

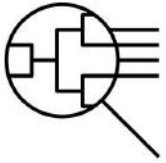
The background features a grid of dark teal 'H' and 'U' shapes. The 'H' shapes are arranged in a regular pattern, while the 'U' shapes are located at the bottom of the grid. Yellow rectangular accents are placed at various intersections and within the grid, creating a visual rhythm. The word 'HARMONIA' is written vertically in yellow, bold, sans-serif capital letters, centered within the grid.

HARMONIA

Computational architecture
to connect communities

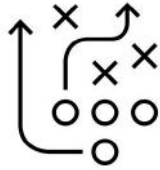
Overview

Design Planning



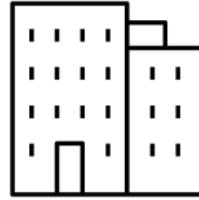
Site investigation
Vision & principles
Stakeholder analysis

Design Process



Plan distribution
Implementation
Design iterations

Final Product



Facade
Section & floor plan
Urban view

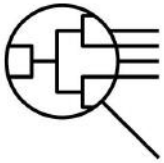
Reflection



Stakeholder alignment
Limitations
For future studies

Overview

Design Planning

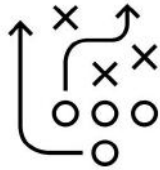


Site investigation

Vision & principles

Stakeholder analysis

Design Process

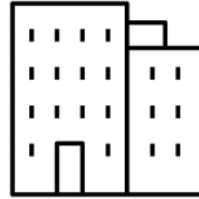


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Stakeholder alignment

Limitations

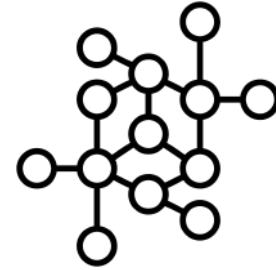
For future studies

Harmonia



Origin of inspiration

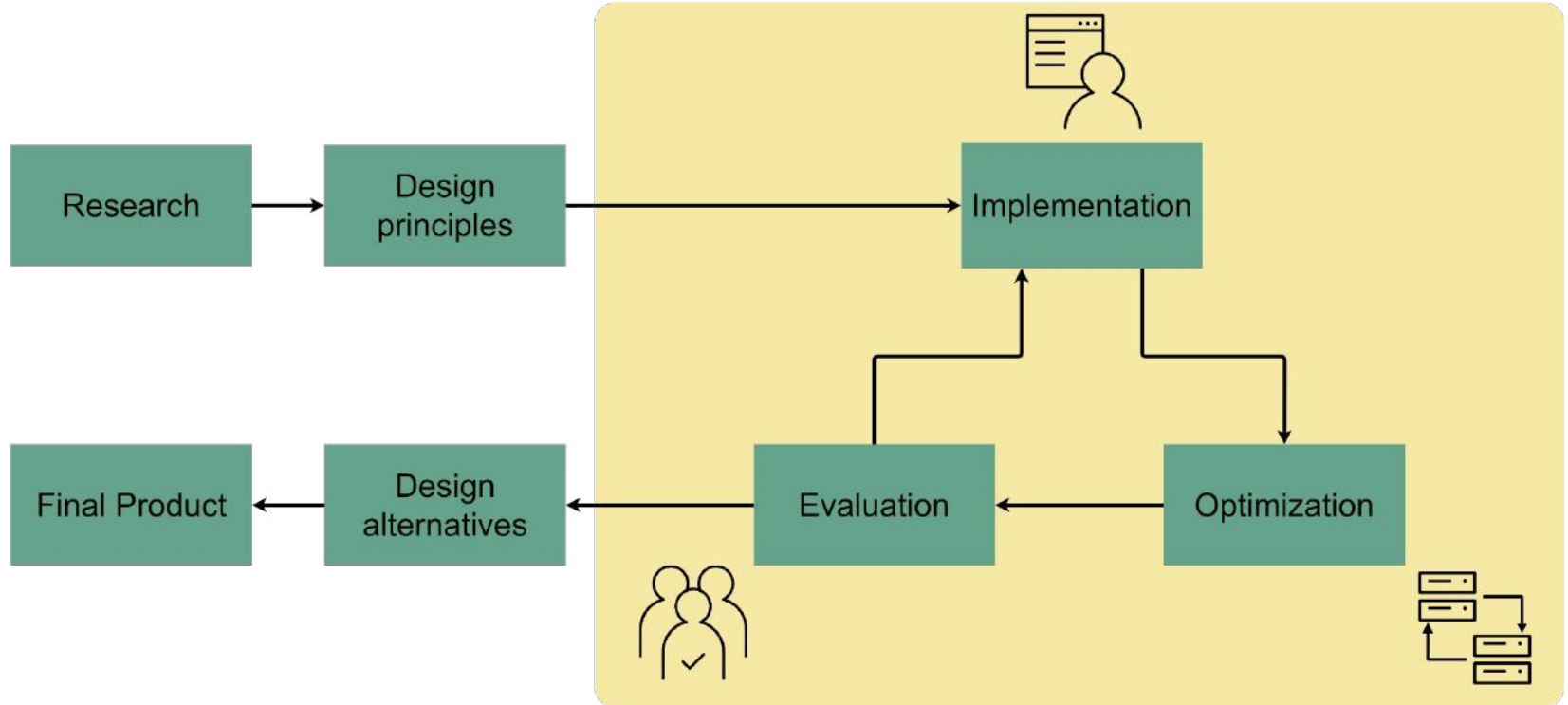
Harmonia was the Greek Goddess of harmony. She was also considered to bring *ideal social concord*.



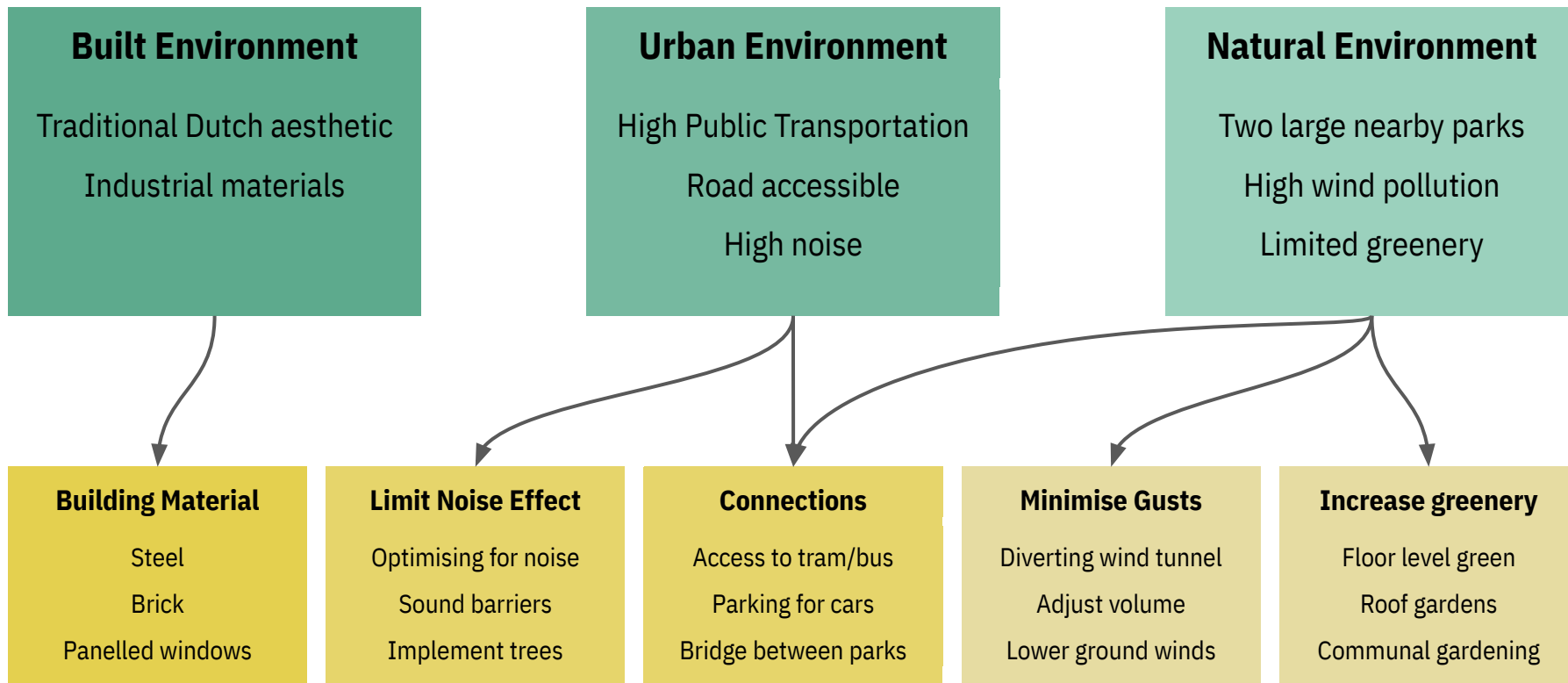
Relation to project

Our project aims to improve the *social network* in the neighbourhood. Emphasizing the need on *community spaces*.

Design Flow



Site Investigation: Personal



Site Investigation: Interviews with Locals



Marina (27)

“ Not a lot happens nearby, I don’t have see much community. It’s easy to get to the centre however which is great. And the noise is really bad. ”



Julio (54)

“ It’s really close to the centre! You can always go there. There is great green spaces nearby, with local communities. But it’s horribly loud. ”



Adem (35) & Mo (6)

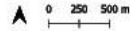
“ We really like living in this neighbourhood. The city centre is quite close even by walking. There are many good places to go here. Although it is a bit noisy. ”

Site Research: GIS



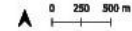
LEGEND - NOISE TRAFFIC AND INDUSTRY - DURING THE DAY

- Site location
- Streets
- >= 75 dB
- 70 - 75 dB
- 65 - 69 dB
- 60 - 64 dB
- 55 - 59 dB



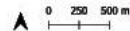
LEGEND - GREENERY

- Site location
- Green area
- Trees



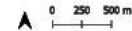
LEGEND - FACILITIES

- Site location
- Streets
- Stores
- Food and drinks
- Healthcare
- Education
- Hotels and guest houses

