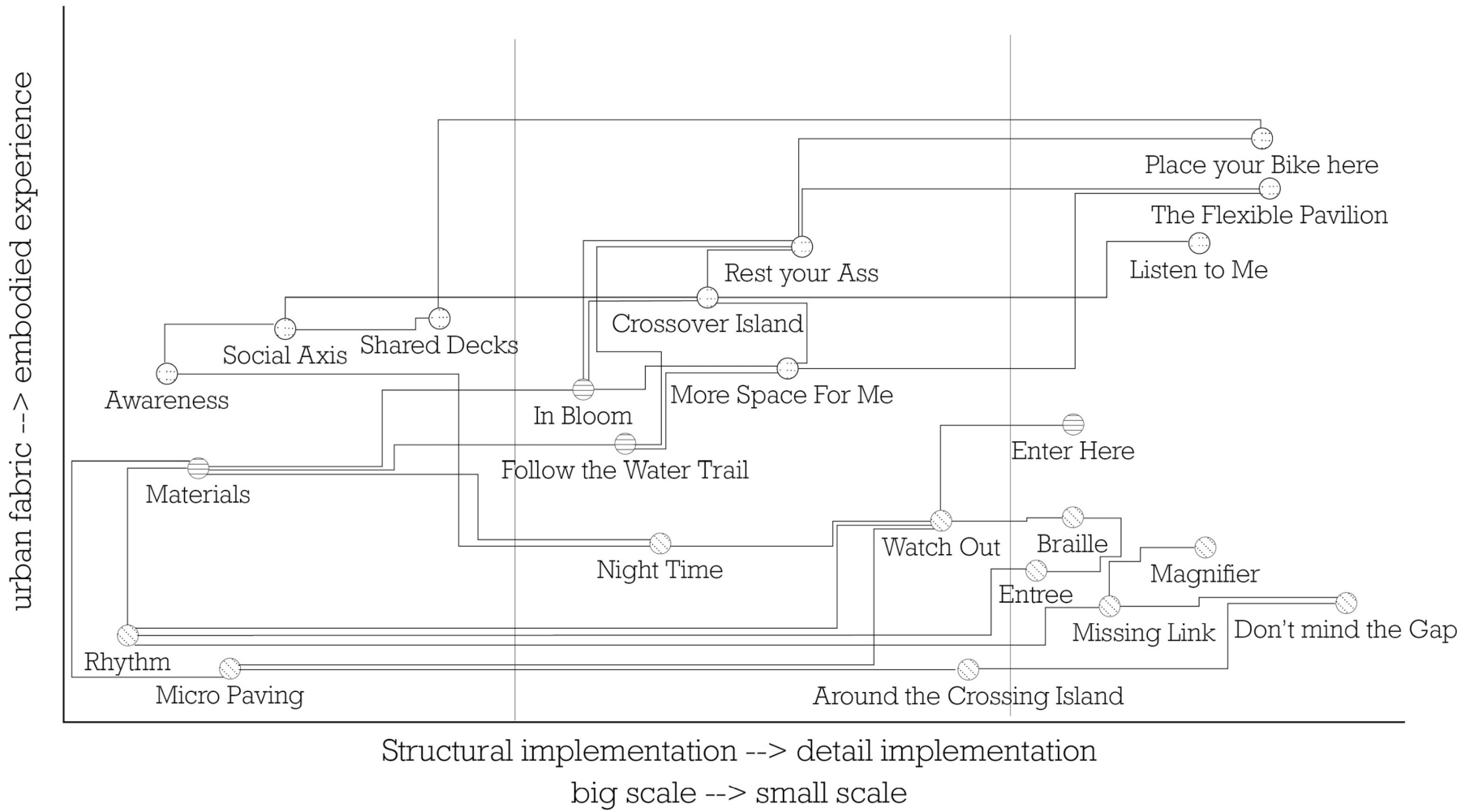


WO01 // WO03 - WO06 - SD02 - SD03

(intw, 2025)