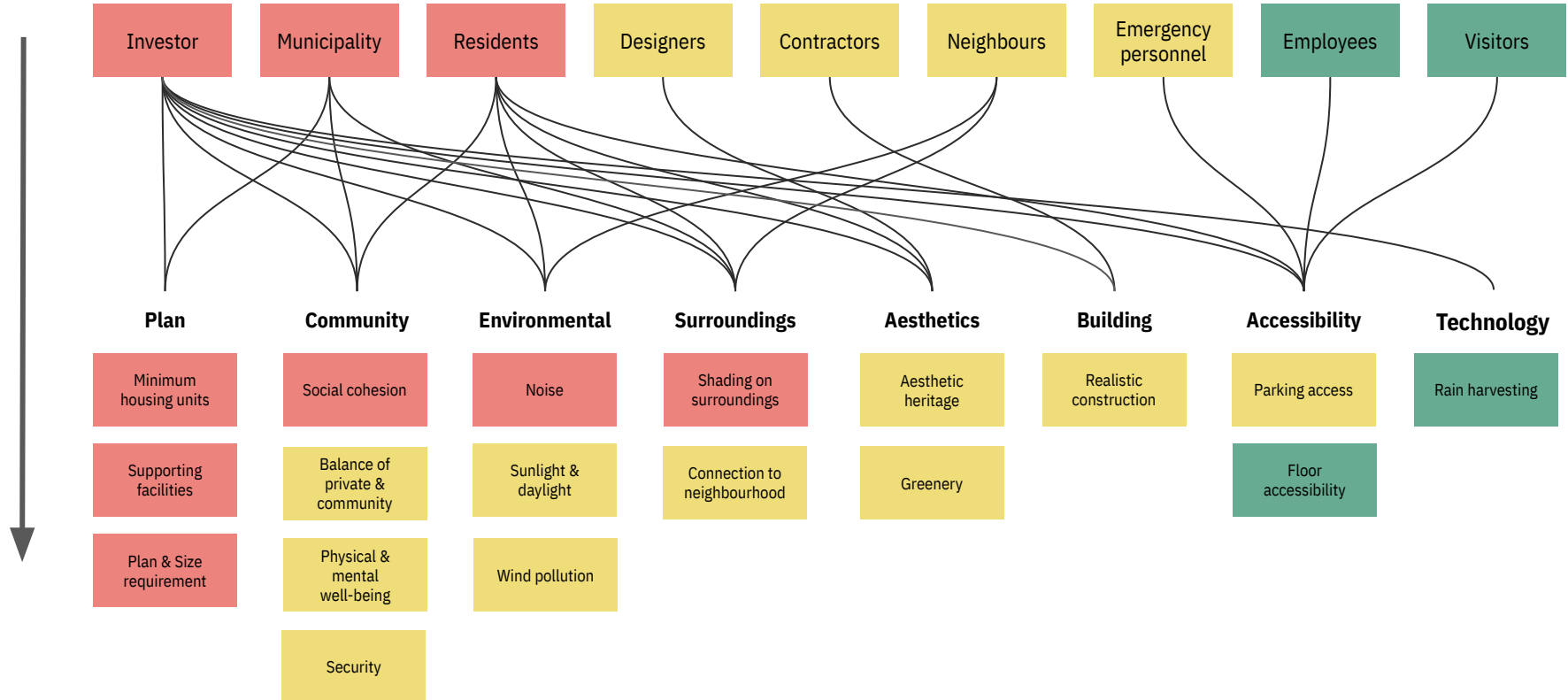


LEGEND - PUBLIC TRANSPORTATION

- Site location
- Streets
- Bus stops
- Tram stops
- Tramway

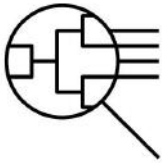


Stakeholder Analysis: Needs



Overview

Design Planning

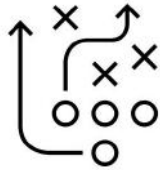


Site investigation

Vision & principles

Stakeholder analysis

Design Process

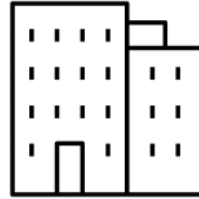


Plan distribution

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Design iterations

Final Product



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Urban view

Reflection



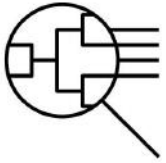
Stakeholder alignment

Limitations

For future studies

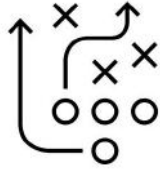
Overview

Design Planning



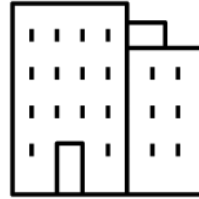
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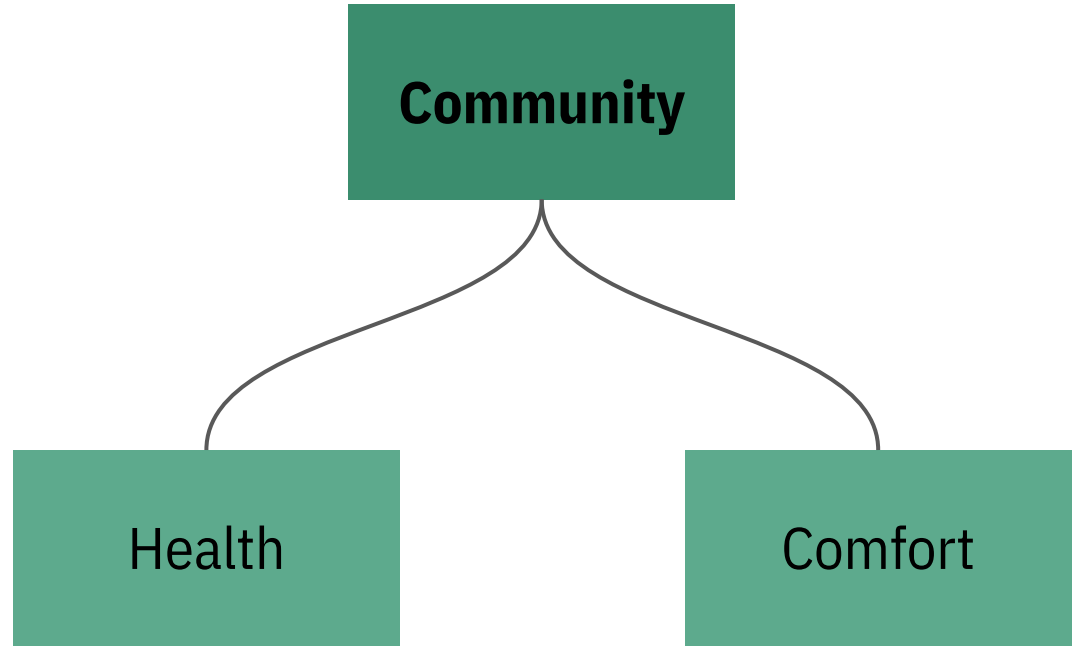
Reflection



Stakeholder alignment
Limitations
For future studies

Vision

“Our aim is to create an inclusive Community, where people experience Health and Comfort.”