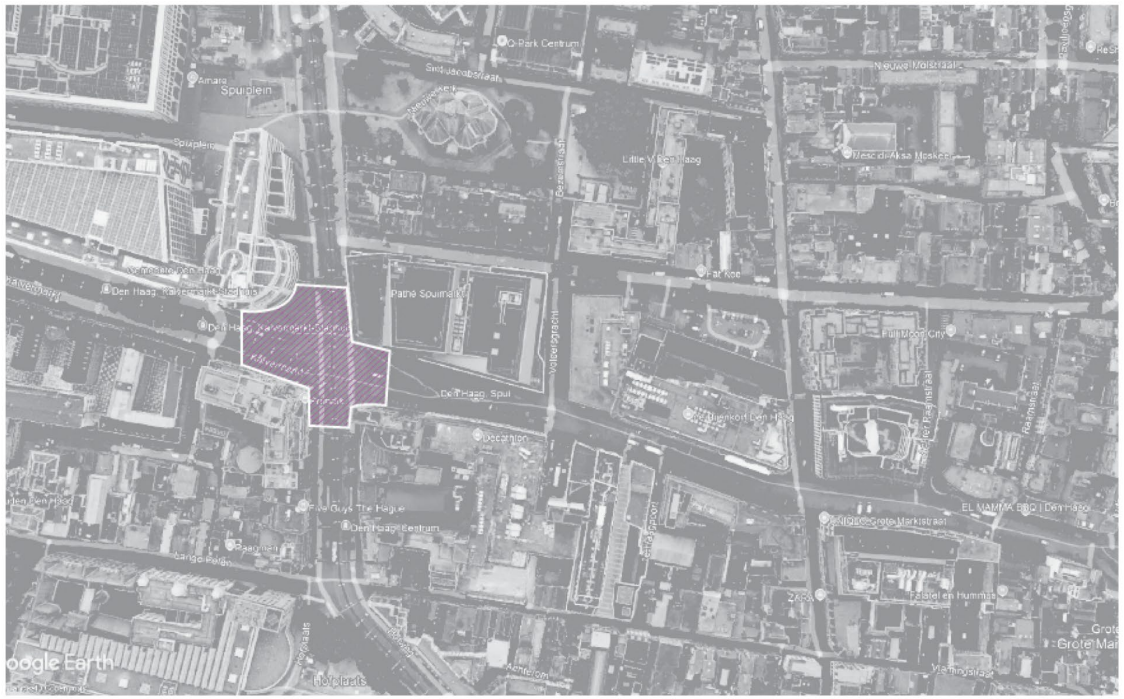
The Pattern

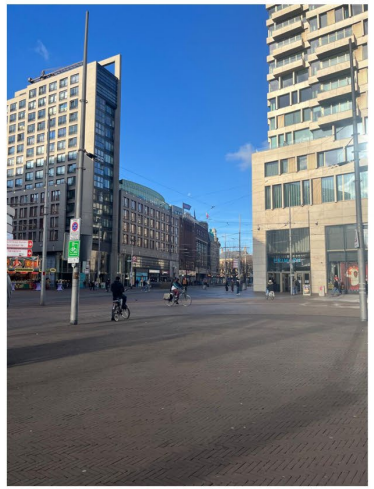
pattern field

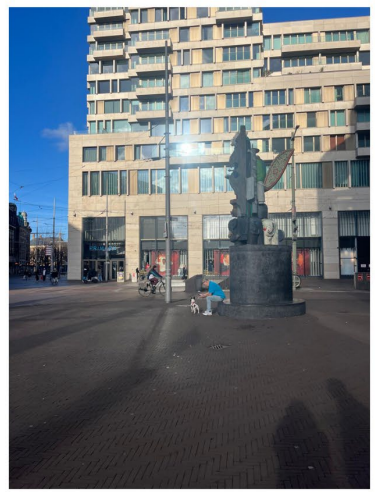


pattern language

location

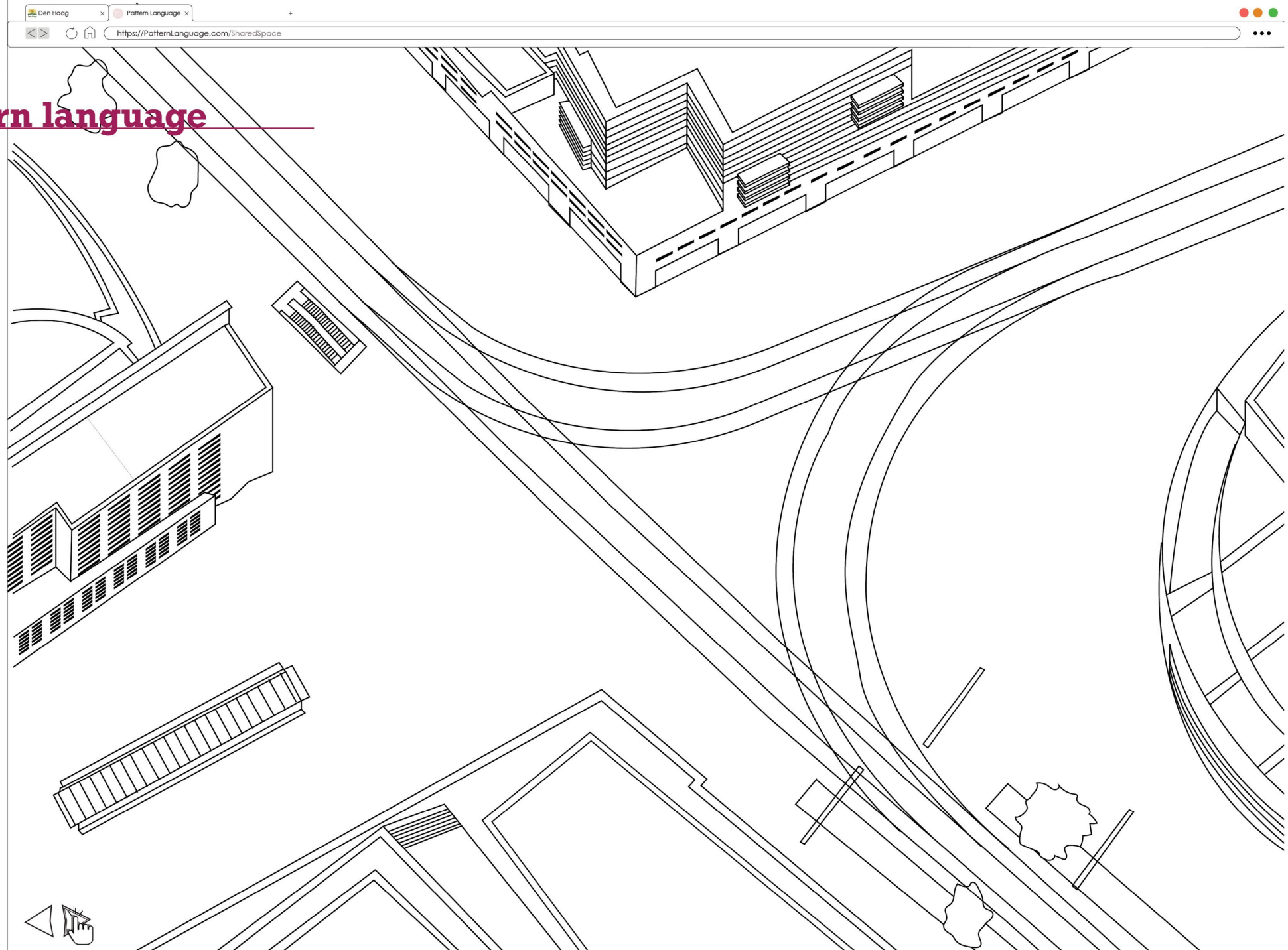






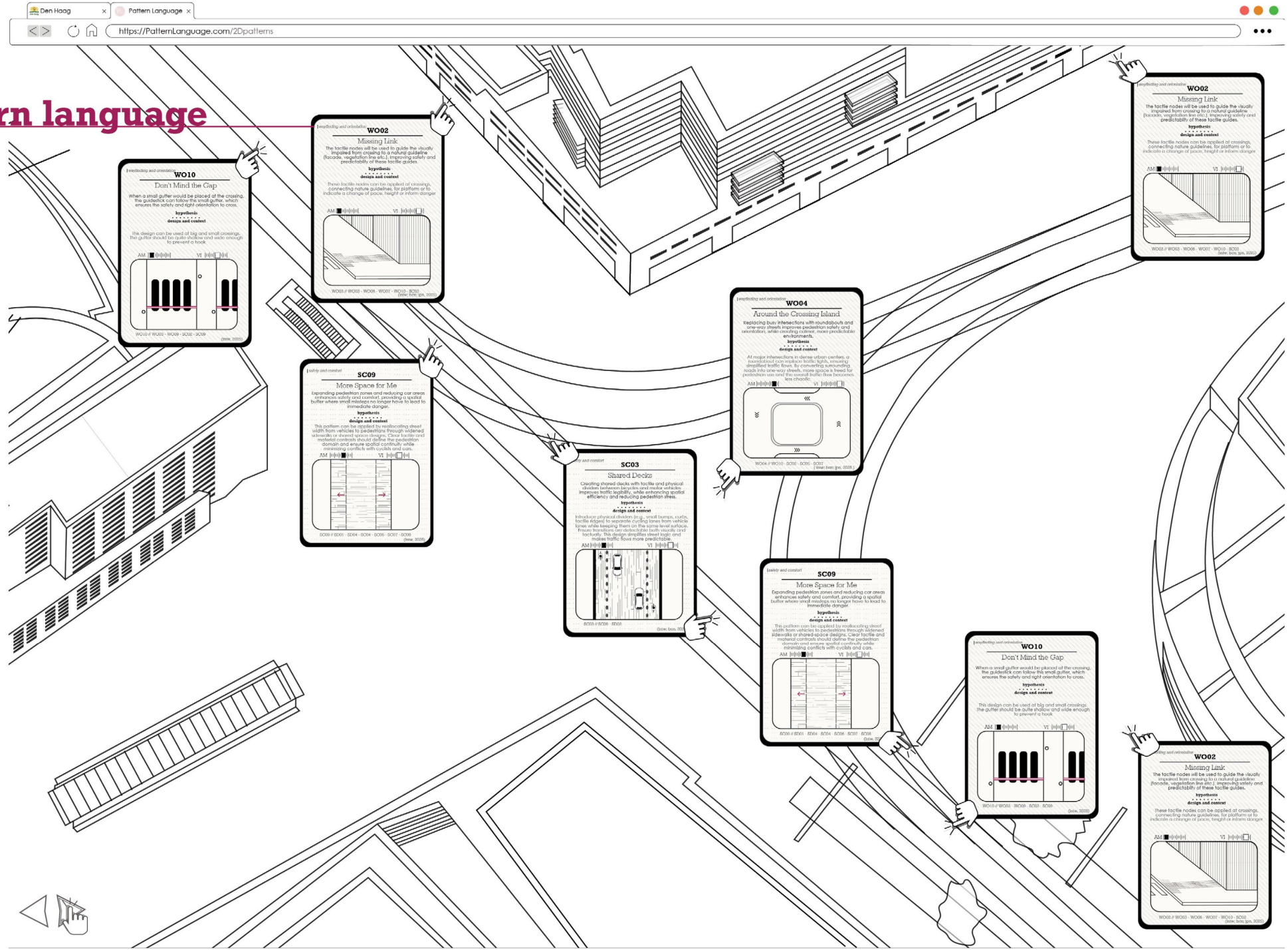
pattern language

location



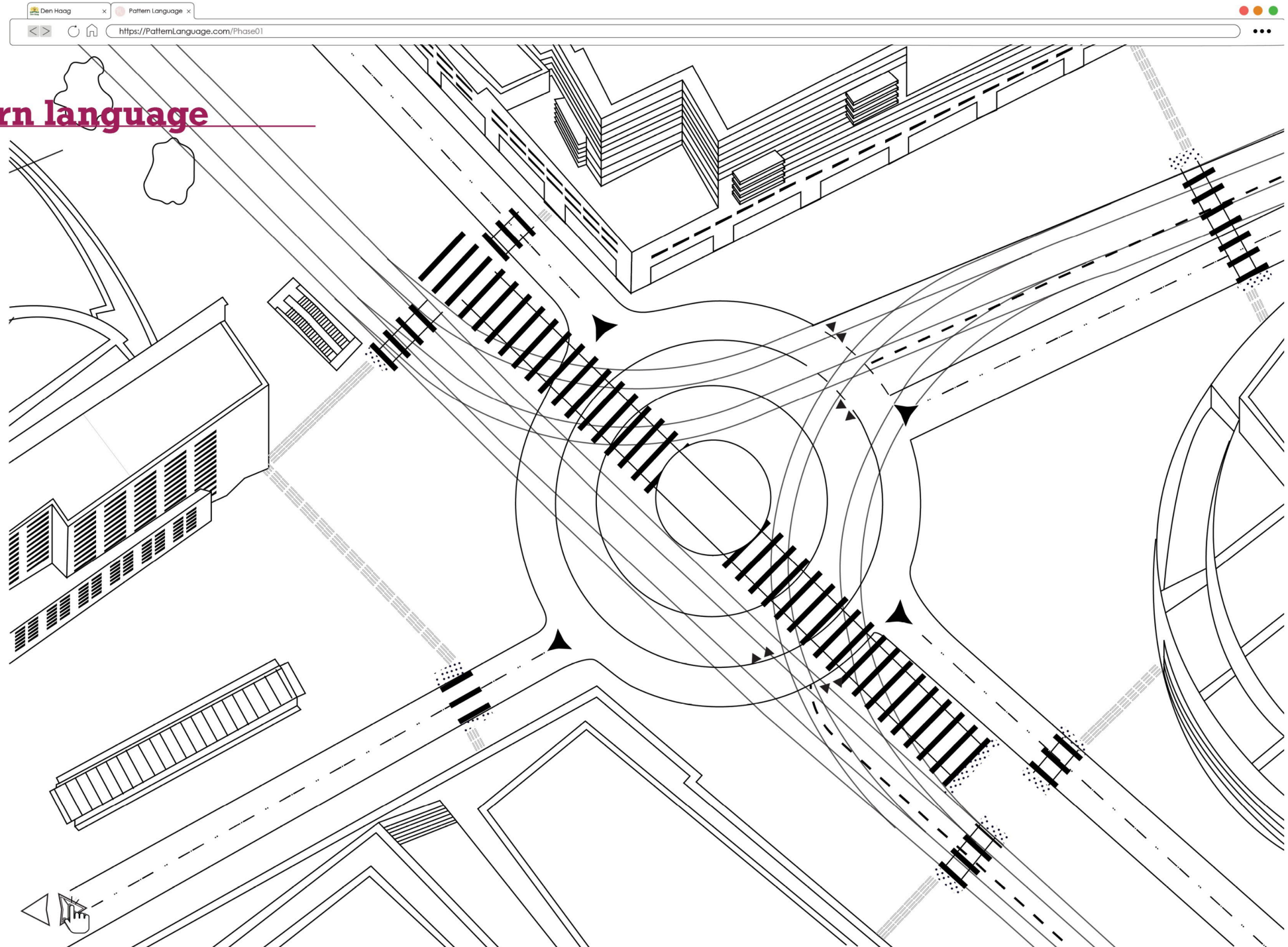
pattern language

location



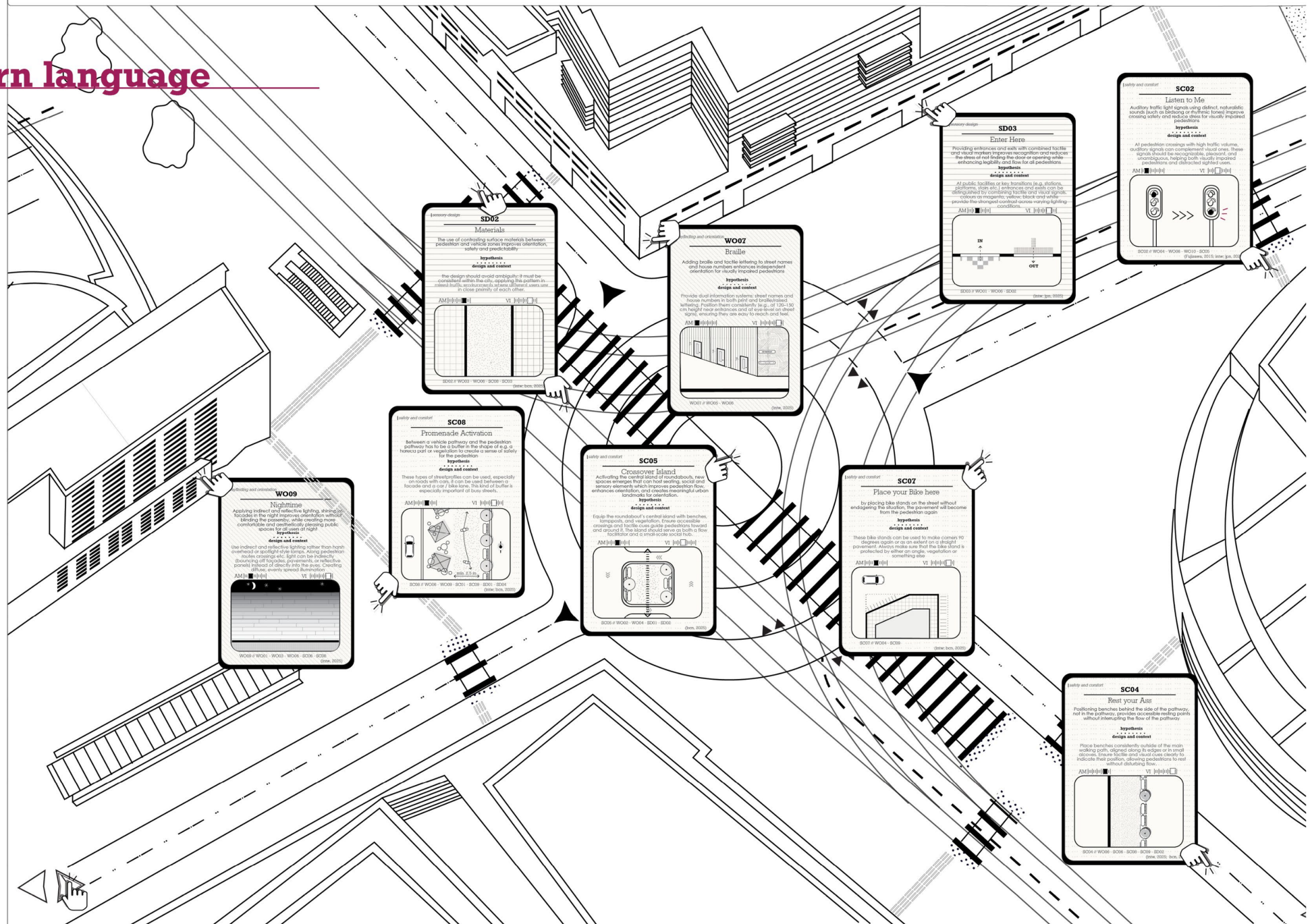
pattern language

location



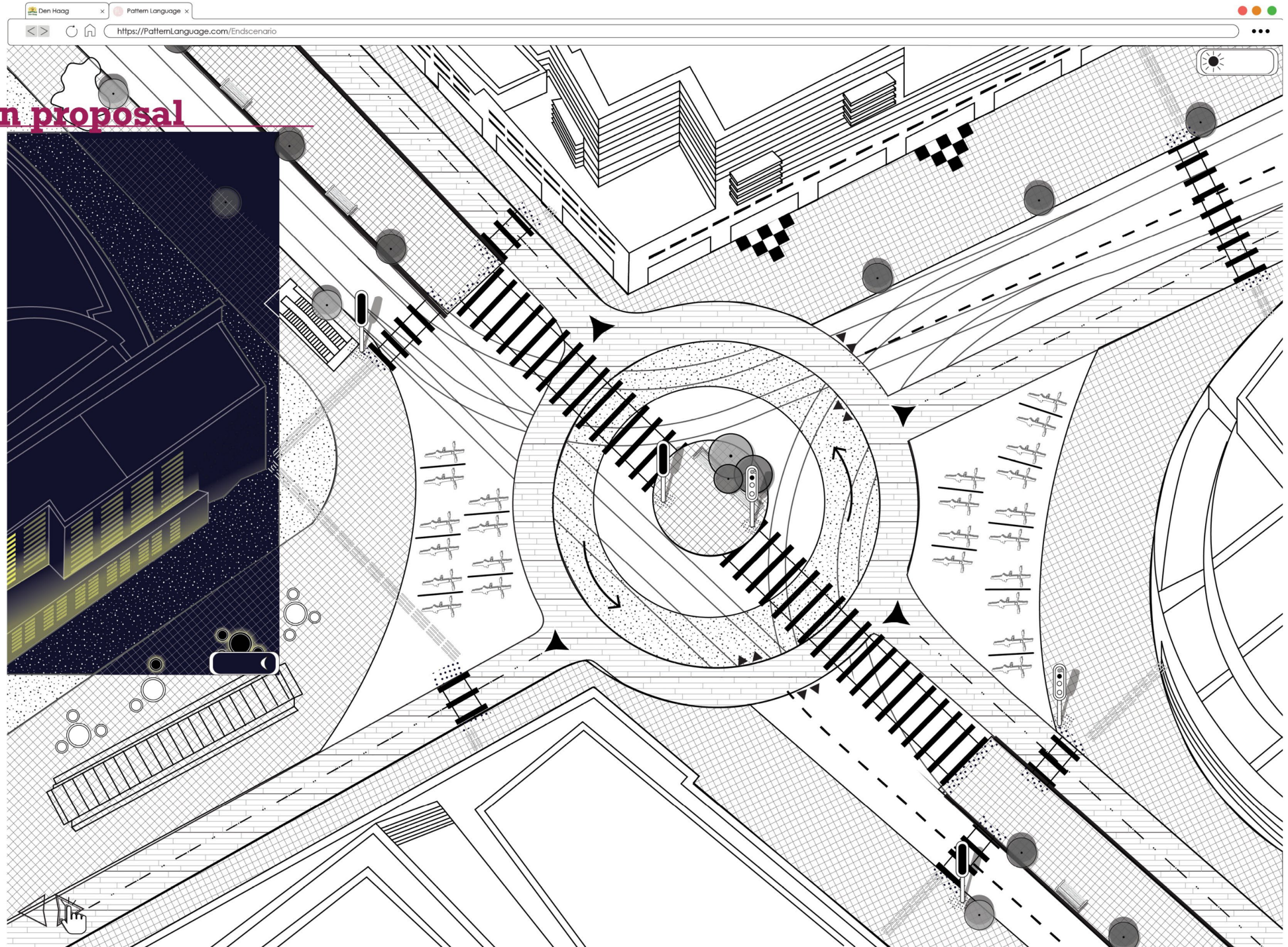
pattern language

location



design proposal

top view



design proposal


design proposal

definition

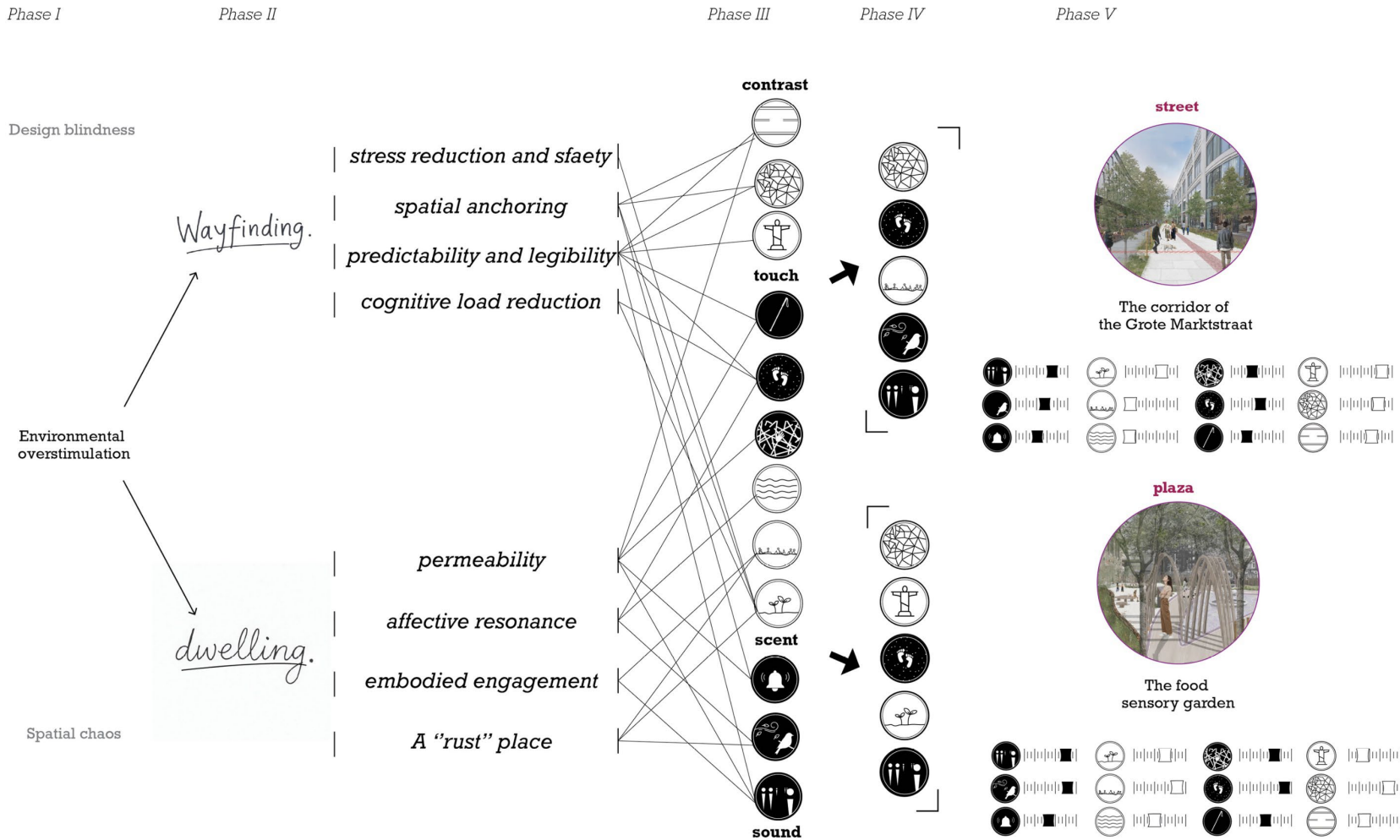
maximization

This method maximises each aspect on its own, followed by optimisation and integration between the aspects creating an end scenario with different aspect complimenting each other

(TU Delft, n.d.)