Vision

**Addressing
key requirement**

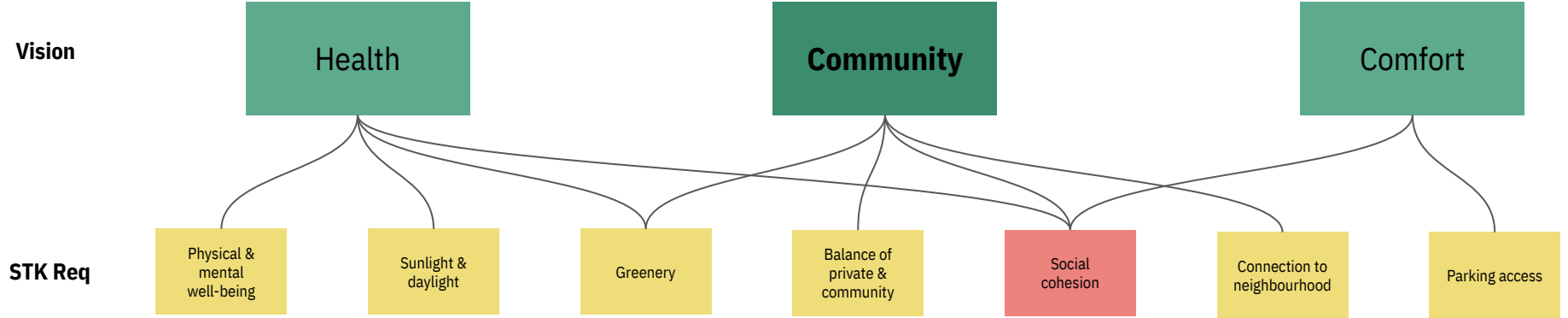
Supporting facilities

Community

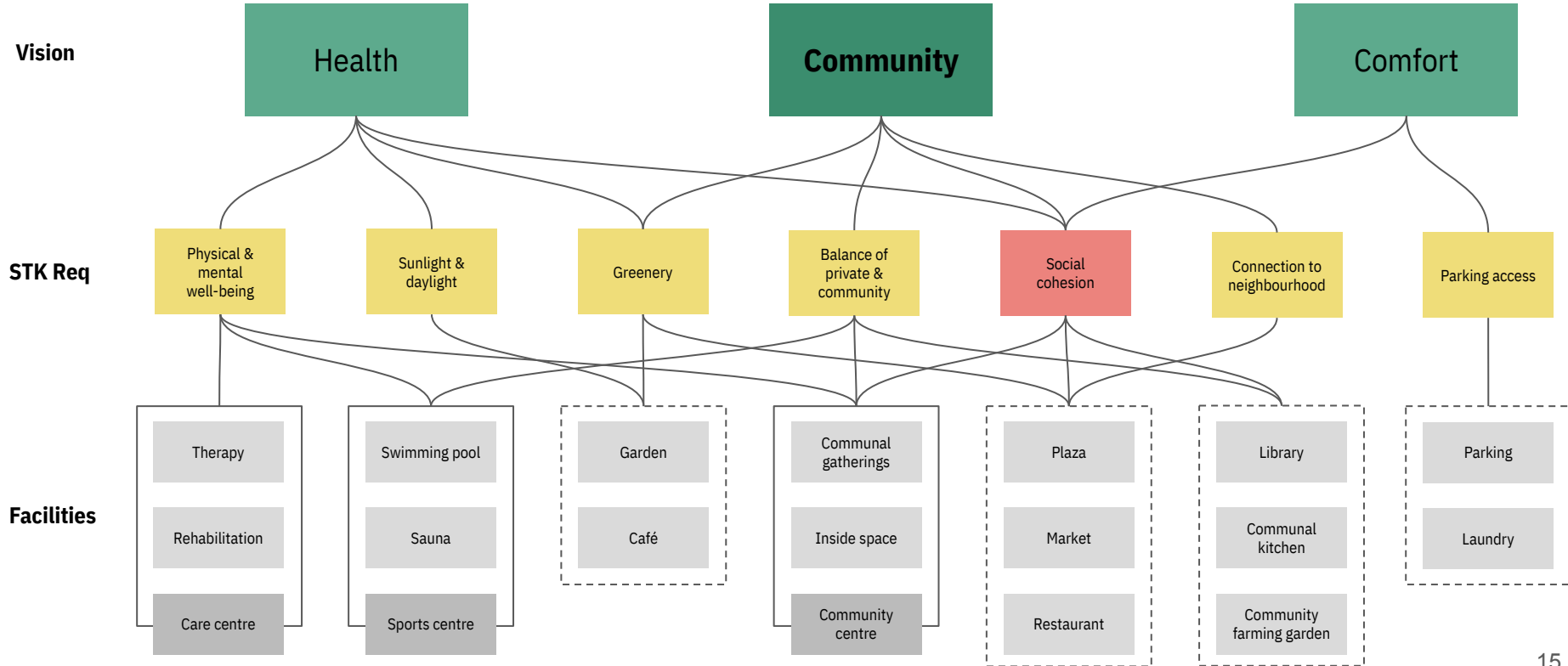
Health

Comfort

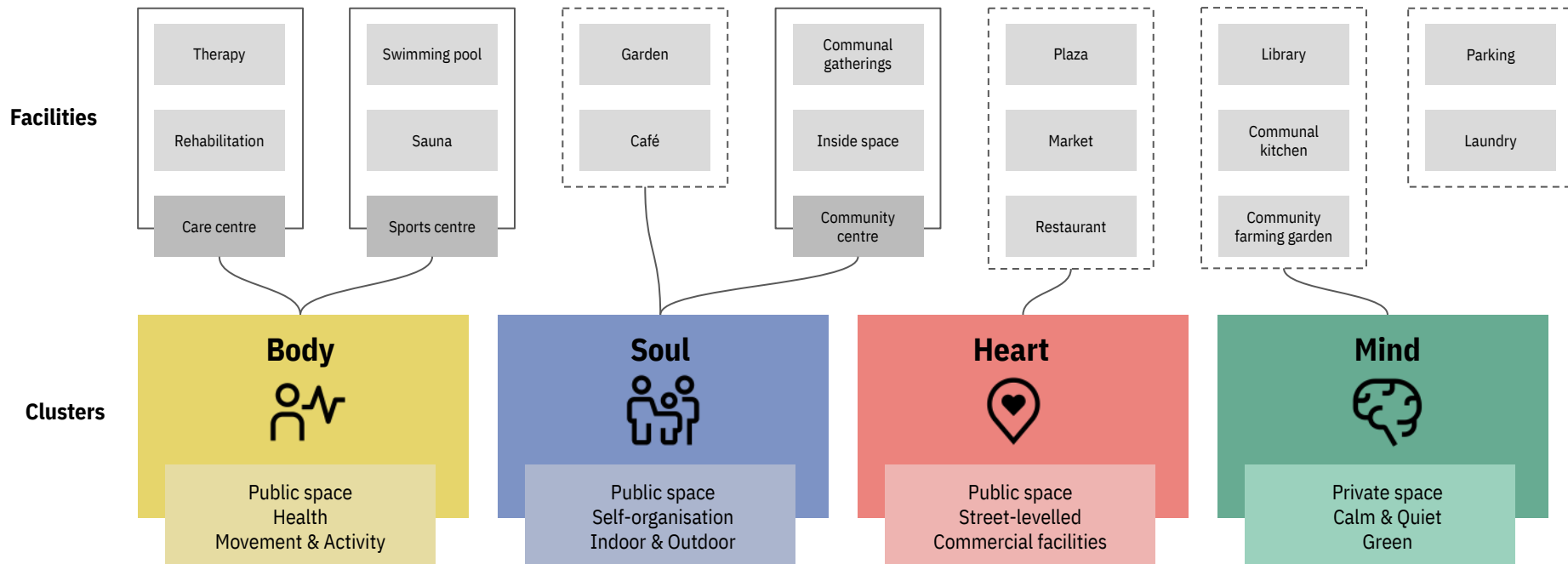
Plan Distribution: Stakeholder relation



Plan Distribution: Facilities



Plan Distribution: Clusters



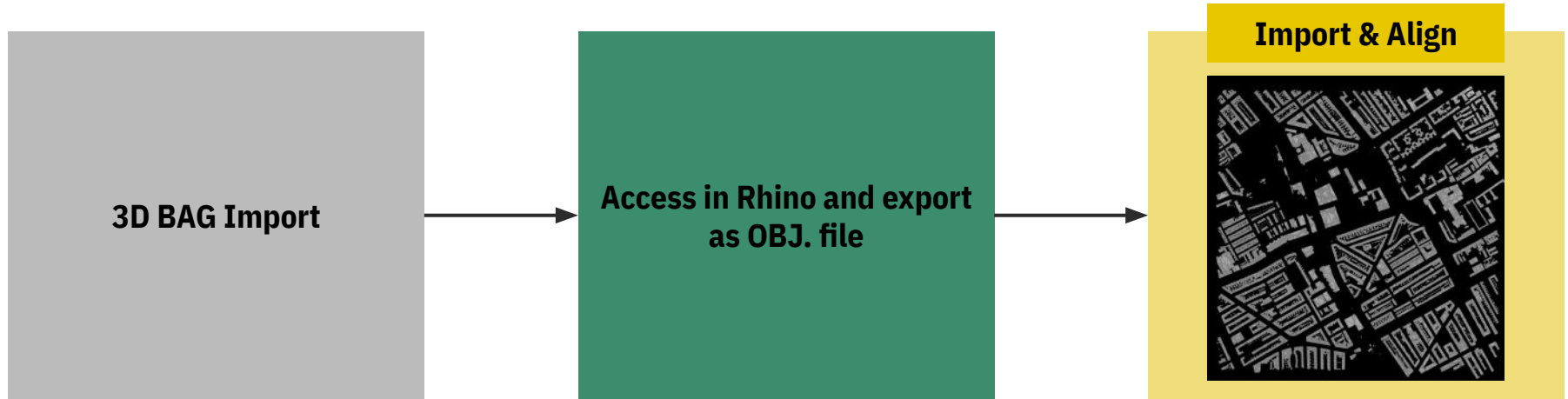
Adjacency matrix

	Facility	Market	Plaza	Restaurant	Cultural Hall	Café	Garden	Sports centre	Care centre	Garden	Library	Communal kitchen	Garden (farming)	Starters	Students (Studio)	Students (Communal)	Elderly (Independent)	Elderly (Assisted)	Laundry room	Private Car Parking	Public Car Parking	Public Bike Parking	Main Entrance	1. Priv. Entrance + Bike P.	2. Priv. Entrance + Bike P.	3. Priv. Entrance + Bike P.
Heart	Market	0.8																								
	Plaza	1	1																							
	Restaurant	0.6	1	1																						
Soul	Cultural Hall	0.5	0.5	0.5	1																					
	Café	0.4	0.4	0.4	1	1																				
	Garden	0.4	0.4	0.4	1	1	1																			
Body	Sports centre	0.5	0.5	0.5	0.5	0.5	0.5	1																		
	Care centre	0.3	0.3	0.3	0.4	0.4	0.4	1	1																	
	Garden	0.3	0.3	0.3	0.4	0.4	0.2	0.7	1	1																
Mind	Library	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.7	0.5	1															
	Communal kitchen	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.7	0.5	1	1														
	Garden (farming)	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.5	0.2	0.8	1	1													
Residential & Utilities	Starters	0.2	0.2	0.3	0.5	0.6	0.5	0.7	0.5	0.5	0.5	0.5	0.8	0.8												
	Students (Studio)	0.5	0.6	0.5	0.7	0.5	0.5	0.7	0.5	0.5	0.8	0.5	0.6	0.5	0.7											
	Students (Communal)	0.5	0.6	0.5	0.7	0.5	0.5	0.7	0.5	0.5	0.8	0.5	0.6	0.5	0.7	0.7										
	Elderly (Independent)	0.2	0.2	0.2	0.6	0.6	0.5	0.5	0.8	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.8									
	Elderly (Assisted)	0.2	0.2	0.2	0.6	0.5	0.5	0.5	1	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.8	1								
	Laundry room	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.2	0.4	0.4	0.3	1	1	0.3	0.3	1							
	Private Car Parking	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.3	0.1	0.5	1						
	Public Car Parking	0.9	1	0.8	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	1	1					
	Public Bike Parking	0.9	0.9	0.8	0.5	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.5	0.5	1	1				
	Main Entrance	0.9	1	0.9	1	0.7	0.5	0.7	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.8	1	0.8				
	1. Priv. Entrance + Bike P.	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	1		
	2. Priv. Entrance + Bike P.	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.2	1	
	3. Priv. Entrance + Bike P.	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.8	0.5	0.5	0.5	0.5	0.2	0.2	0.2	1

1 = Attraction

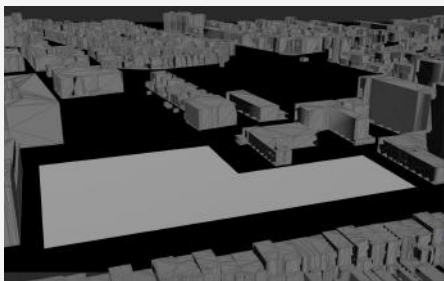
0.1 = Repulsion

Implementation: Site Environment (Context)