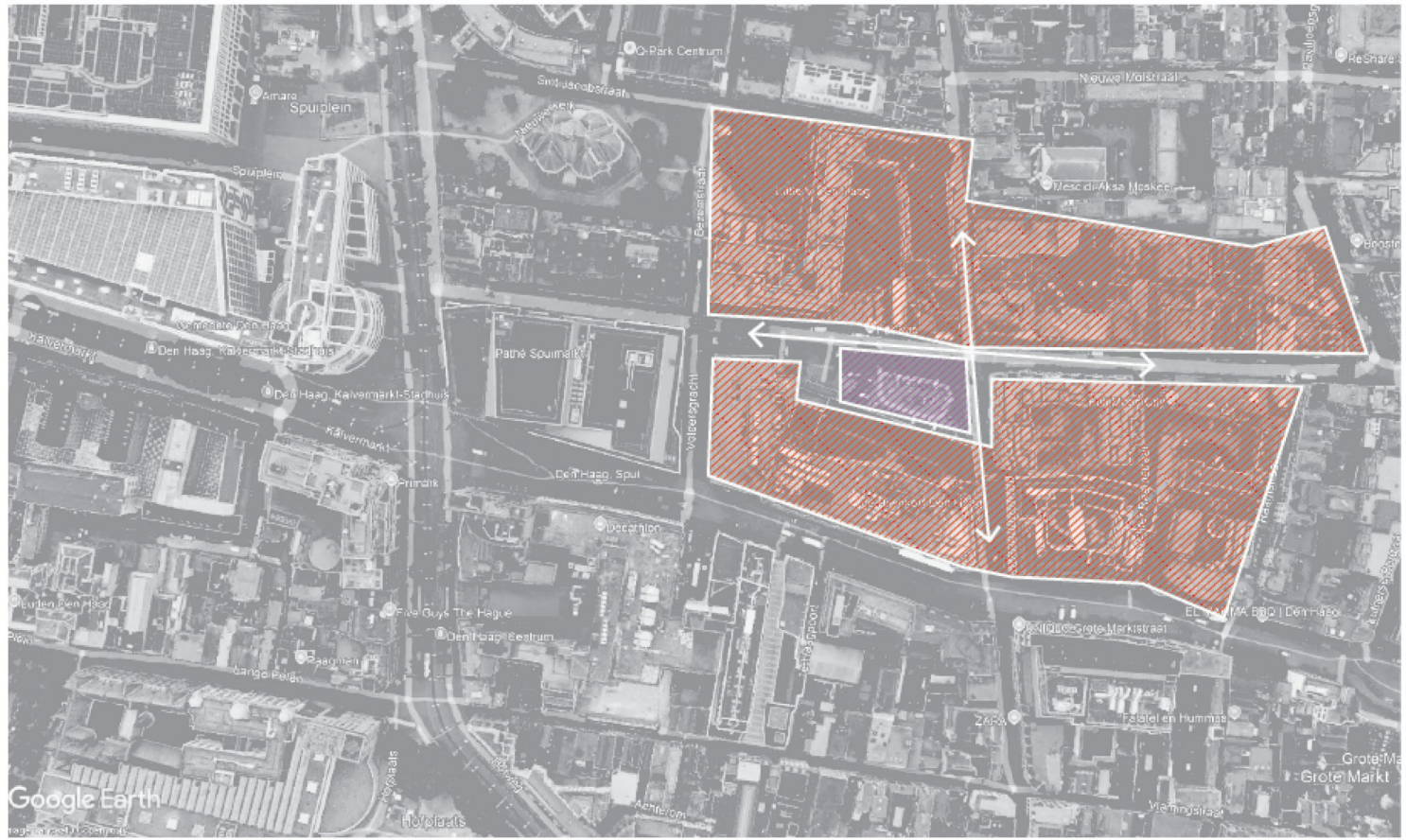
maximization

diagram



maximization

environment

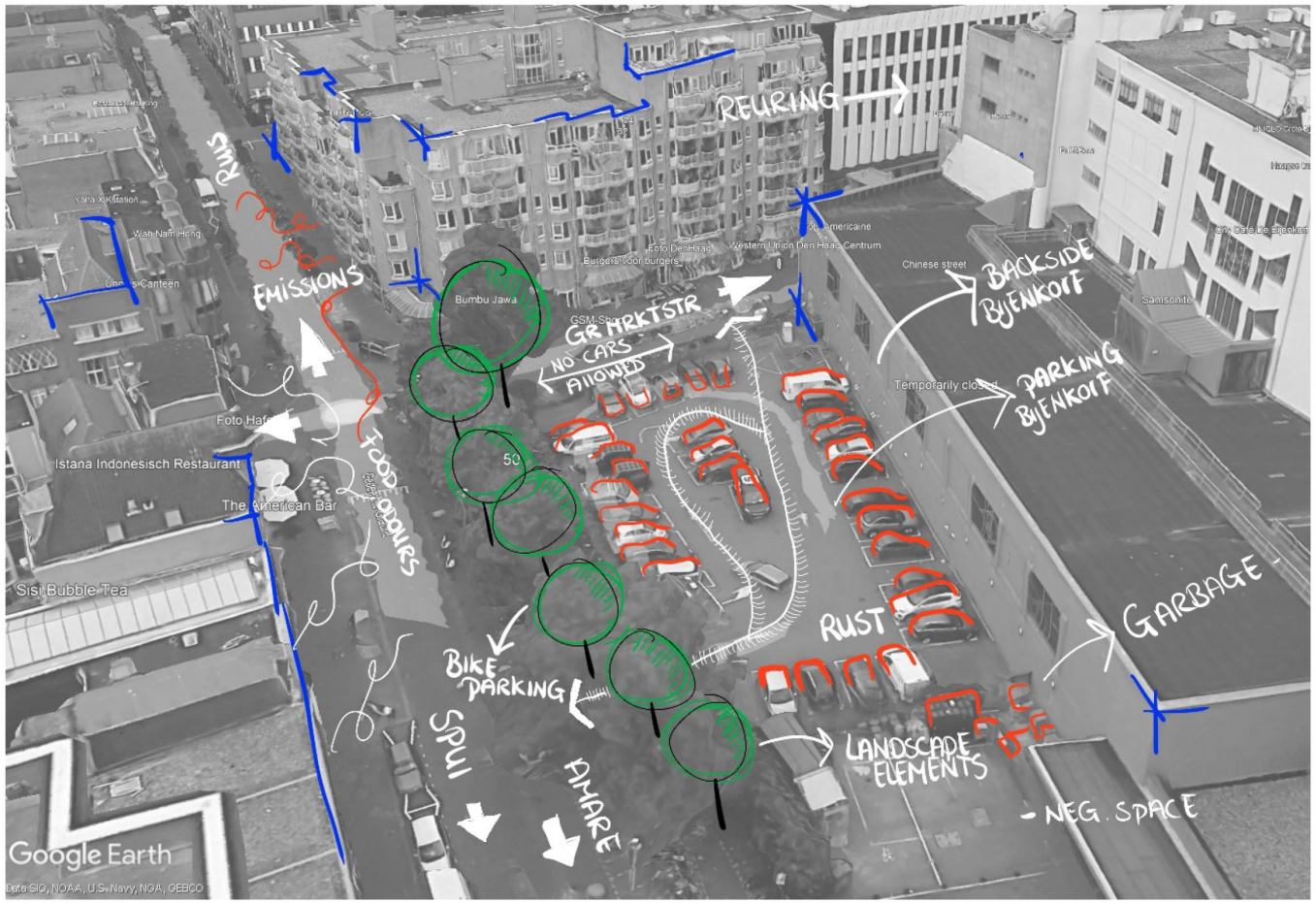


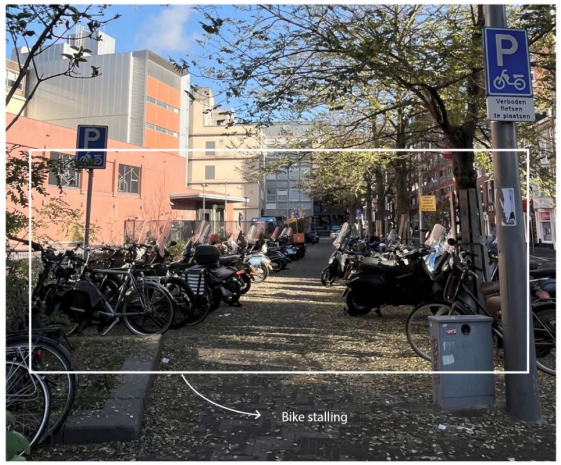
ruis area

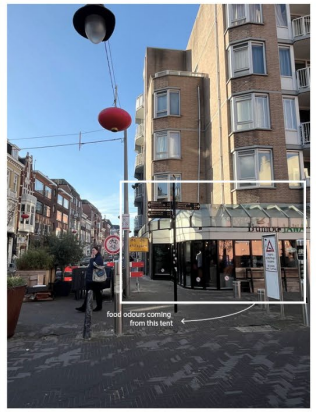
possible rust area

maximization

location





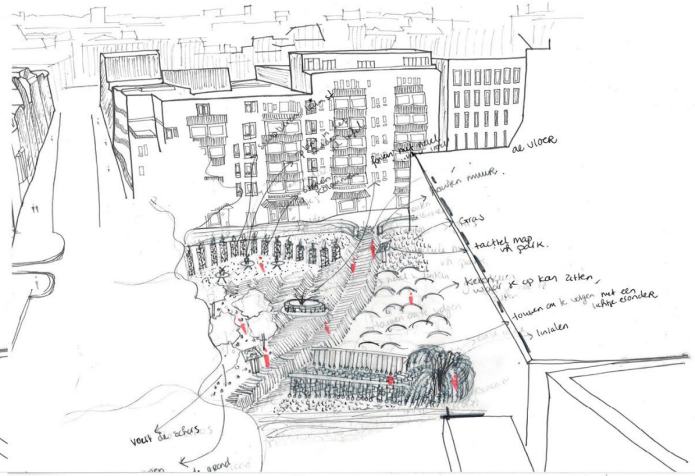


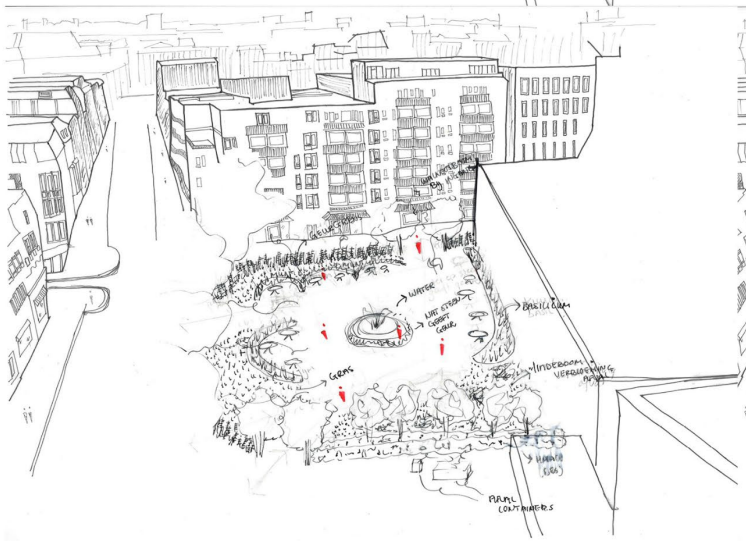
maximization

phase I

SOUND

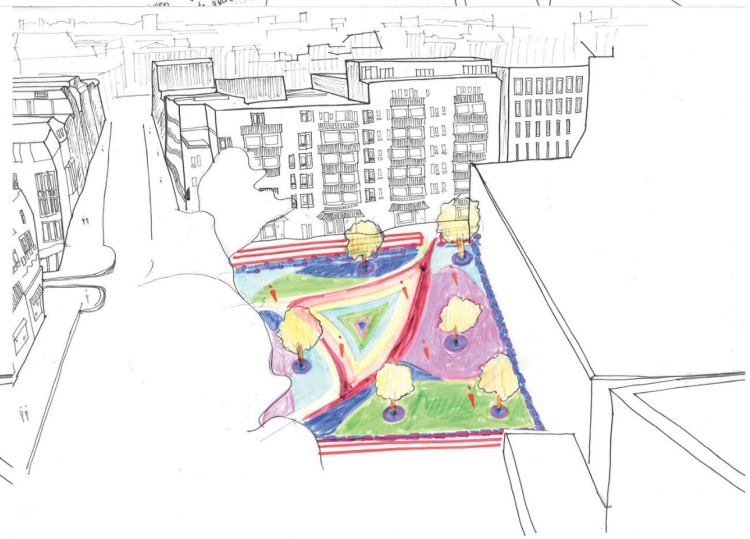
TOUCH





SCENT

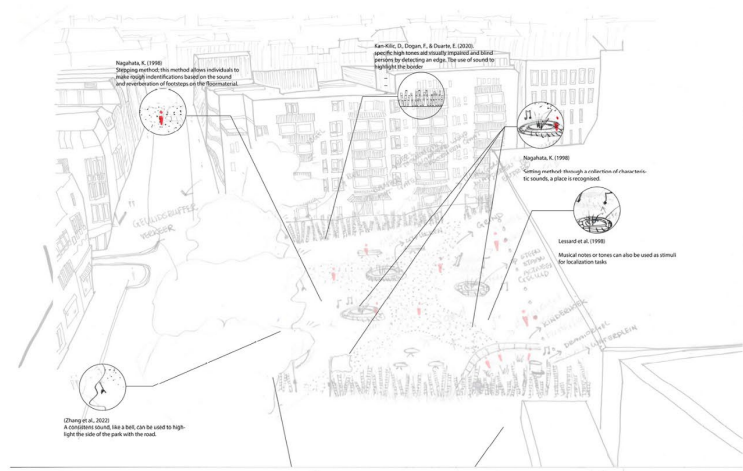
CONTRAST



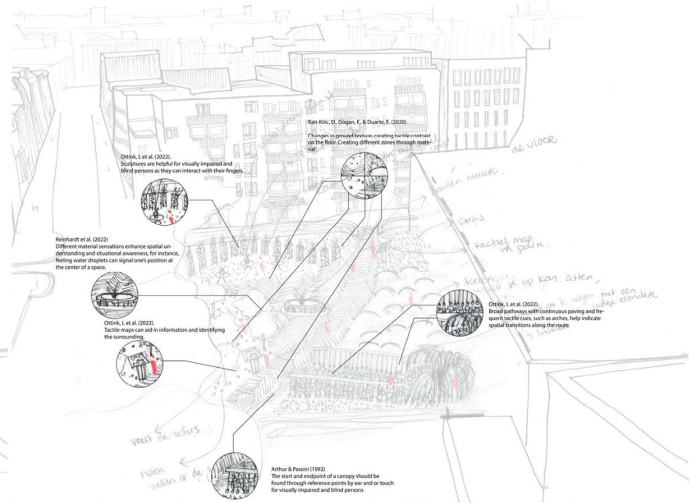
maximization

input phase I

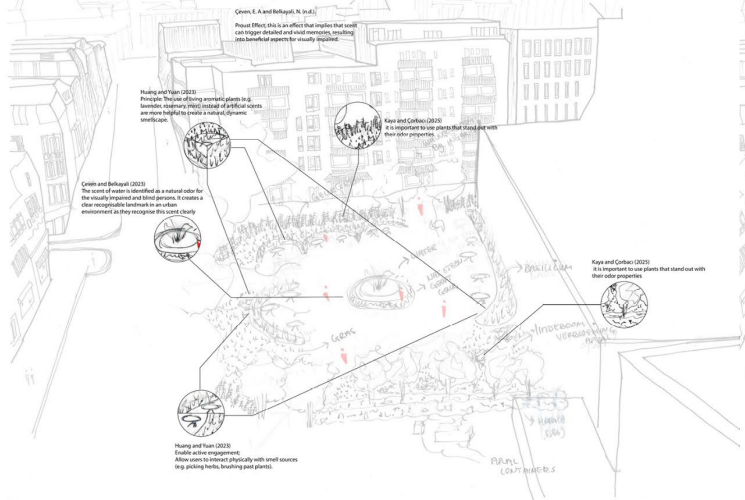
SOUND



TOUCH



SCENT

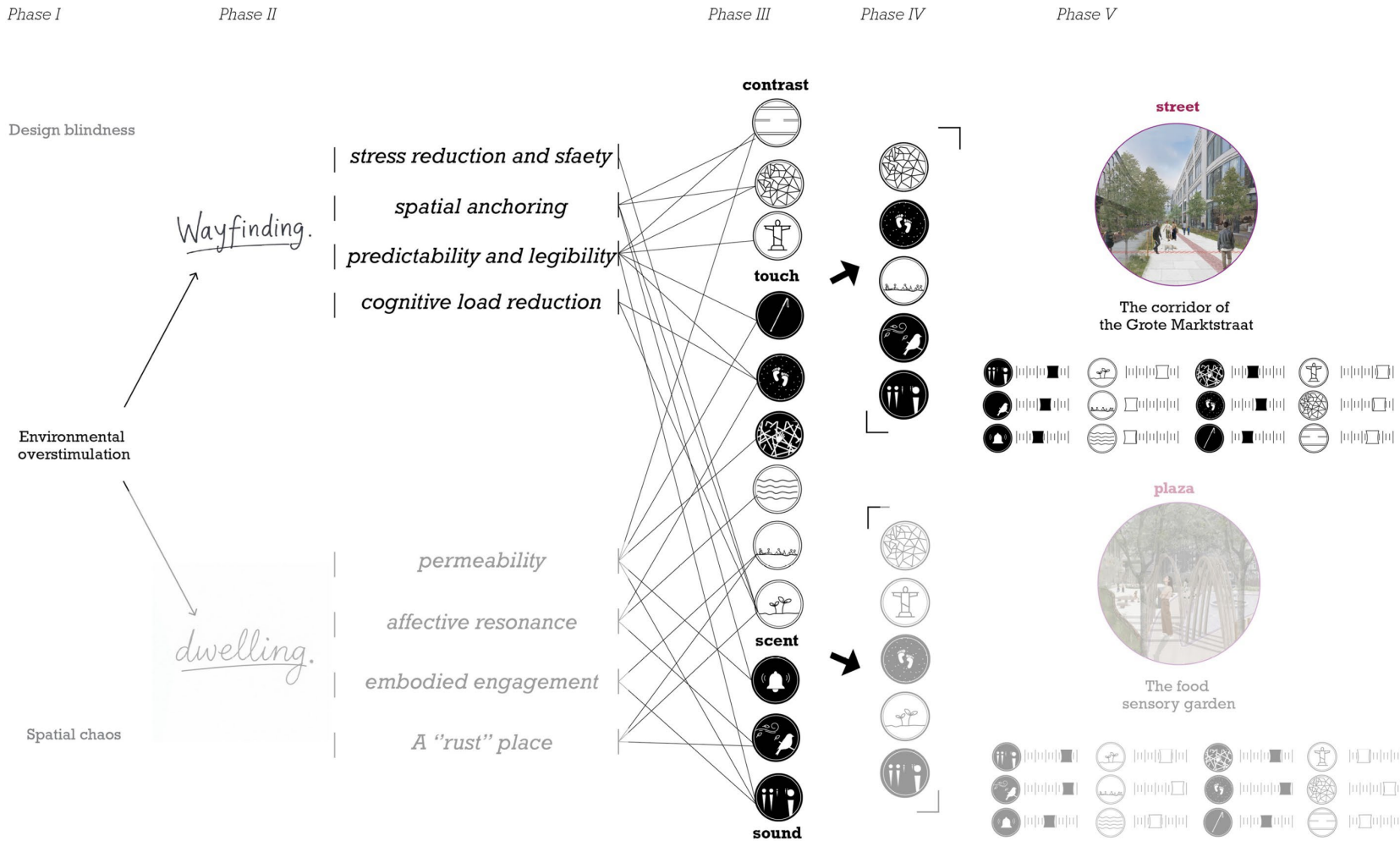


CONTRAST


GR. MARKTSTR.
BAMBOO
GRAVEL
FALLEN TREES TO HIGHLIGHT ENTRANCE
GRAVEL
GRAVEL
BAMBOO

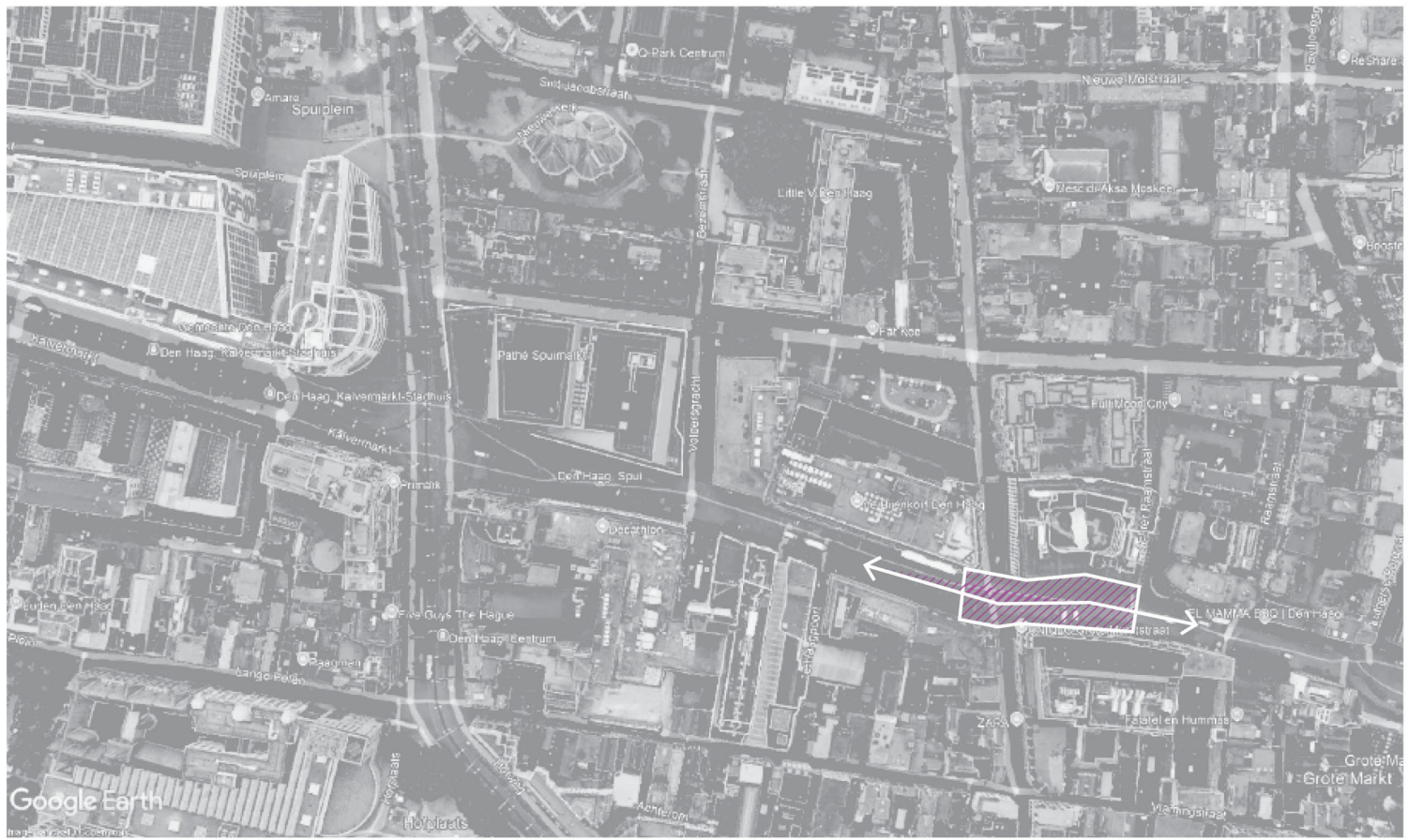
maximization

diagram



maximization

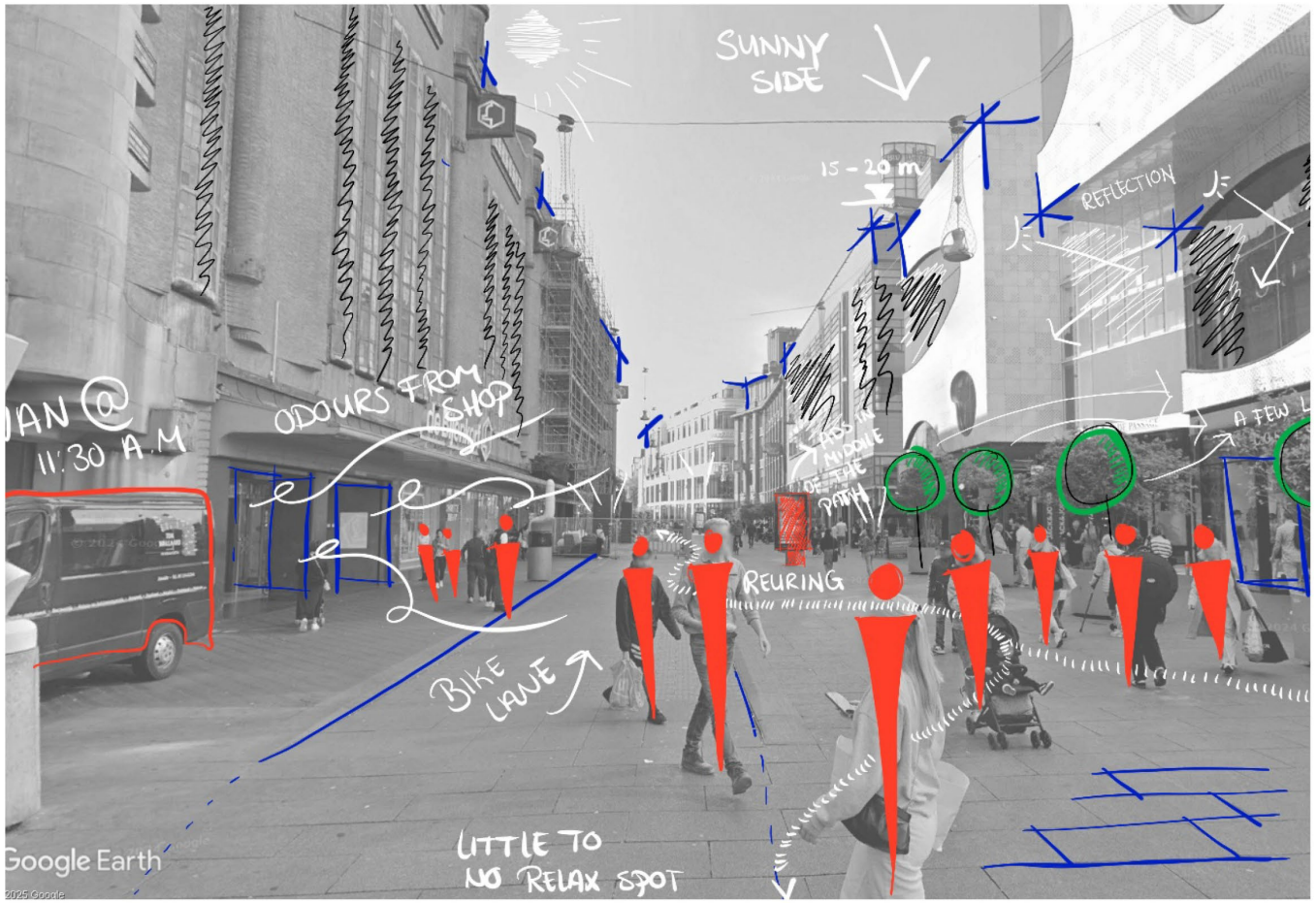
environment



wayfinding path

maximization

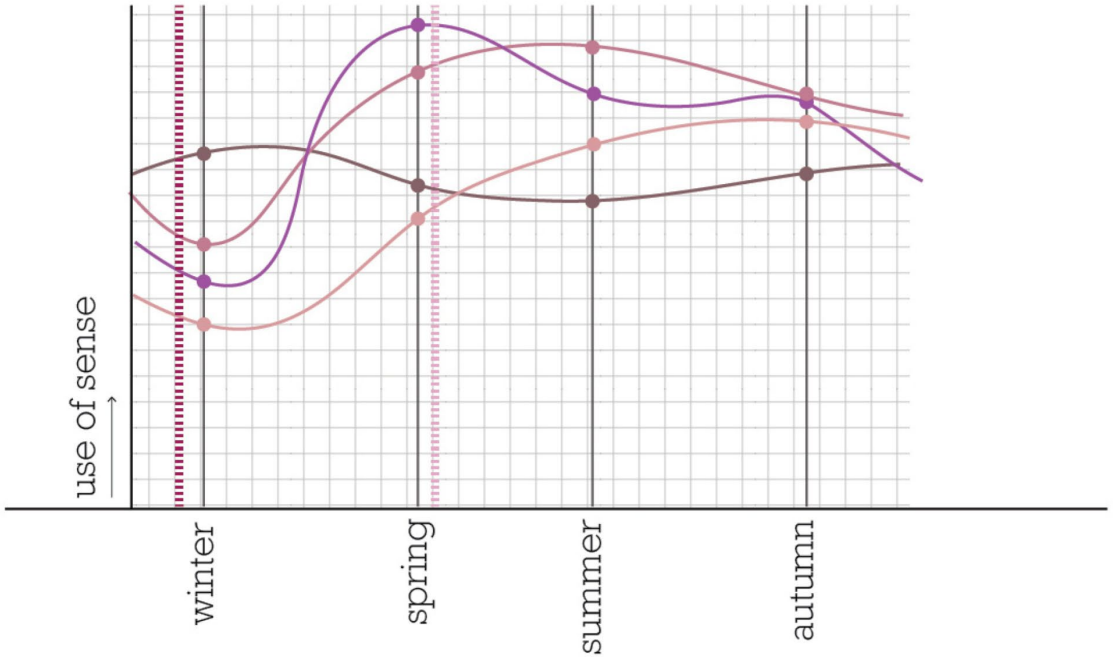
location

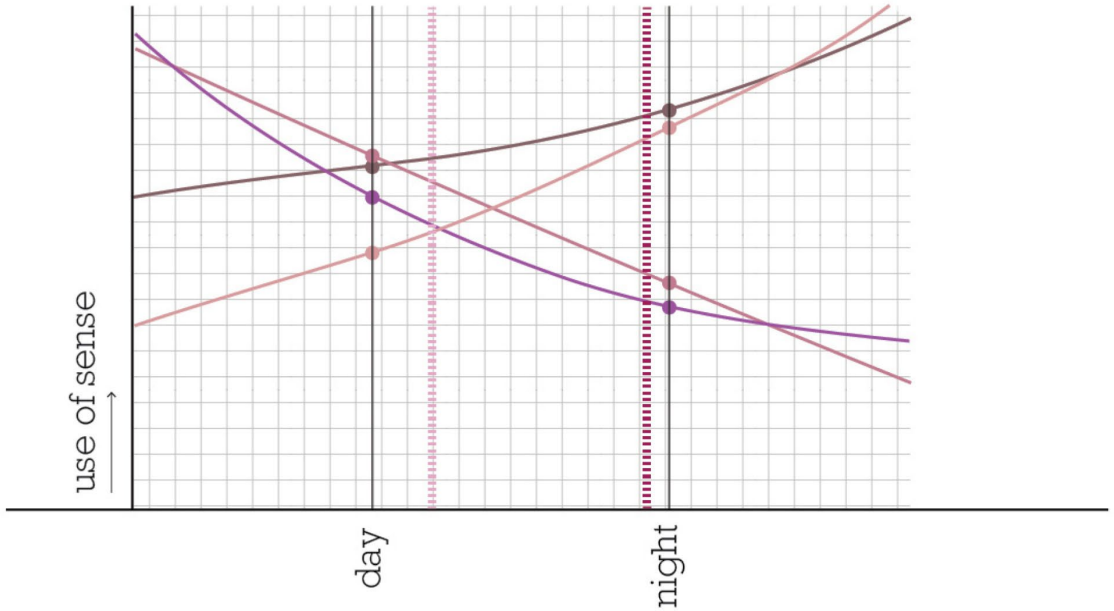



VEGETATION TO FOLLOW AND SMELL
A SWISTLE WINDCHIME
DIFFERENT MATERIAL TO FOLLOW AND FEEL
NODES OVER THE WIDTH OF A PATH
NODES THAT HIGH-LIGHT THE ENTRANCE
CANOPY
ALLEY TO MORE SHOPS
PAVING THAT BRINGS YOU TO A NATURAL CAL DE SAC
SENSORY GARDEN
BAMBOO TO MITHLIGHT BIKERS PATH
PULL&BEAR