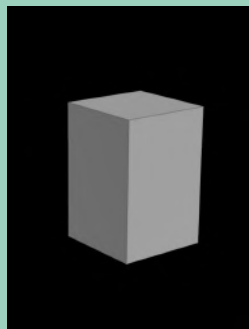


Implementation: Initial volume

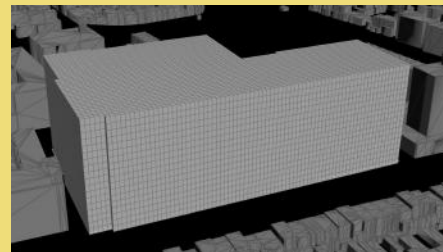
Site boundaries



Voxel size

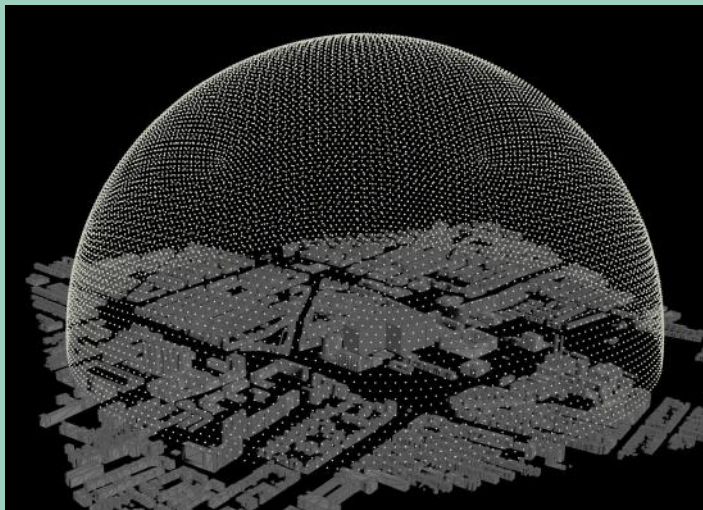


Voxel cloud

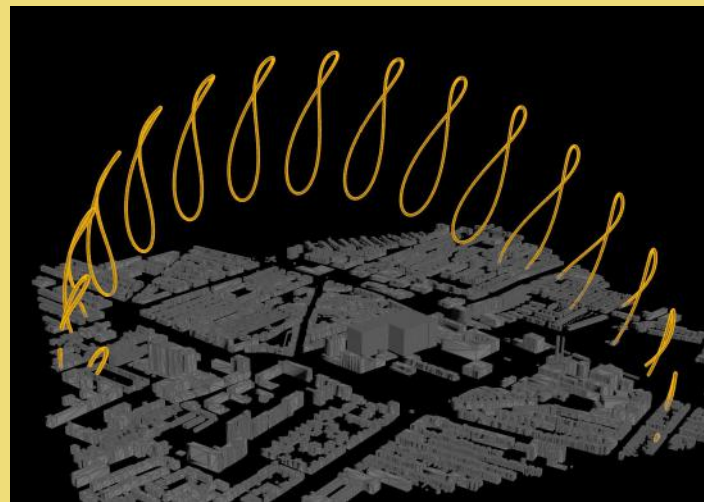


Implementation: Sky & Sun

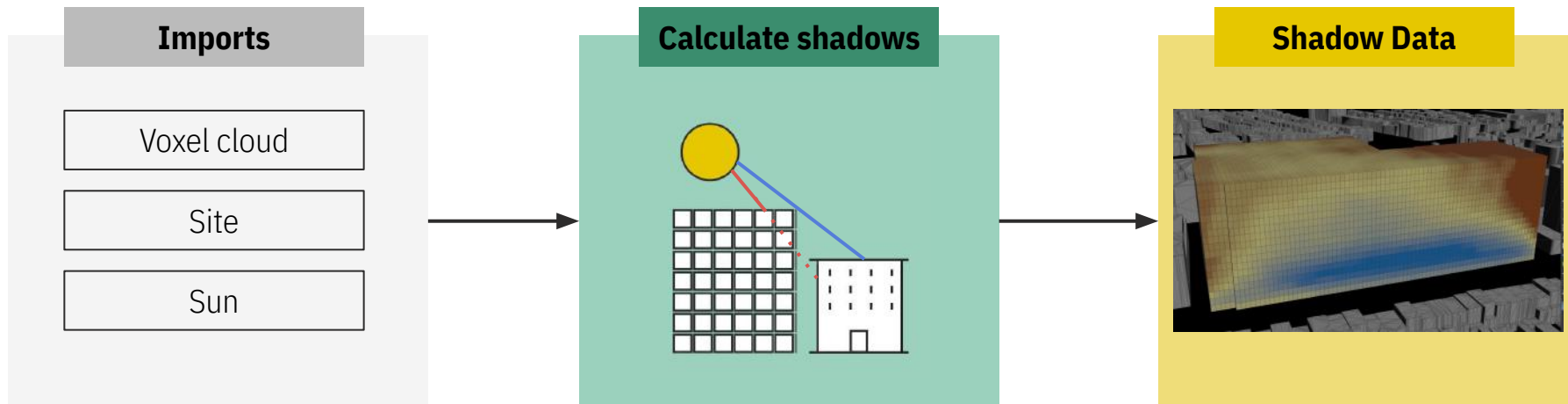
Sky



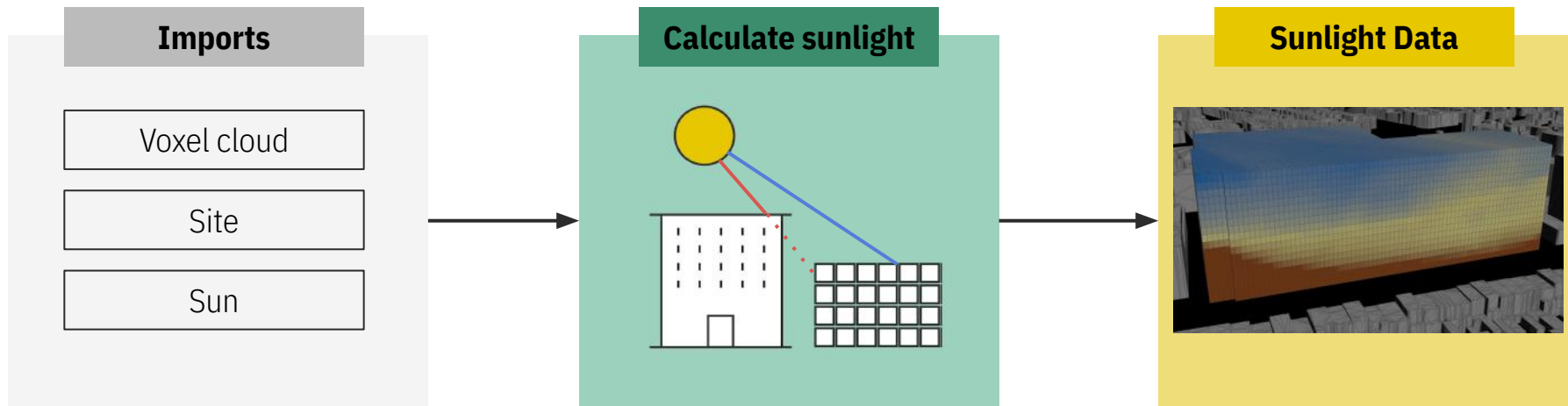
Sun



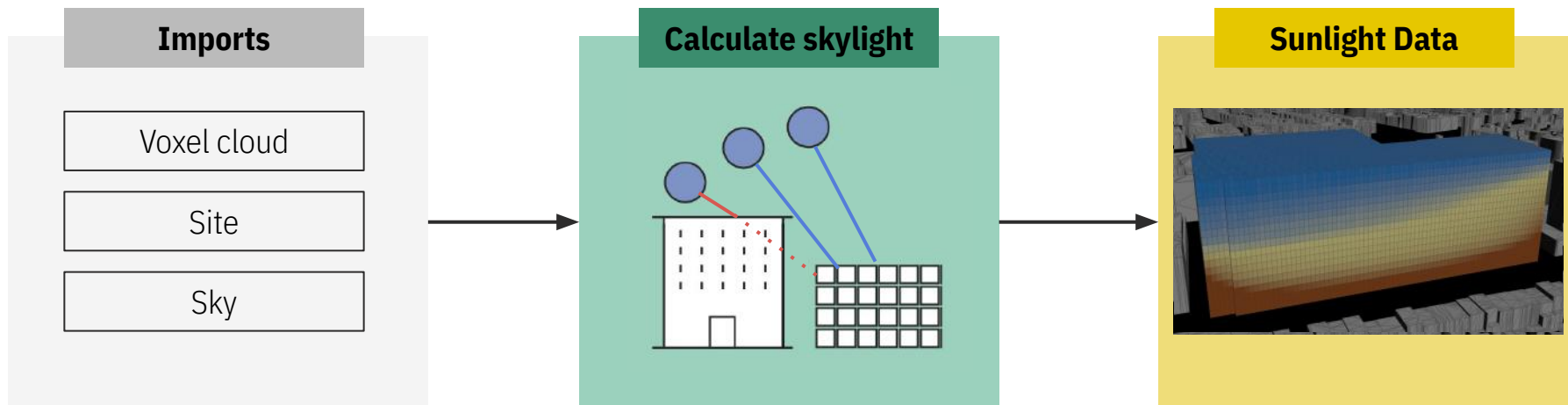
Implementation: Shadow Casting



Implementation: Sunlight



Implementation: Skylight



Implementation: Noise

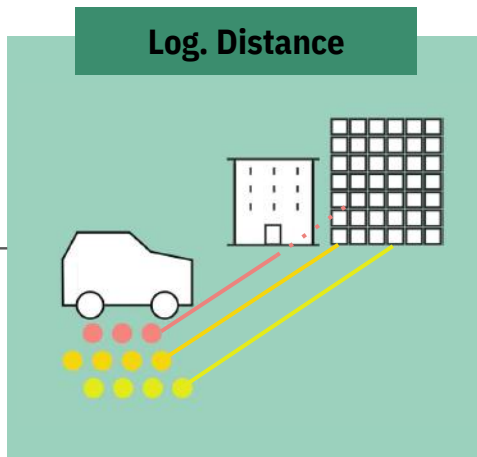
Import Noise (Day)



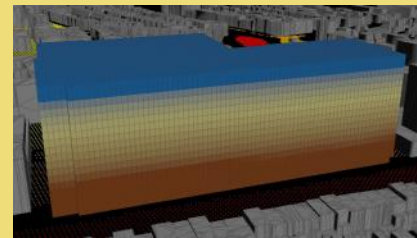
Import Noise (Night)



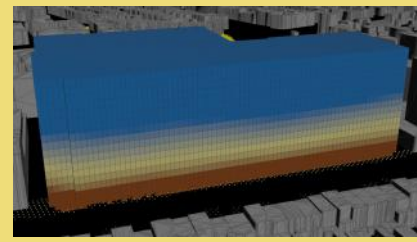
Log. Distance



Noise Data (Day)



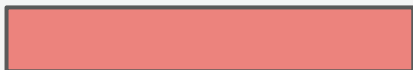
Noise Data (Night)



Implementation: Weighted Sum

Number of voxels

Num. Voxels = Max



Weights of criterion

Shadow Casting weight



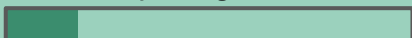
Sunlight weight



Daylight weight



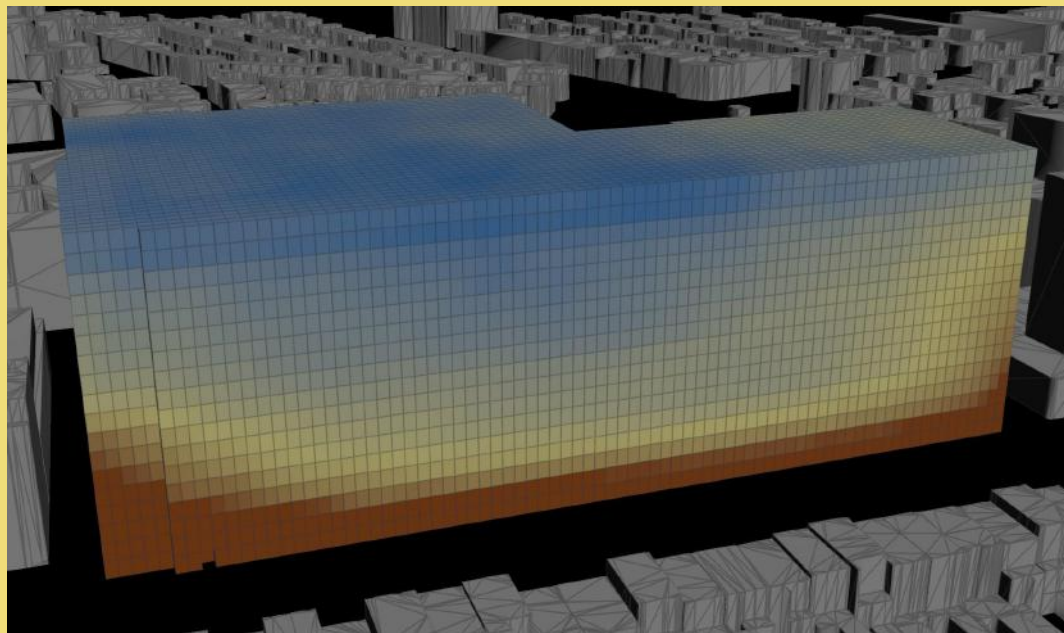
Noise (Day) weight



Noise (Night) weight



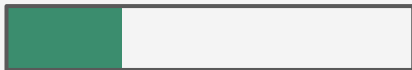
Weighted sum



Implementation: Num. Voxels

Number of voxels

Num. Voxels = Plan Size



Weights of criterion

Shadow Casting weight



Sunlight weight



Daylight weight



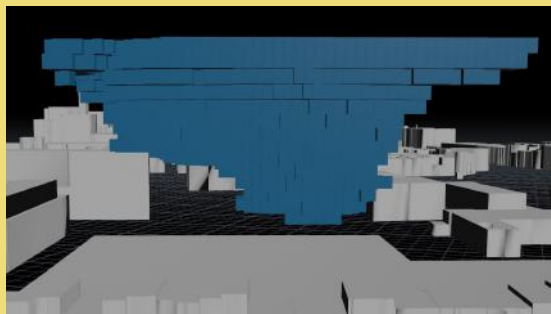
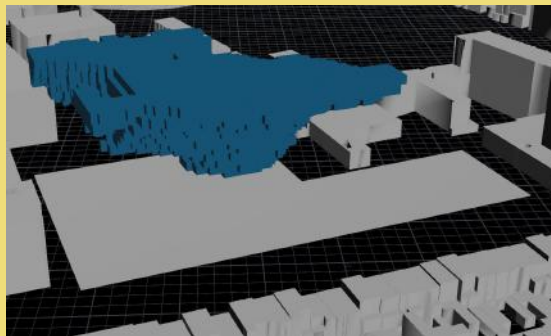
Noise (Day) weight