maximization

what-if scenario





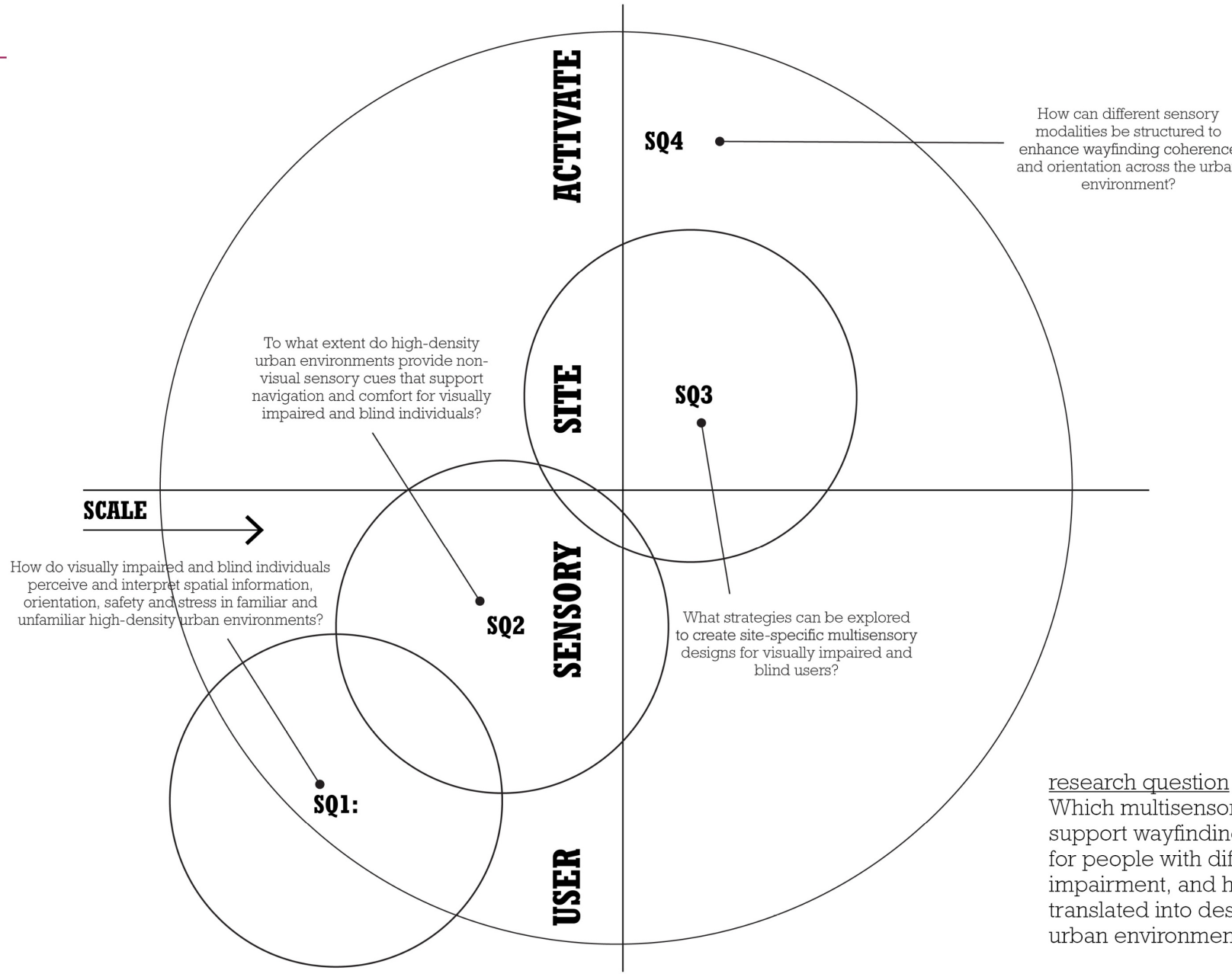
tactile
sound
scent
contrast

possibe what-if scenario
current situation


PULL&BEAR


PULL&BEAR

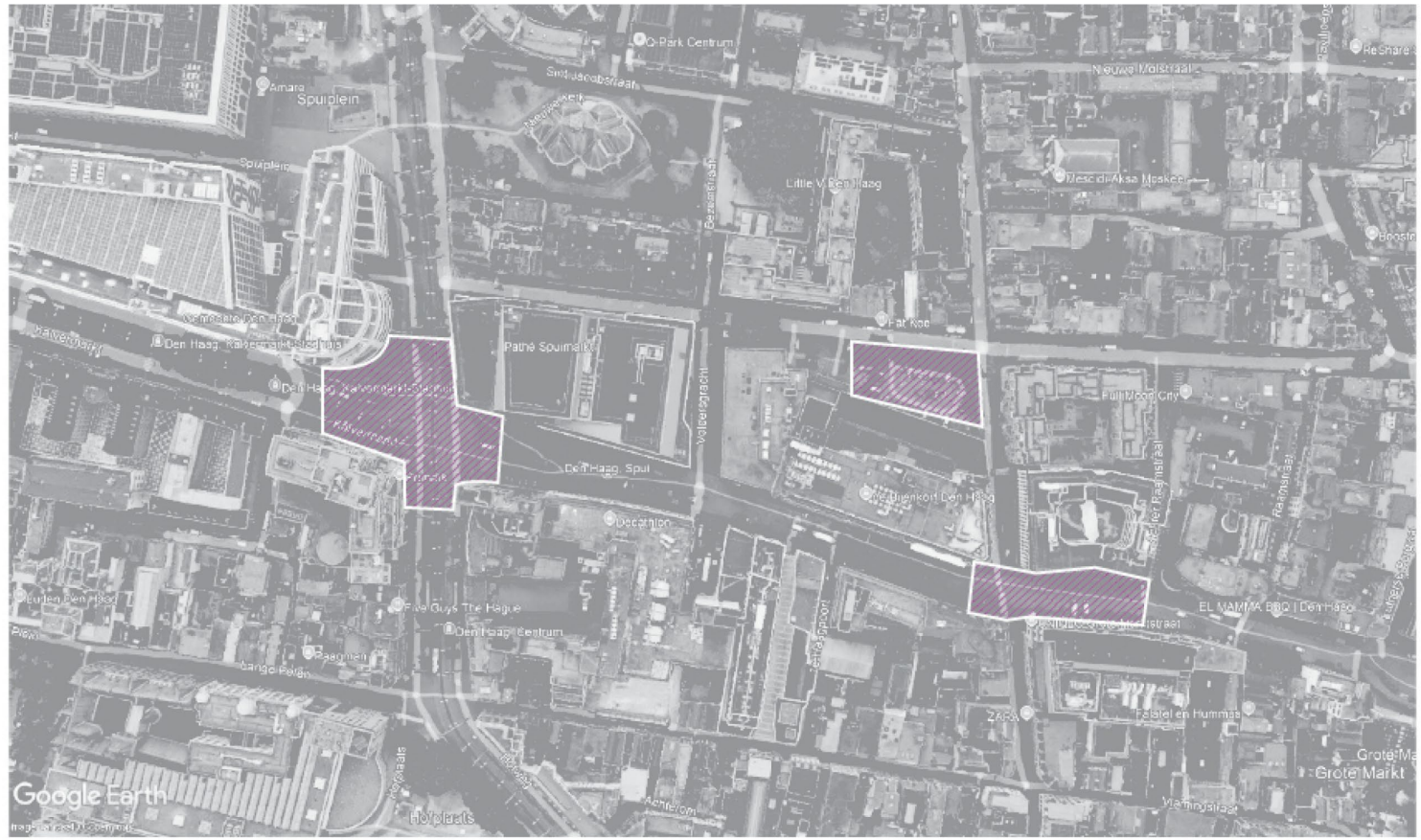
Research



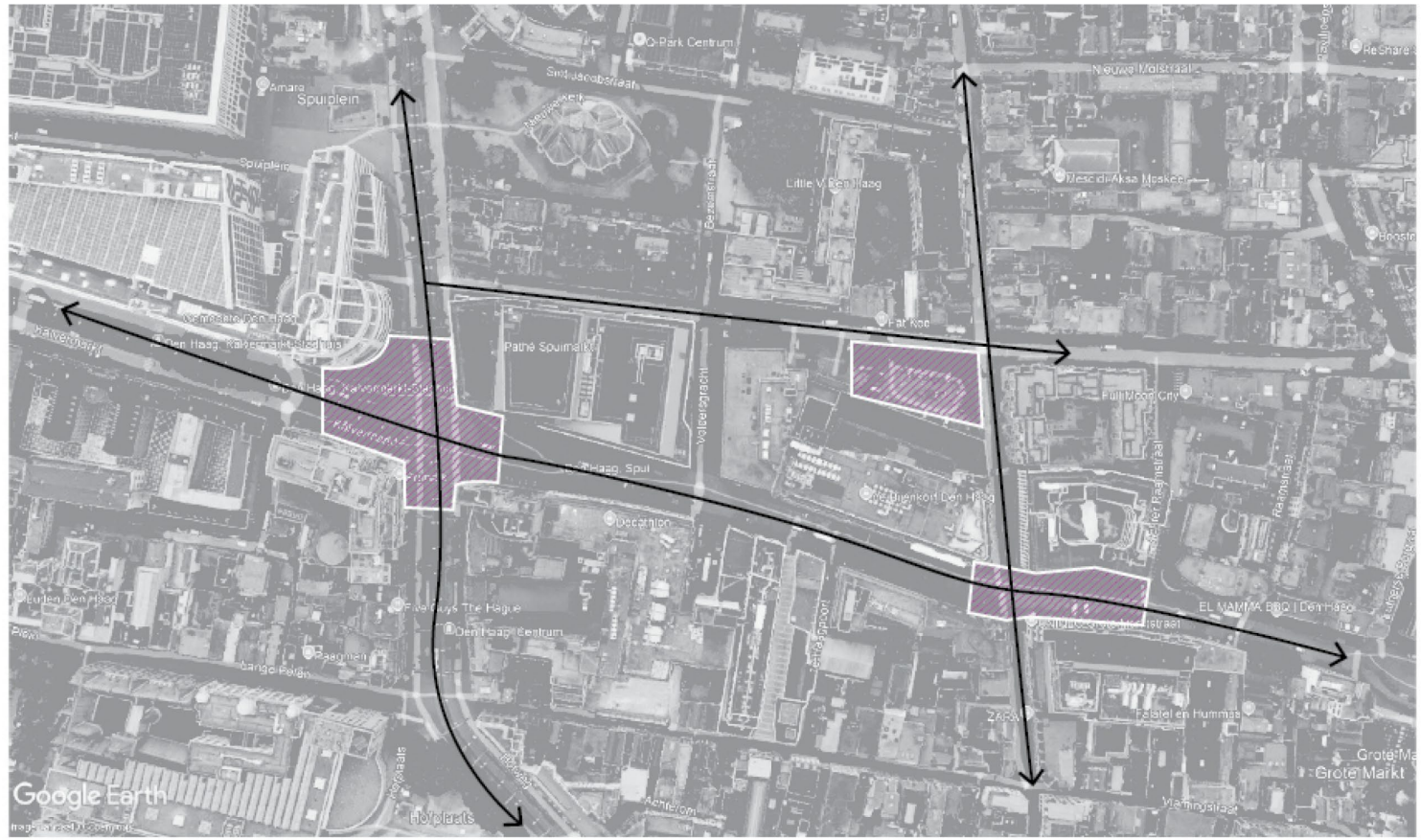
research question

Which multisensory spatial design variables support wayfinding and perceptual comfort for people with different degrees of visual impairment, and how can these variables be translated into design strategies for high-density urban environments?

the three proposals

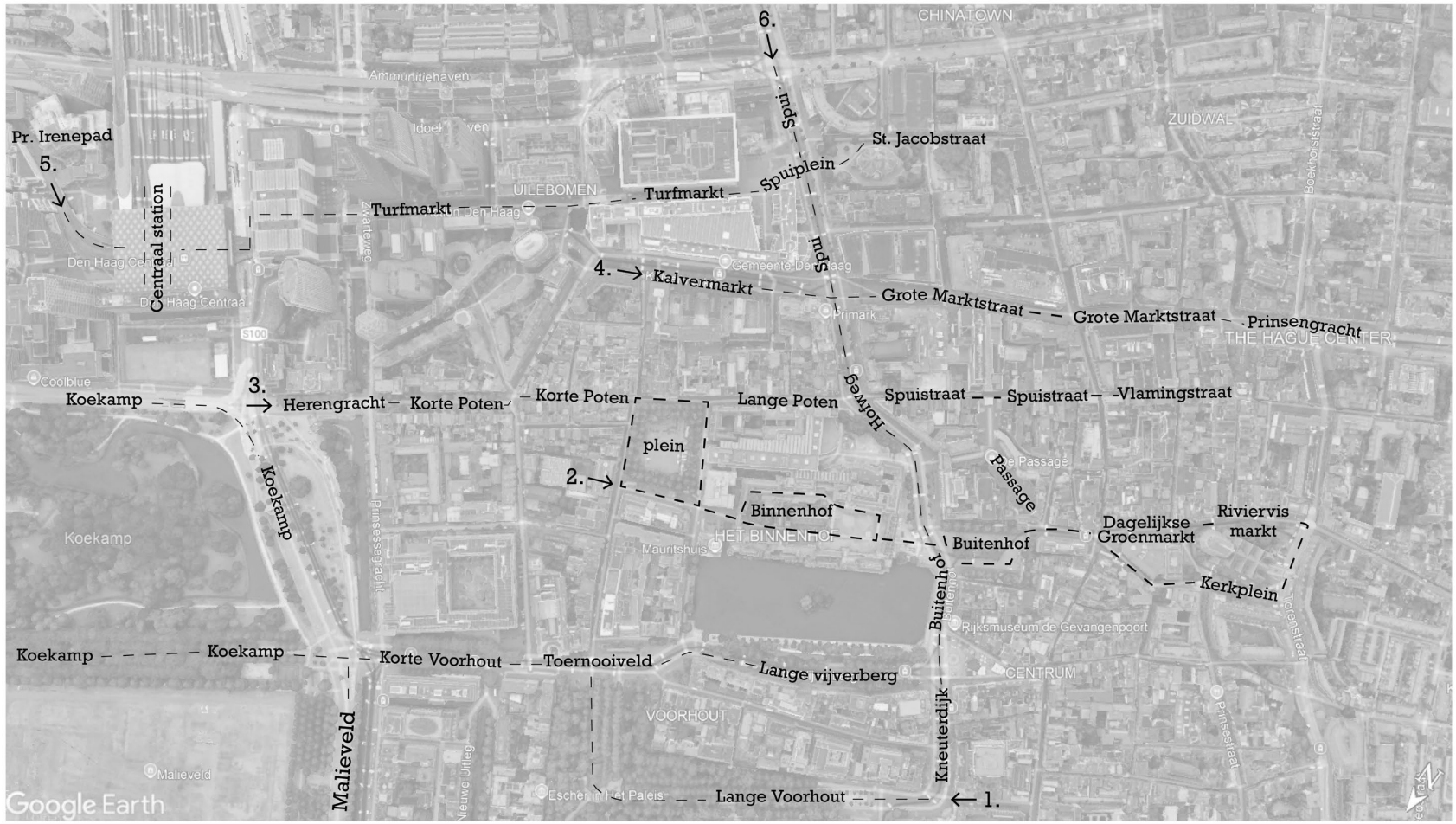


the three proposals



big scale

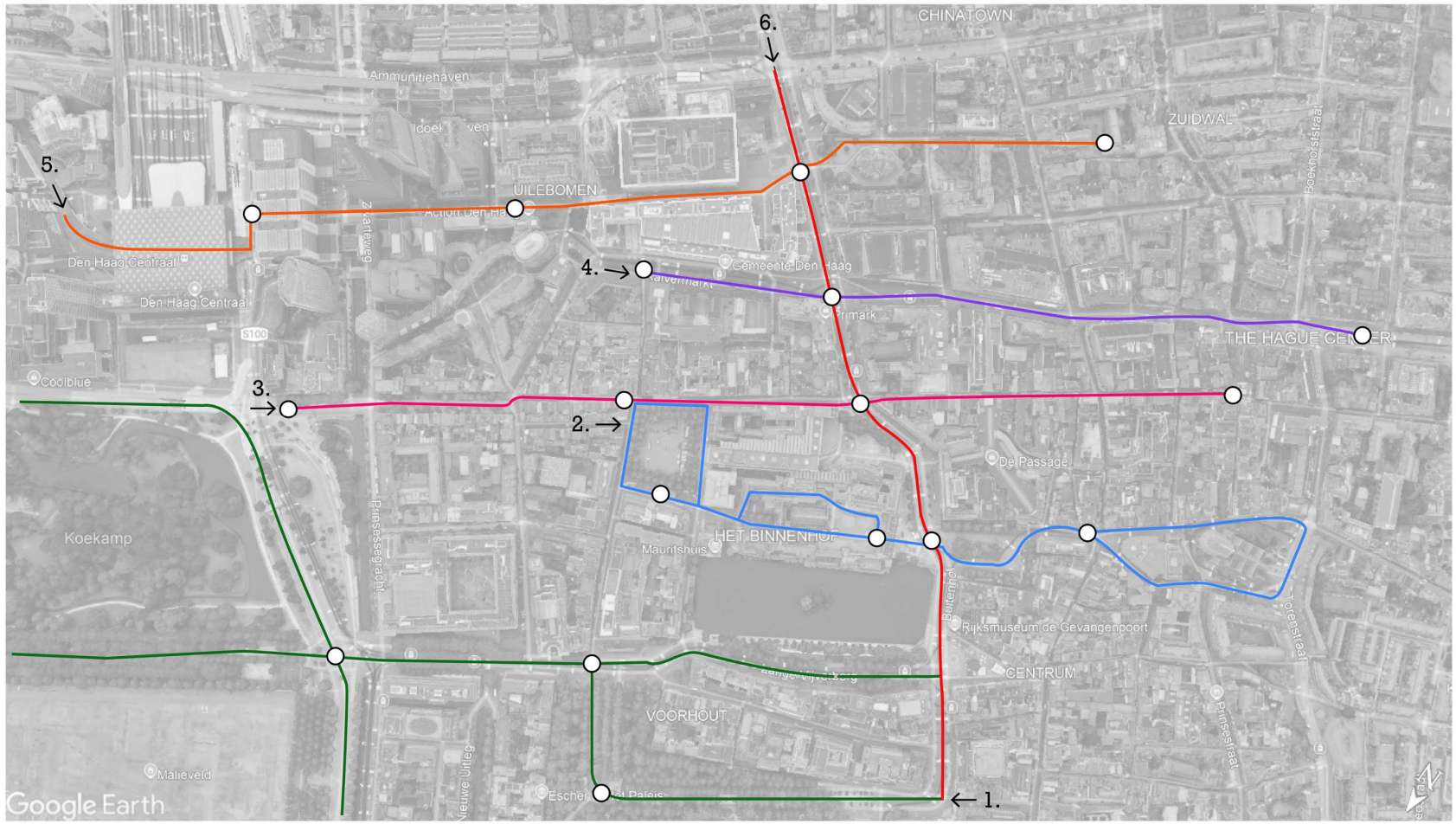
The Hague



(Den Haag 7 Lijnen, 2004)

big scale

the city's hidden subway skeleton

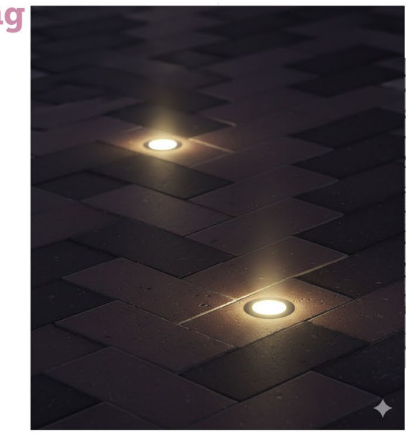


landmark

(made by author, 2025)

the seven lines

paving



Reflective / light stone
Sense: Sight (indirect light) / Touch
How it works: Subtle micro-reflectors or matte coating create contrast and guide light without glare.
Benefit: Enhances spatial legibility for people with low vision; improves orientation at night or in shade.

LINE 1

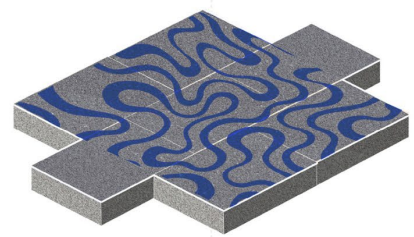
LINE 2

matte stone
Sense: Touch / Temperature
How it works: The dense, matte-smooth surface of the stone feels naturally cool and slightly silky to the touch.
Benefit: Creates a calm, formal atmosphere that reflects the historic and institutional character of the Binnenhof.

Scented stone
Sense: Smell + Touch
How it works: Porous stones stay warm. When the first drops of rain hit,
they release a subtle earthy scent, slightly change texture and they become cooler
Benefit: The scent and tactile change after rainfall help people smell and feel the place.

LINE 3

LINE 4



Hydrochromic stone
Sense: Sight + Touch
How it works: Hydrochromic paving changes color when wet, revealing patterns as rain falls.
The coating reacts to moisture, allowing the ground to visually transform during or after rain.
Benefit: Turns rain into a guide. The shifting pattern becomes a subtle orientation.

Crunching or "leaf-like" texture stone
Sense: Hearing / Touch
How it works: This paving mimics the sound of dry leaves or gravel through a porous, composite surface that slightly compresses
underfoot. Tiny gaps and mixed organic particles create a soft, crisp sound that changes with dryness and weight.
Benefit: Creates an audible landmark or transition zone; adds liveliness and sensory depth to the path.

LINE 5

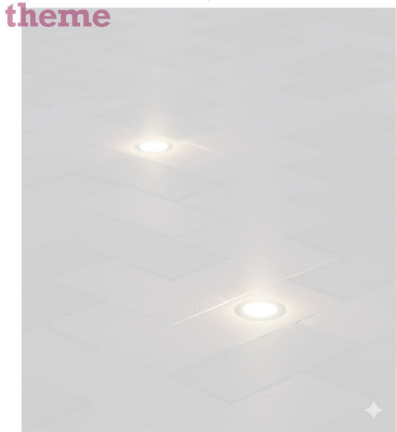
LINE 6

Hollow resonant stone
Sense: Hearing / Vibration
How it works: A partially hollow core beneath the surface amplifies the sound and vibration of footsteps.
an audible and tactile resonance that signals direction or a change in zone; helps users orient through subtle acou

Note. Images generated using Google Gemini, 2025.

line 4

water theme



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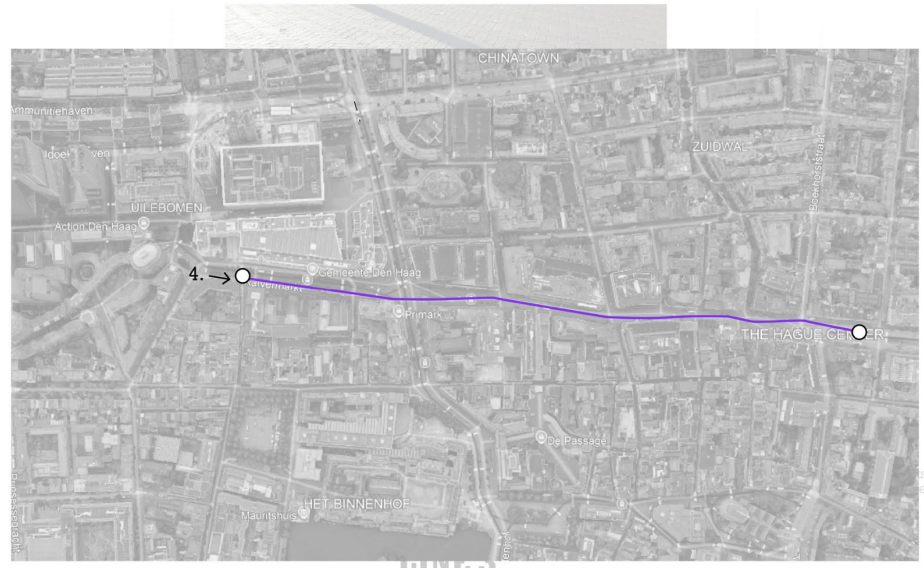

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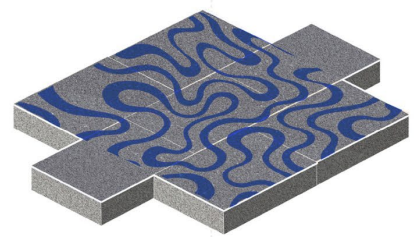

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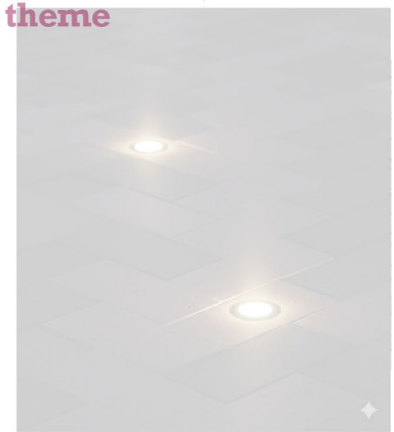
line 6

sound theme



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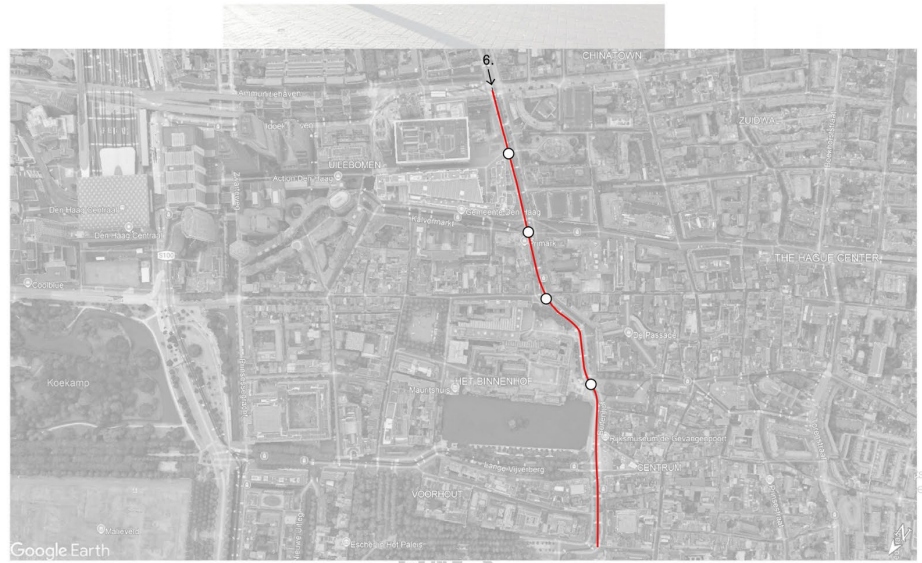

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Note. Images generated using Google Gemini, 2025.