Noise (Night) weight



Weighted sum



Determining Weights

Realistic Building

Criterion	Placement
Shadow Casting	↓
Sunlight	↑
Daylight	↑
Noise (Day)	↑
Noise (Night)	↑

Need a grounded building



High shadowing casting



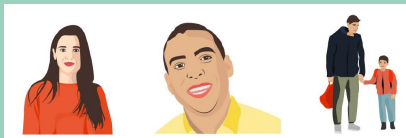
Vision

Community

Health

Comfort

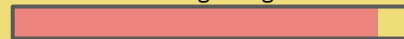
Listening to community...



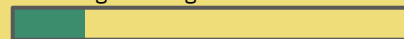
"Reduce Noise!"

Final weights

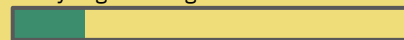
Shadow Casting weight



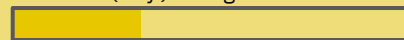
Sunlight weight



Daylight weight



Noise (Day) weight



Noise (Night) weight



Implementation: Weights of criterion

Number of voxels

Num. Voxels = Plan Size



Weights of criterion

Shadow Casting weight



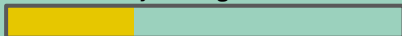
Sunlight weight



Daylight weight



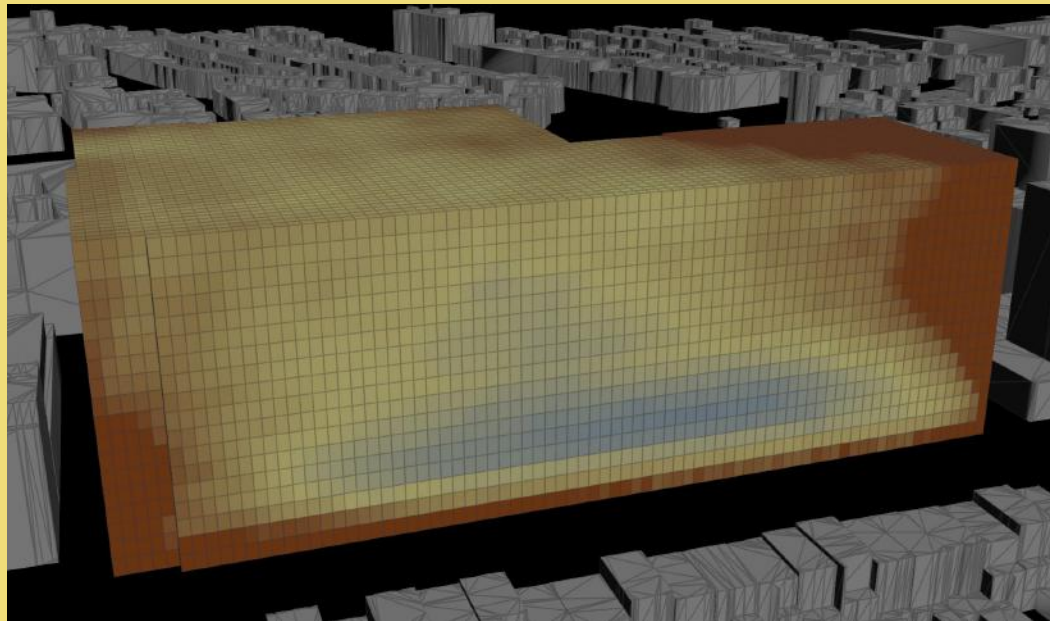
Noise (Day) weight



Noise (Night) weight

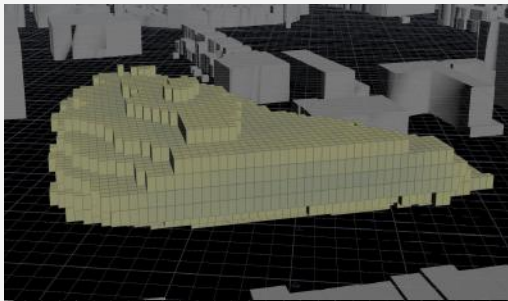


Weighted sum

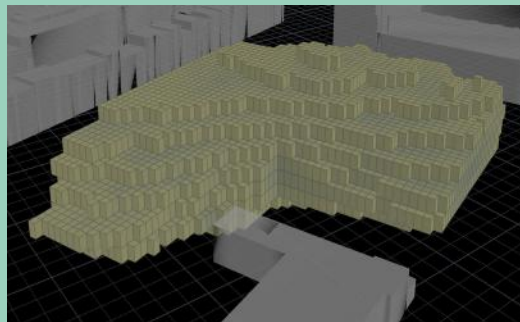


Iteration 1: Weighted Sum

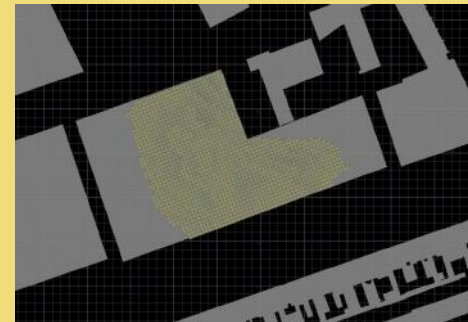
Front view



Back view



Top view



Iteration 2: Public spaces

Urban view

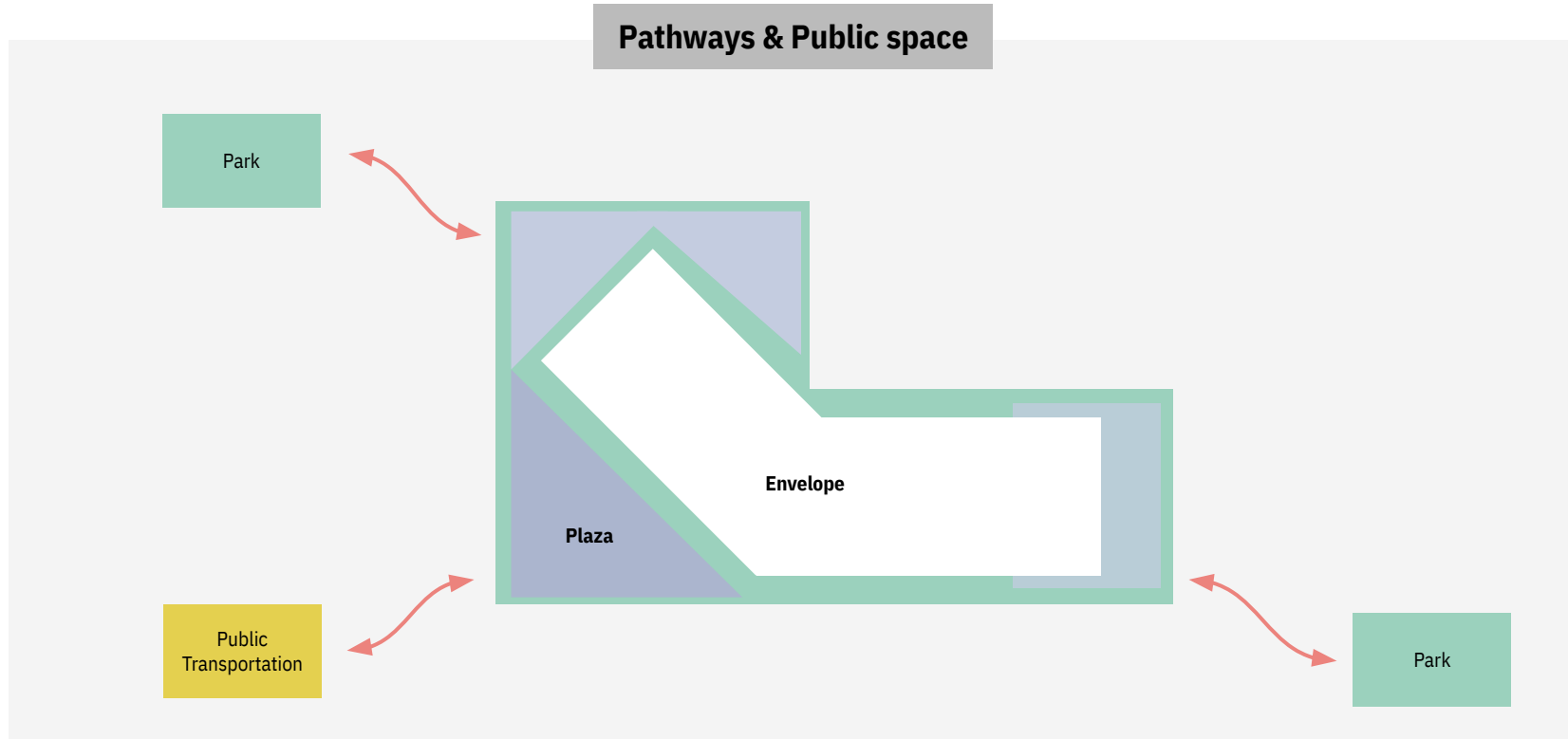


Creating public space

How can the site connect to:

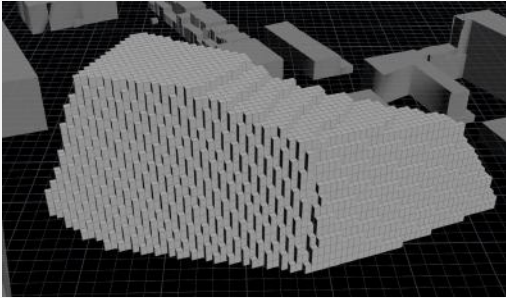
- 1) *Parks - creating green bridge*
- 2) *Public Transportation - giving access to site*