big scale

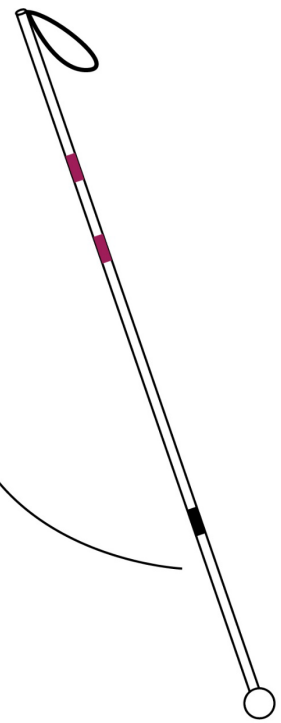
introductions

visually impaired
tube 10%

likes:
- new cities
- quiet places
- scent of vegetation

dislikes:
- shared spaces
- asking for help

aid: cane

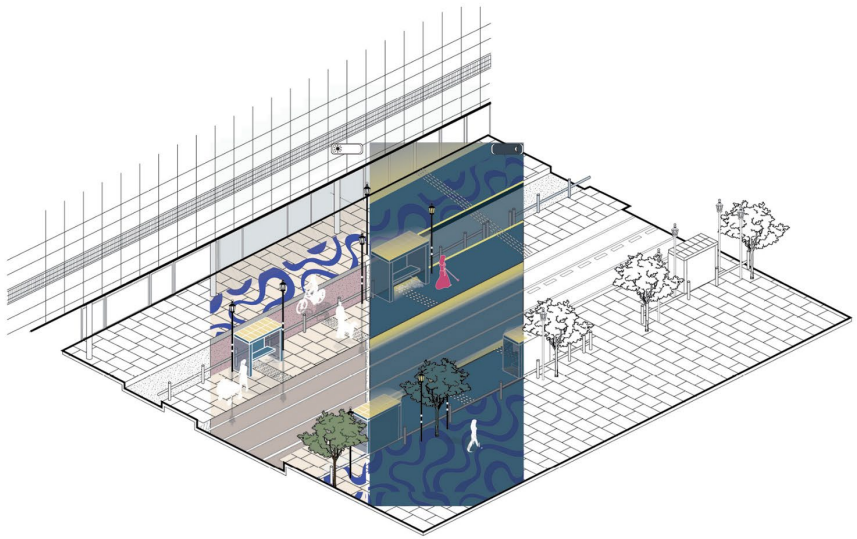


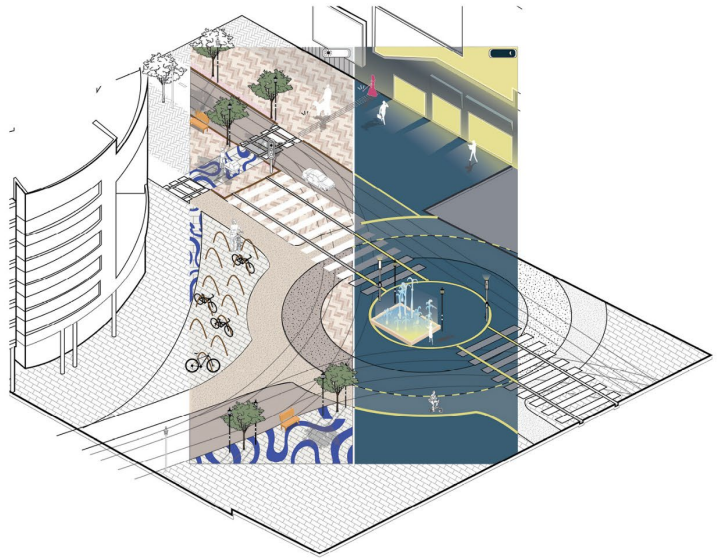
lives in Leiden

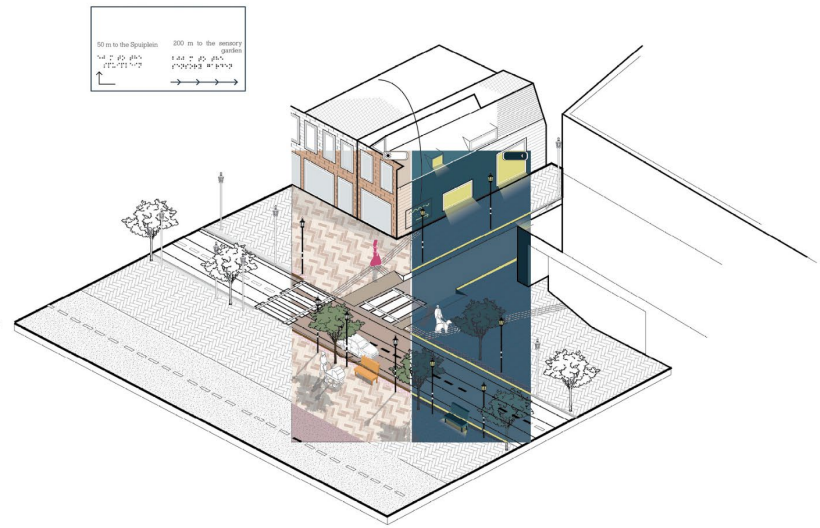
JOLANDA

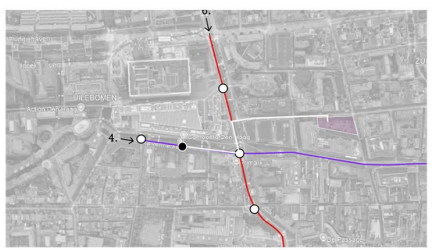
big scale

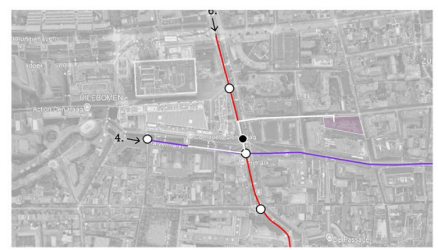
Jolanda's route | water and sound theme

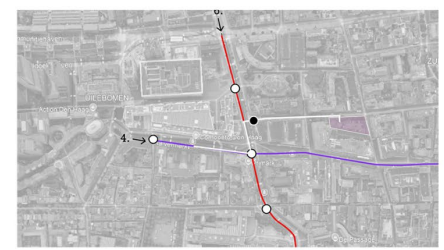






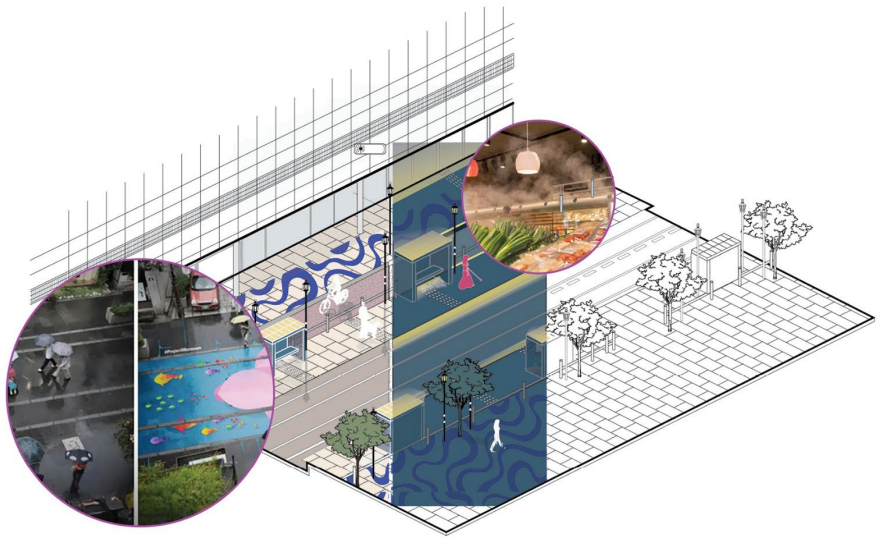


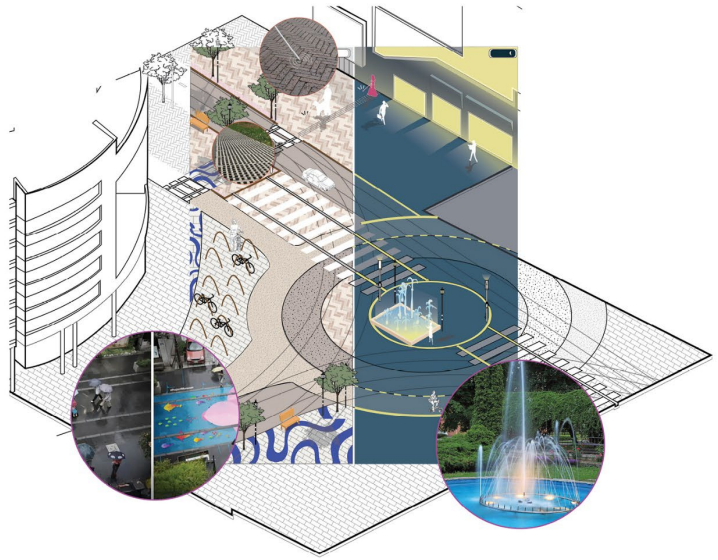


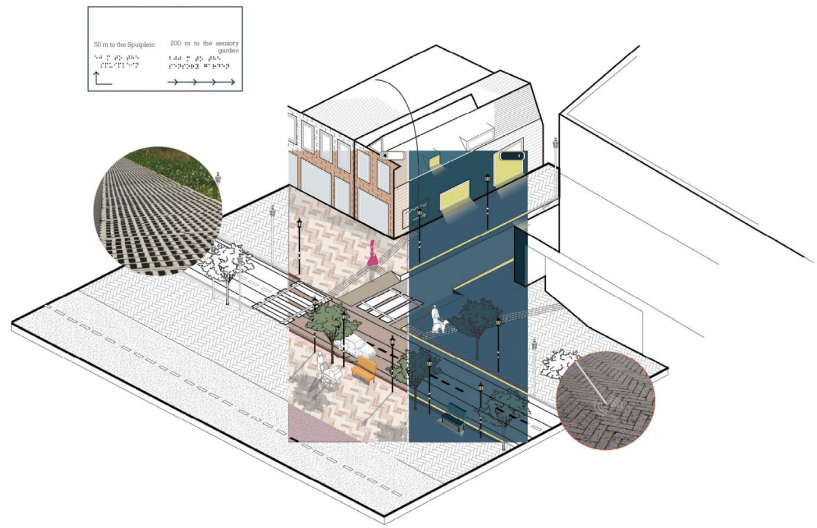


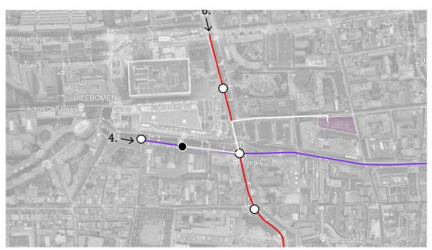
big scale

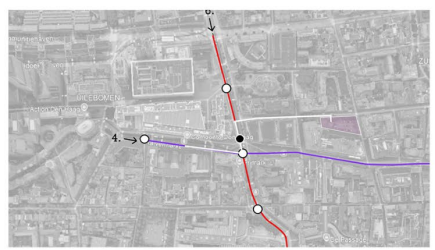
Jolanda's route | water and sound theme

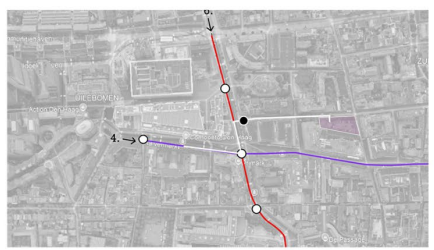




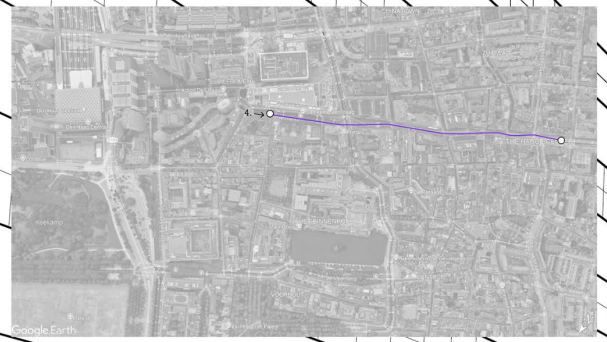




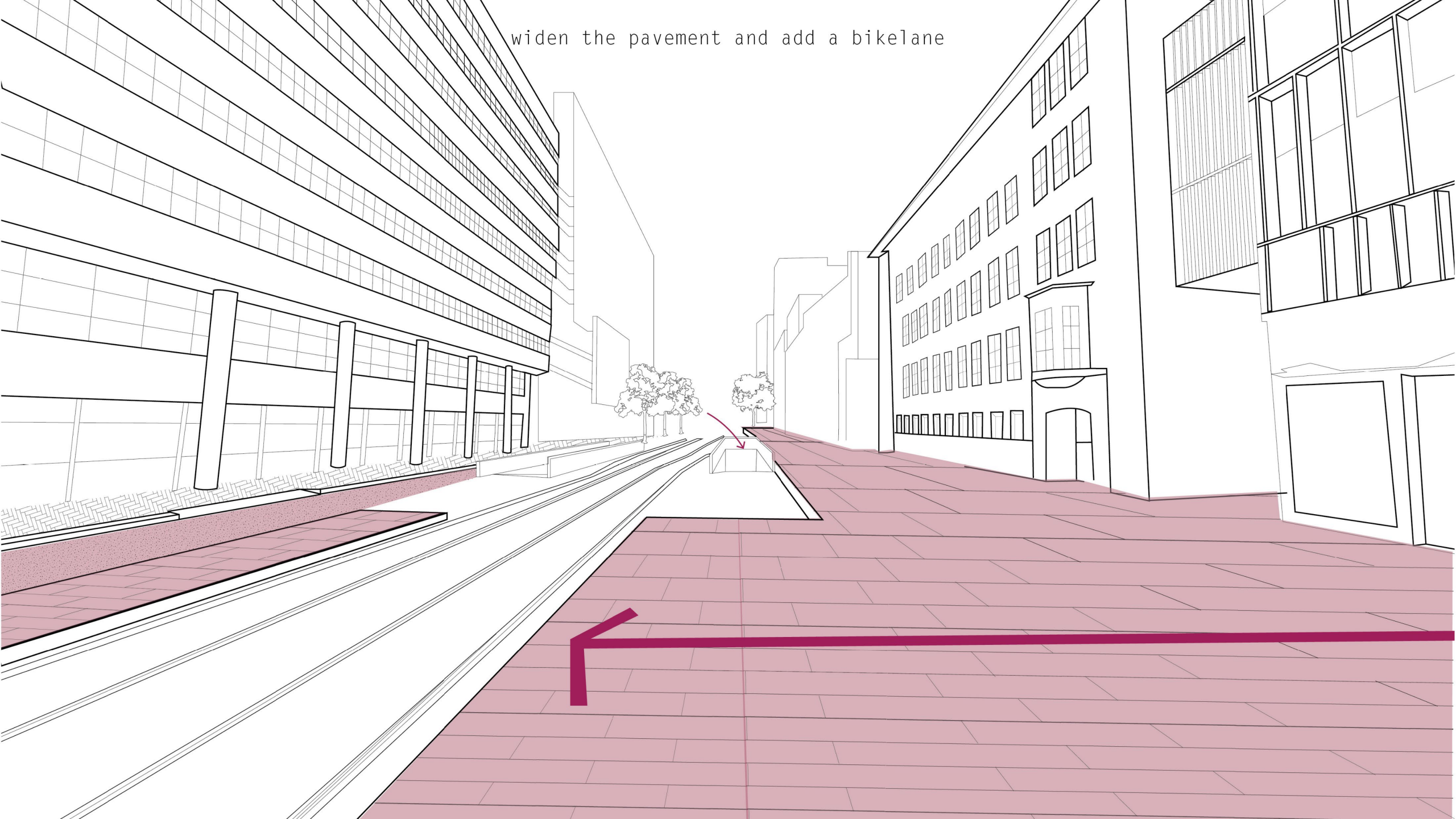




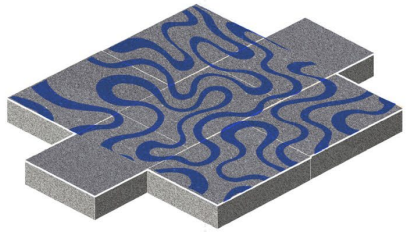
combine the tram and carlane



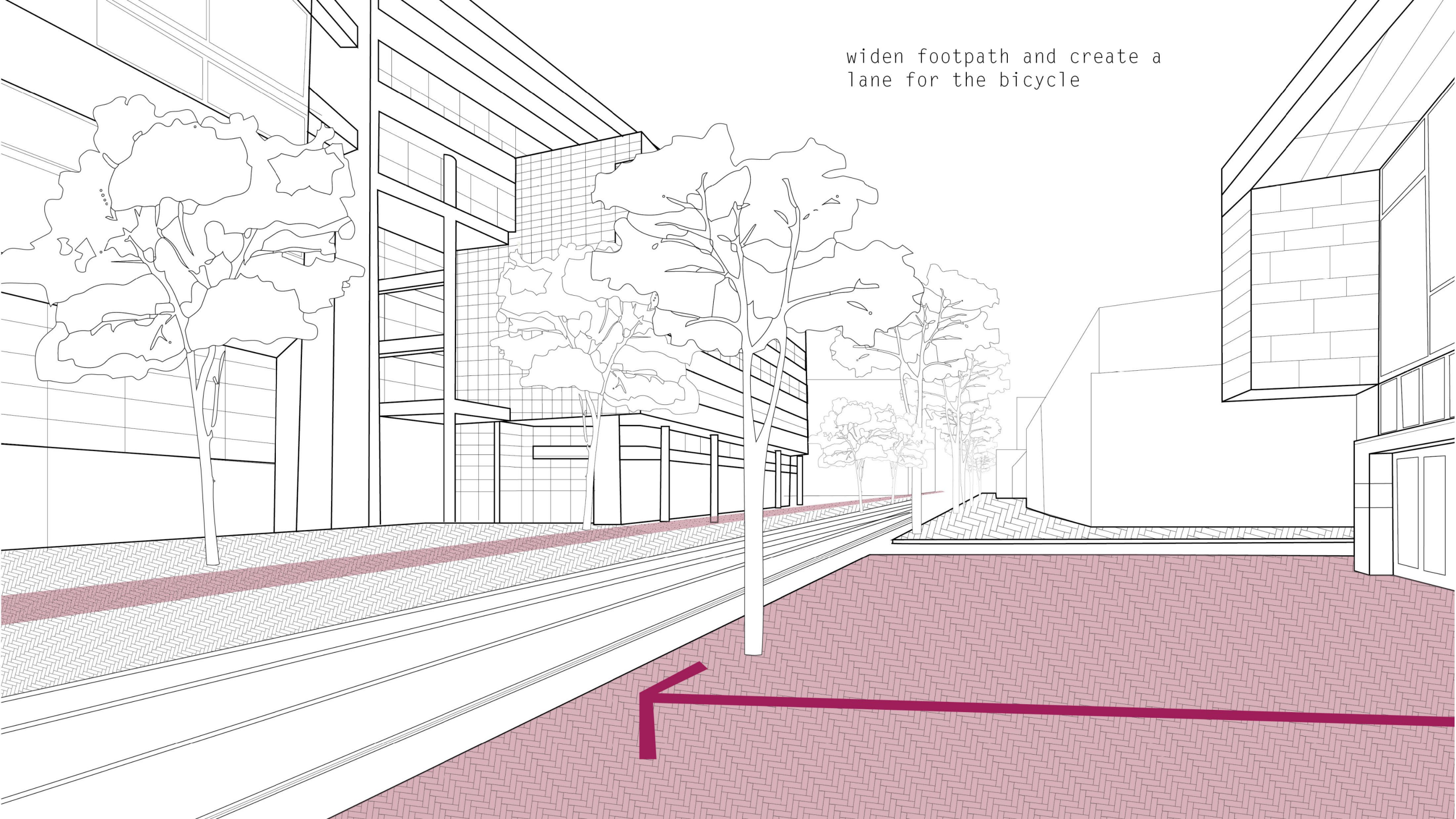
widen the pavement and add a bikelane



(re)place and design the street



move the bikestands to the Spui
roundabout and combine the car
with the tram lane


widen footpath and create a
lane for the bicycle

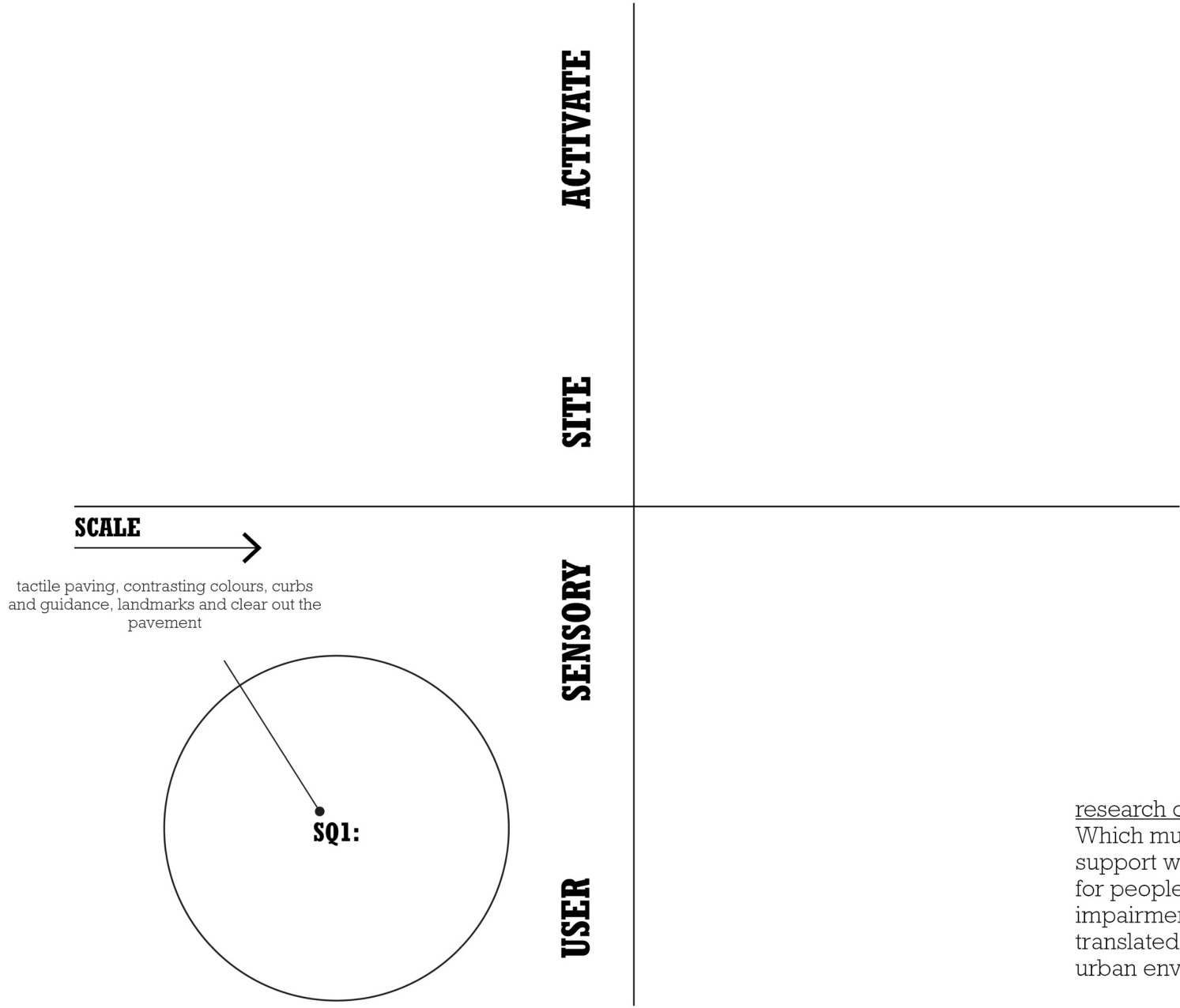
(re)furnish the street

research question

spectrum of visual impairment

Which multisensory spatial design variables support wayfinding and perceptual comfort for people with different degrees of visual impairment, and how can these variables be translated into design strategies for high-density urban environments?