Iteration 2: Sketches

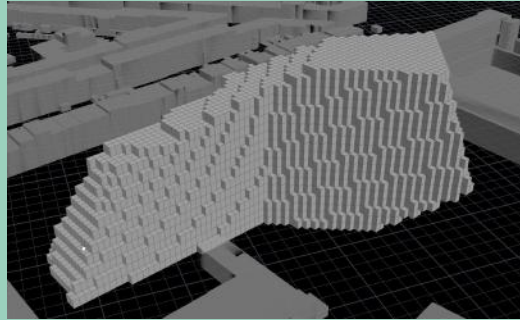


Iteration 2: New Envelope

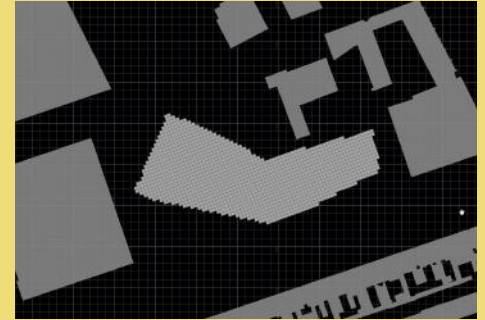
Front view



Back view



Top view

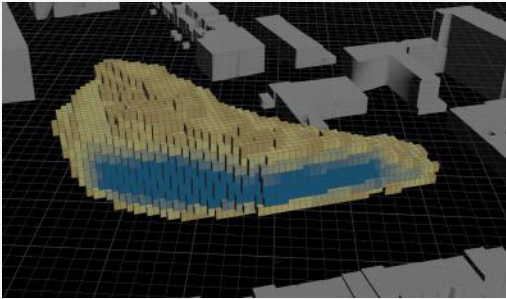


Iteration 2: Forming

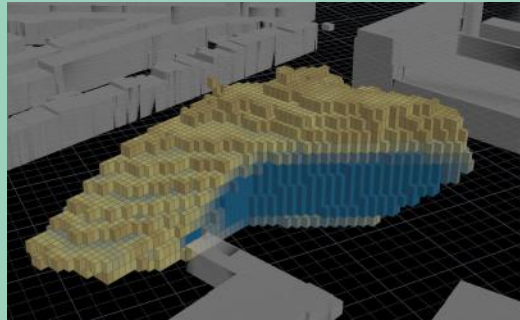
Front view

Iteration 2: Volume

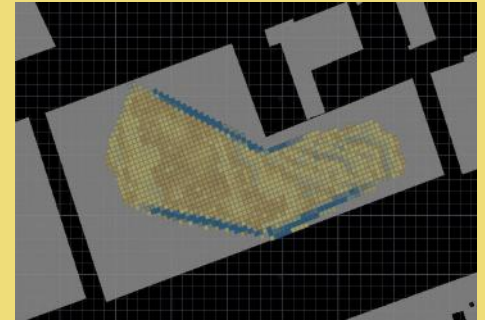
Front view



Back view

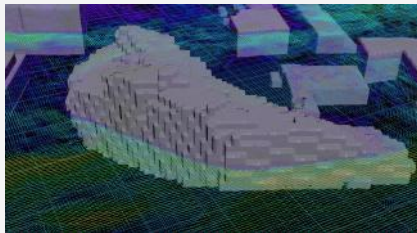
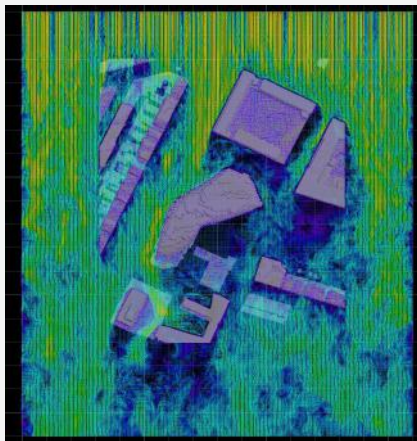


Top view

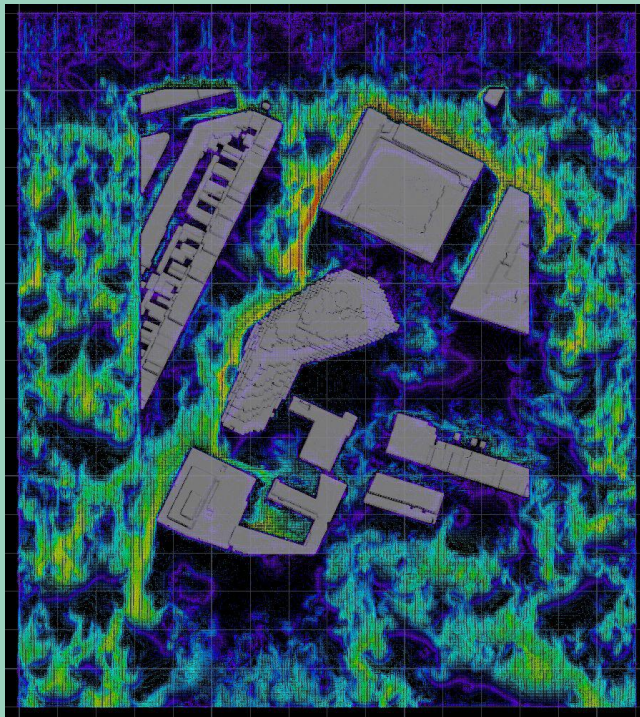


Iteration 3: Wind simulation

Mid-height winds



Ground level winds



Wind shaping

Find points of
highest pressure

*(Qualitative
search)*

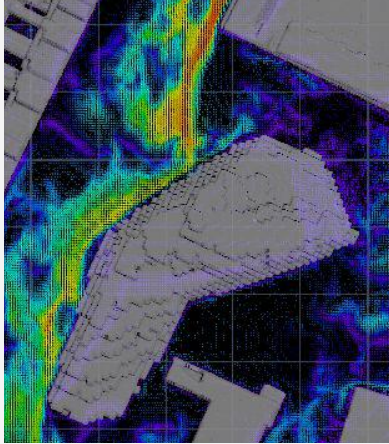
Remove points
iteratively



Organically shaped
for wind

Iteration 3: Envelope iteration

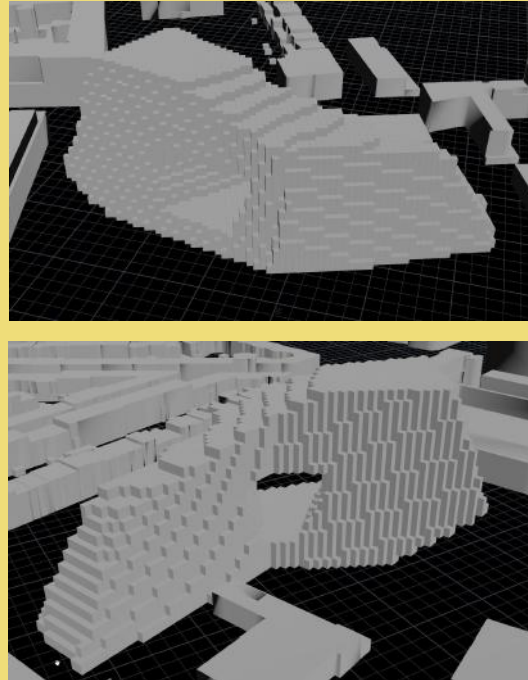
Highest Pressure



Idea

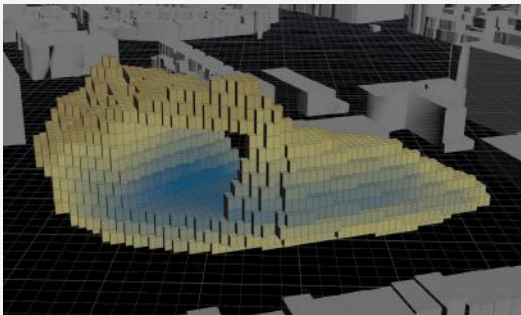
Relieve pressure through
creating tunnel

New Envelope

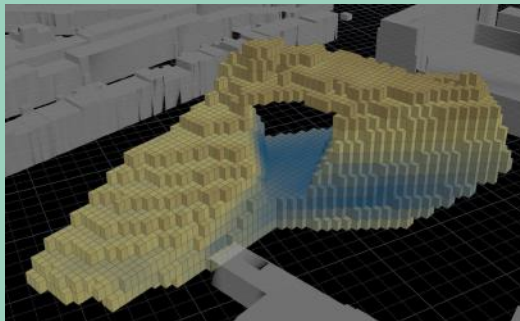


Iteration 3: Final volume

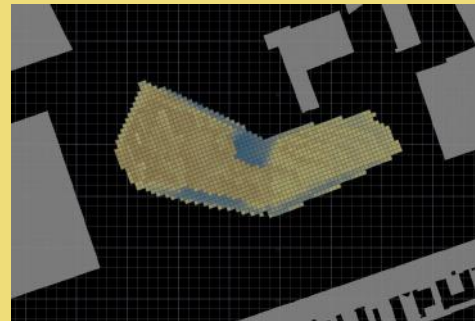
Front view



Back view

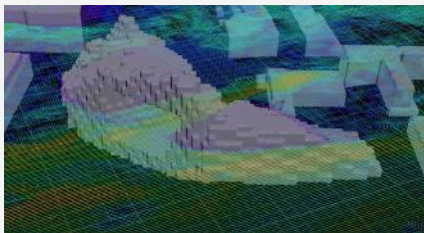
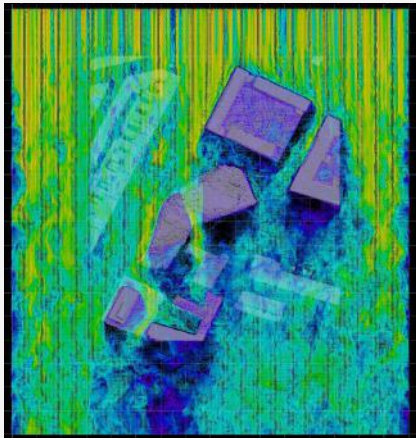


Top view

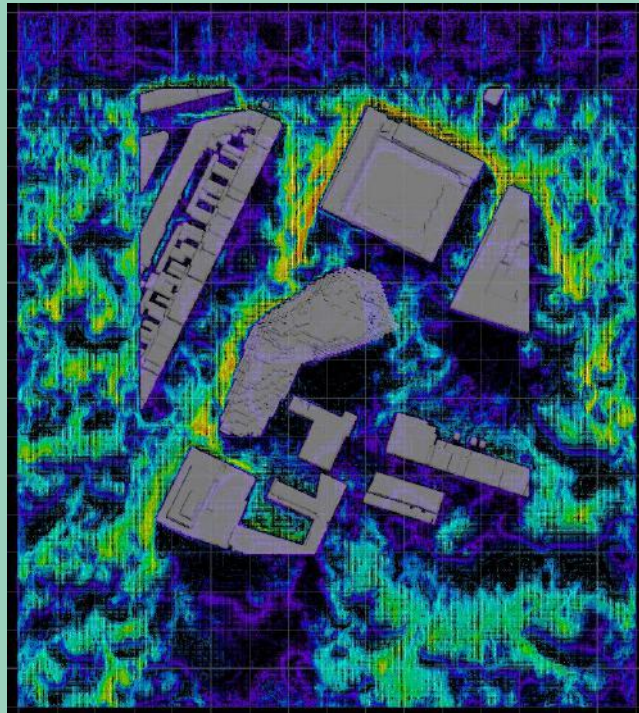


Iteration 3: New wind data

Mid-height winds

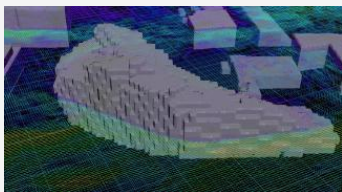
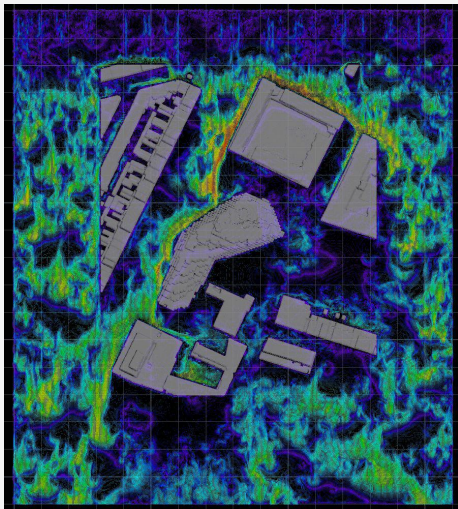
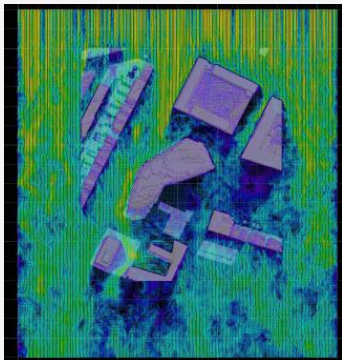