conclusion



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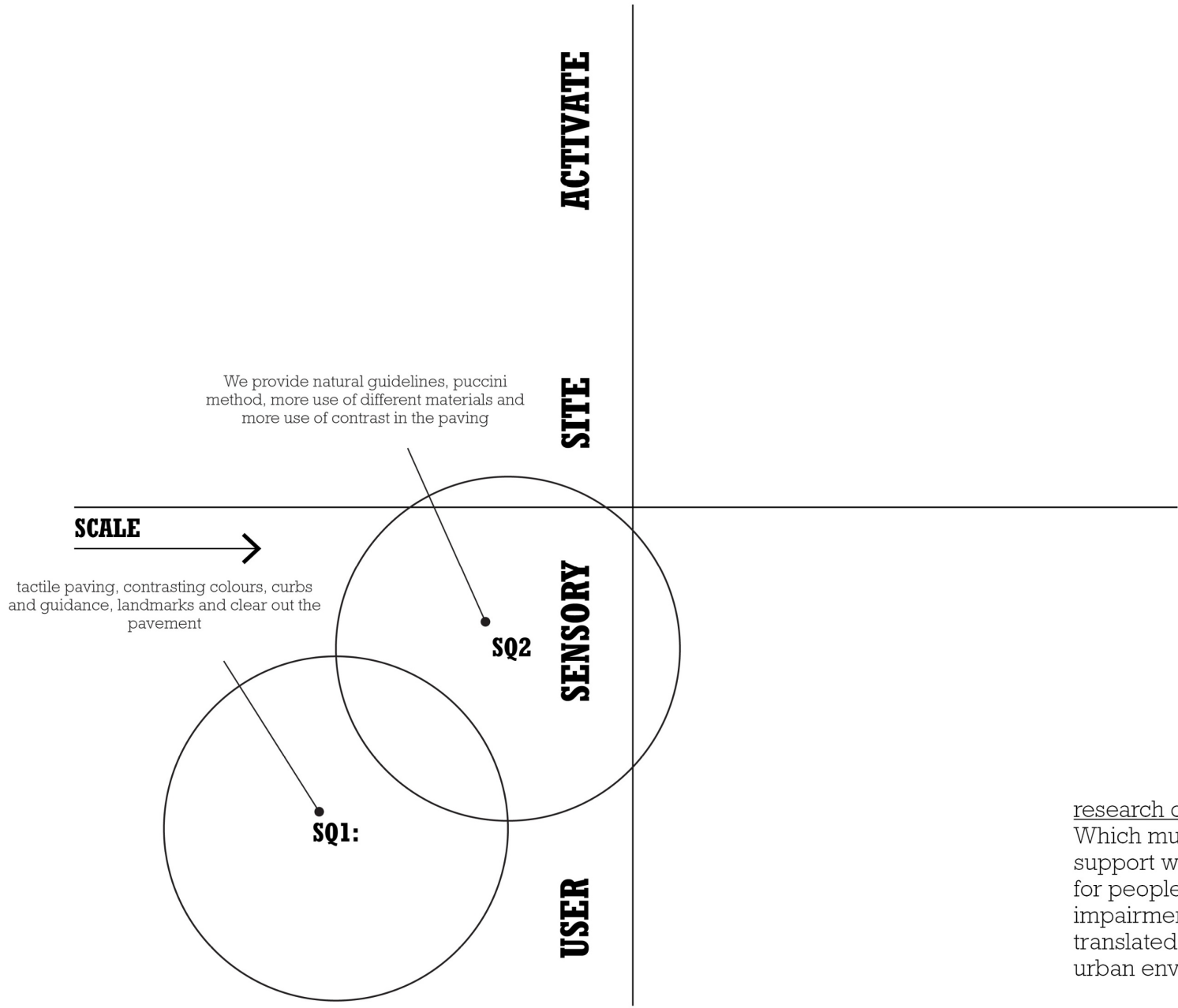

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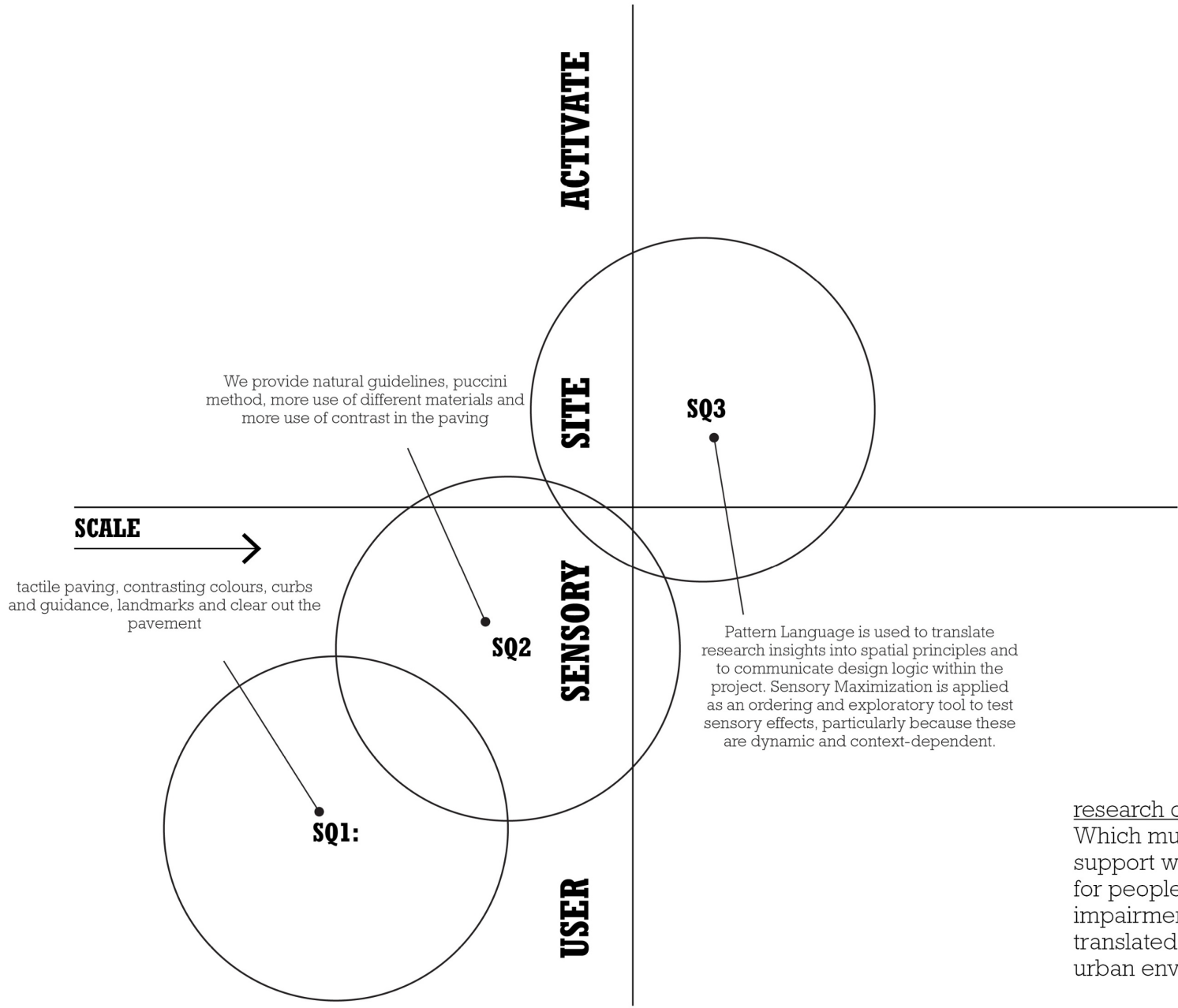

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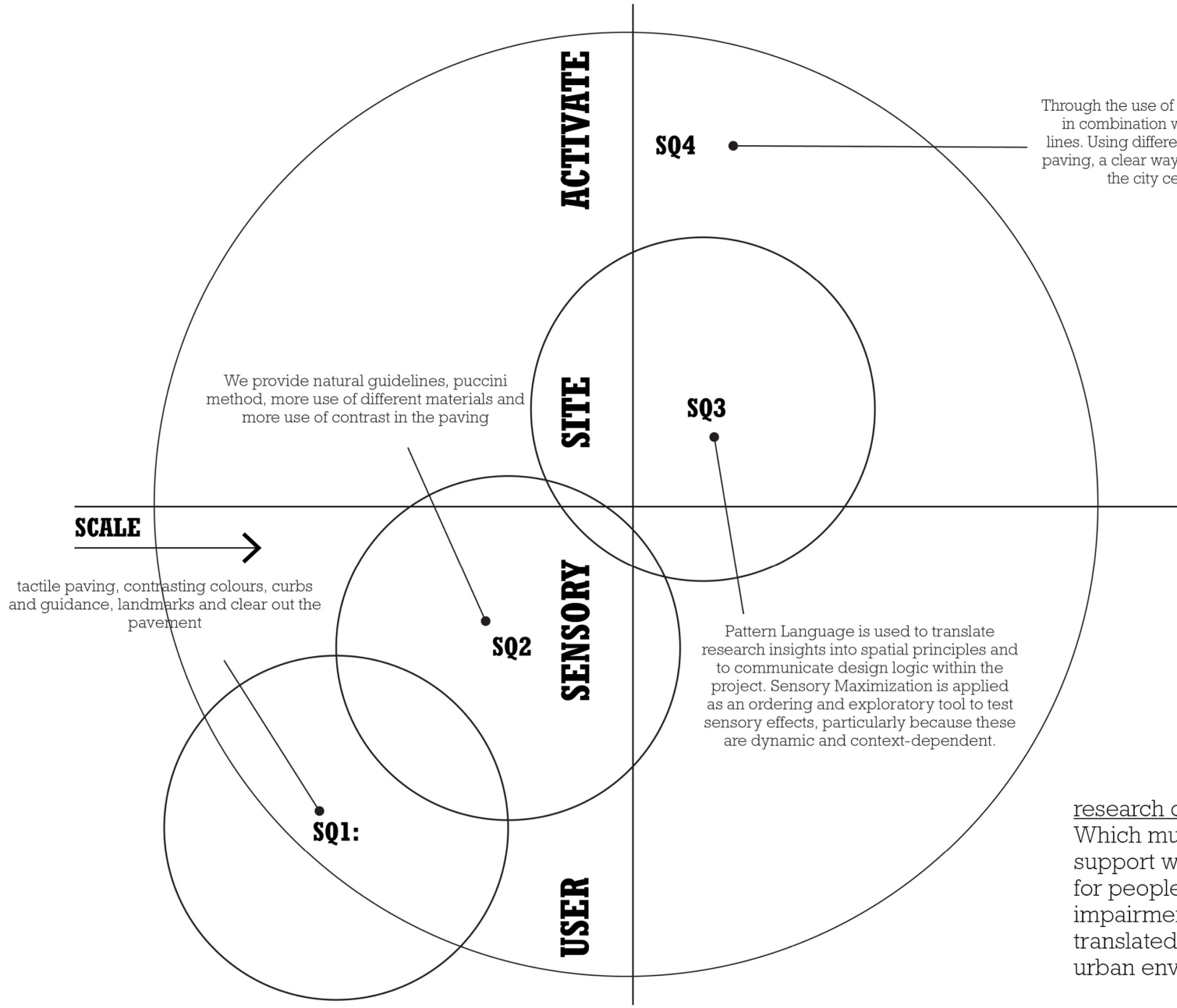

research question

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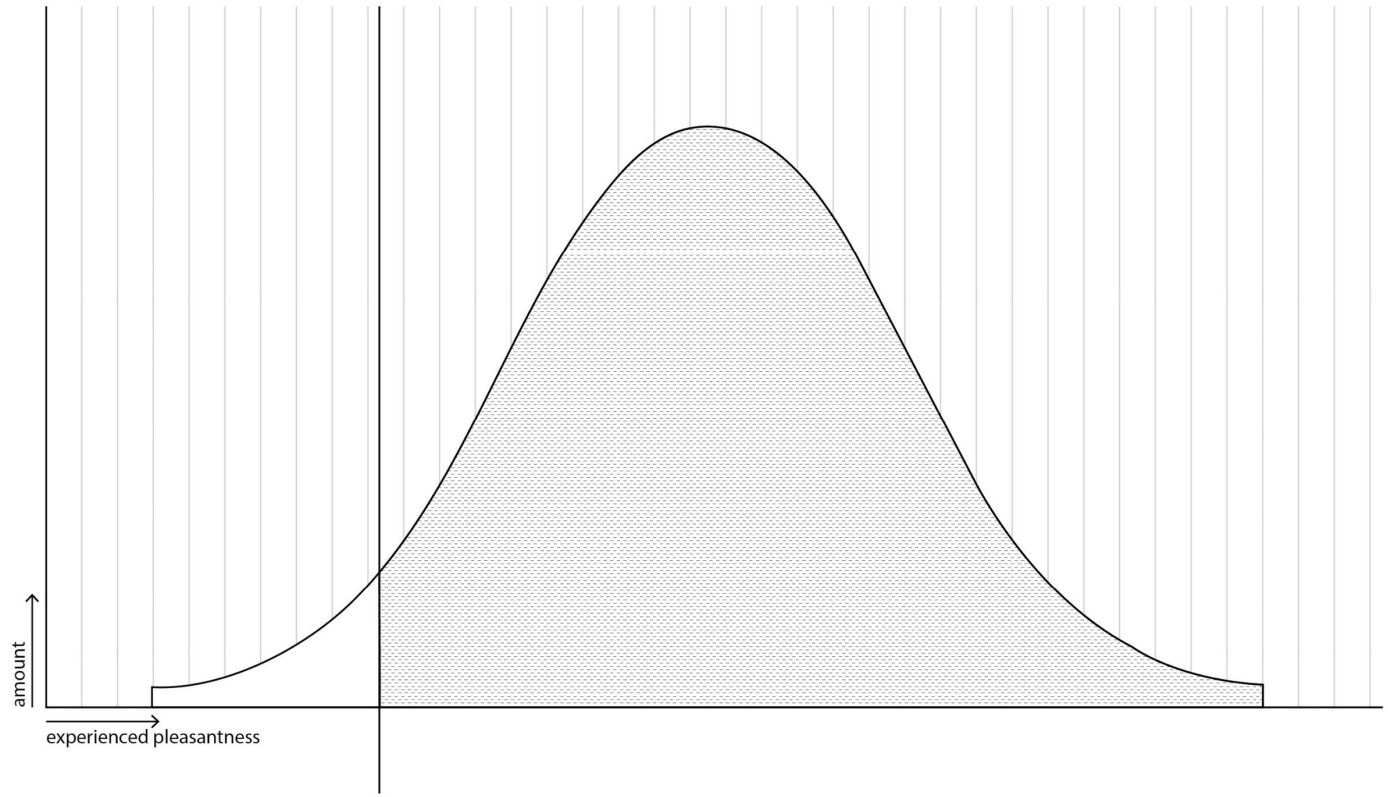
urban cue

pleasantness diagram



(adapted from Janssen, 2025)