Ground level winds

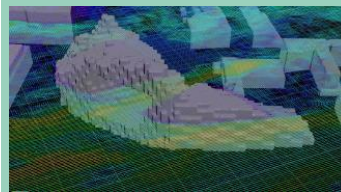
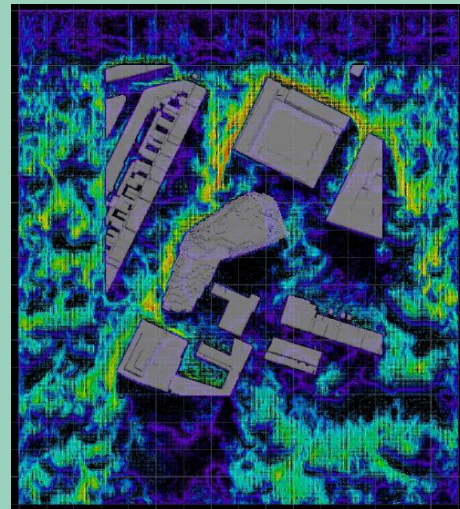
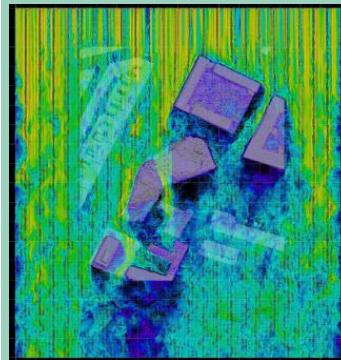


Wind simulation comparison

2nd Iteration



3rd Iteration

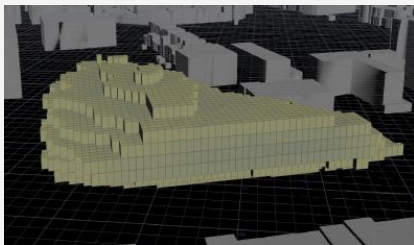


Volume iteration summary

1st Iteration

Adjust num. voxel

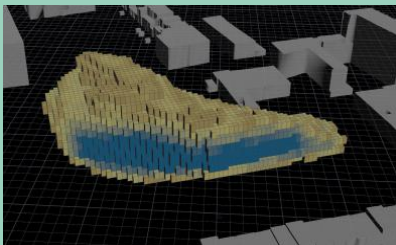
Tuning weights



2nd Iteration

Design public spaces

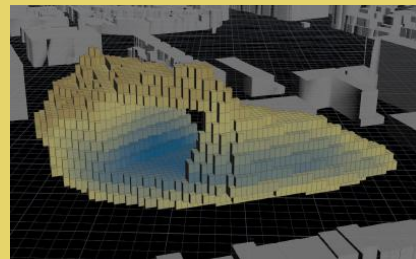
Create envelope



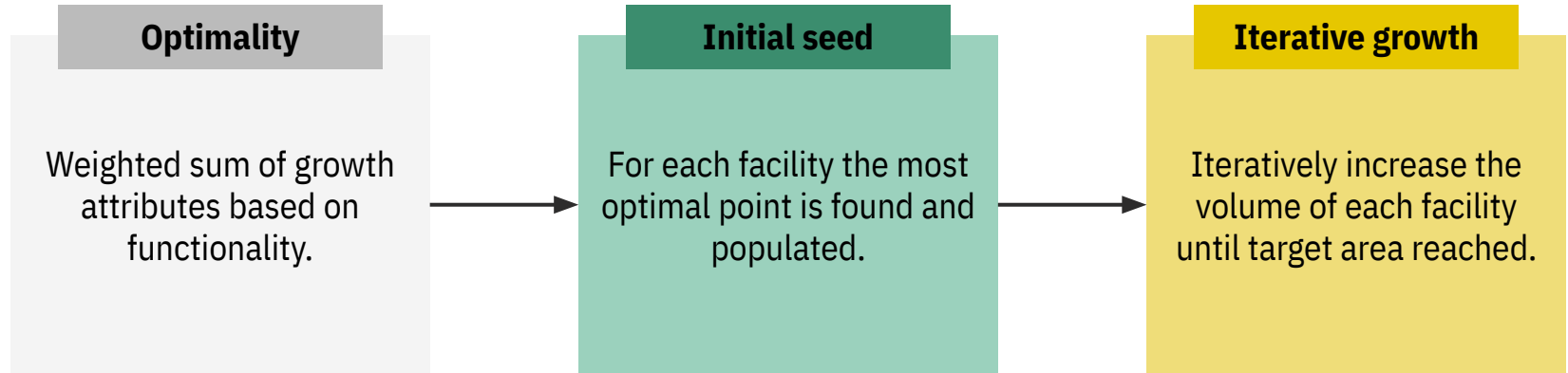
3rd Iteration

Simulate wind

Reduce pressure loads



Growth simulation



Growth simulation: Attributes

Simulation values

Sunlight

Daylight

Daytime Noise

Nighttime Noise

+

Positional values

Elevation

*y coordinate
of point*

Outerness

*closeness to
building's surface*

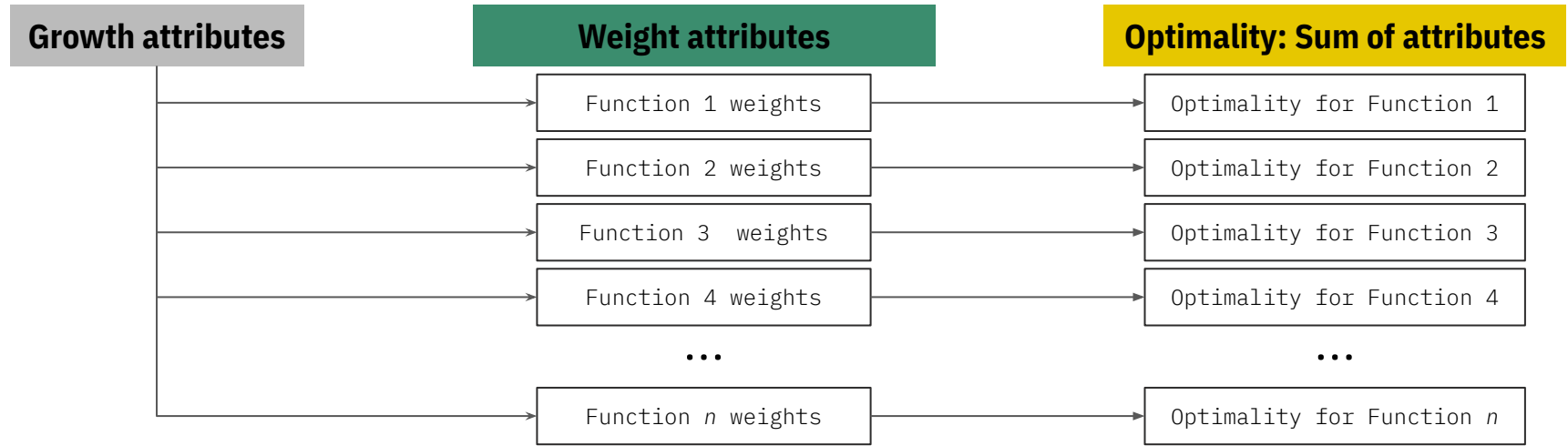
+

Shape value

Blockiness

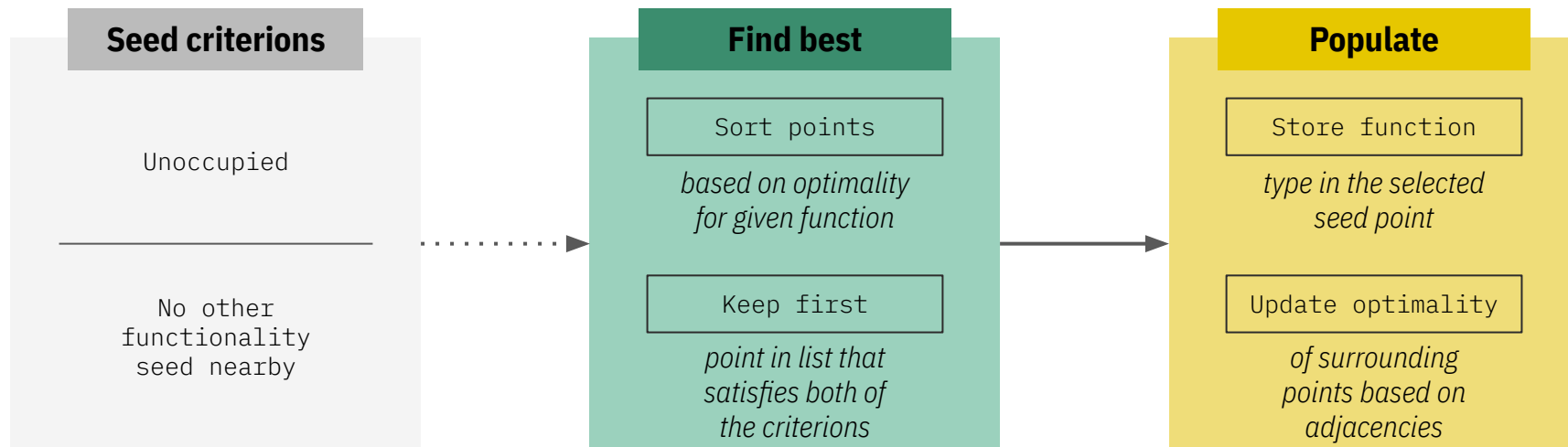
*Concentration of
function points
around initial
seed*

Growth simulation: Optimality

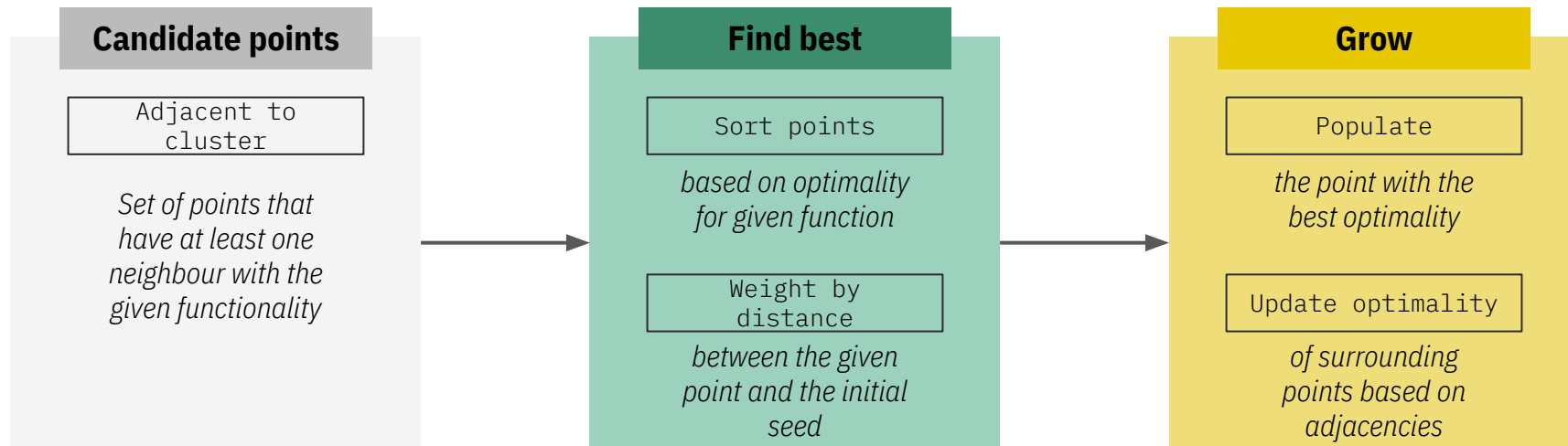


Growth simulation: Initial Seed

For each type of function:



Growth simulation: Iterative growth



Growth simulation: 2D example

0.6	0.6	0.5	0.4	0.3
0.6	0.7	0.7	0.6	0.4
0.5	0.6	0.8	0.7	0.5
0.4	0.5	0.6	0.7	0.6
0.3	0.4	0.4	0.6	0.5

Growth simulation: 2D example

0.6	0.6	0.5	0.4	0.3
0.6	0.7	0.84	0.6	0.4
0.5	0.72	0.8	0.84	0.5
0.4	0.5	0.72	0.7	0.6
0.3	0.4	0.4	0.6	0.5

Growth simulation: 2D example

0.6	0.6	0.5	0.4	0.3
0.6	0.7	0.84	0.6	0.4
0.5	0.72	0.8	0.84	0.5
0.4	0.5	0.72	0.7	0.6
0.3	0.4	0.4	0.6	0.5

Growth simulation: 2D example

0.6	0.6	0.5	0.4	0.3
0.6	0.7	0.84	0.6	0.4
0.5	0.72	0.8	0.84	0.5
0.4	0.5	0.72	0.7	0.6
0.3	0.4	0.4	0.6	0.5

A 5x5 grid representing a 2D growth simulation. The central cell (row 3, column 3) has a value of 0.8 and is shaded light green. It is surrounded by eight cells, each with a green border and a bold green value: top (0.84), bottom (0.72), left (0.72), right (0.84), top-left (0.7), top-right (0.6), bottom-left (0.5), and bottom-right (0.7). A vertical double-headed arrow between the central cell and the top cell is labeled $d=1$.

Growth simulation: 2D example

0.6	0.6	0.6	0.4	0.3
0.6	0.84	0.84	0.72	0.4
0.5	0.72	0.8	0.84	0.5
0.4	0.5	0.72	0.7	0.6
0.3	0.4	0.4	0.6	0.5

Growth simulation: 2D example

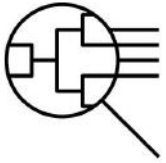
0.6	0.66	0.6	0.4	0.3
0.66	0.924	0.84	0.72	0.4
0.5	0.72	0.8	0.672	0.5
0.4	0.5	0.576	0.7	0.48
0.3	0.4	0.4	0.48	0.5

Growth simulation: Final Result

Add growth gif

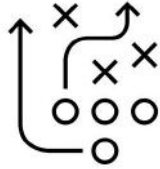
Overview

Design Planning



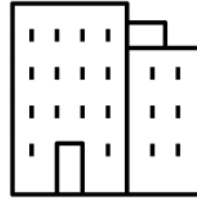
Site investigation
Vision & principles
Stakeholder analysis

Design Process



Plan distribution
Implementation
Design iterations

Final Product



Facade
Section & floor plan
Urban view

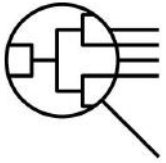
Reflection



Stakeholder alignment
Limitations
For future studies

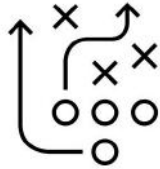
Overview

Design Planning



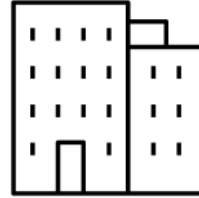
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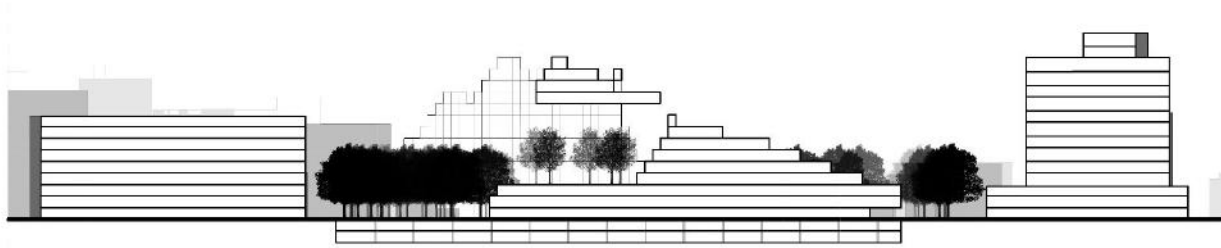


Stakeholder alignment
Limitations
For future studies

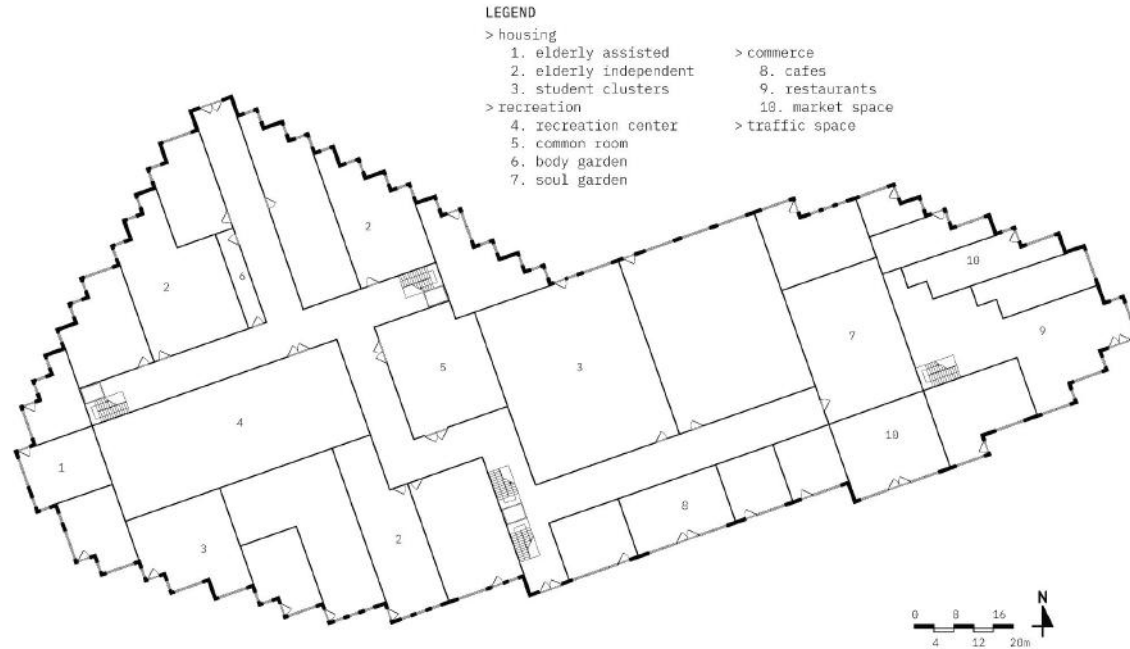
Urban floor plan 1:500



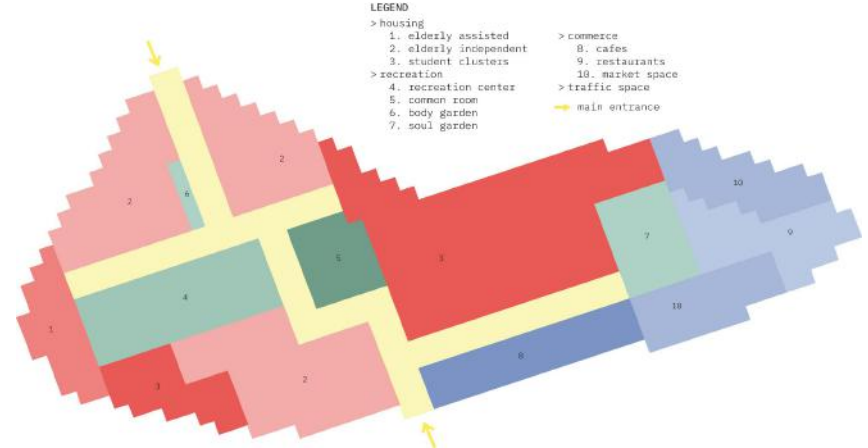
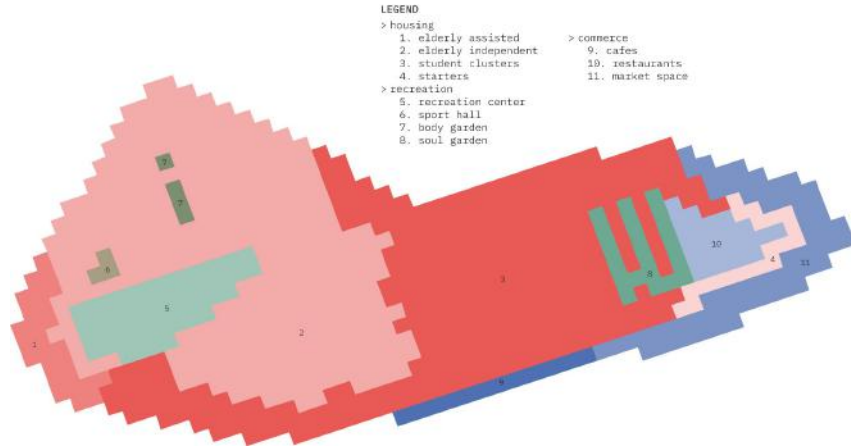
Section 1:500



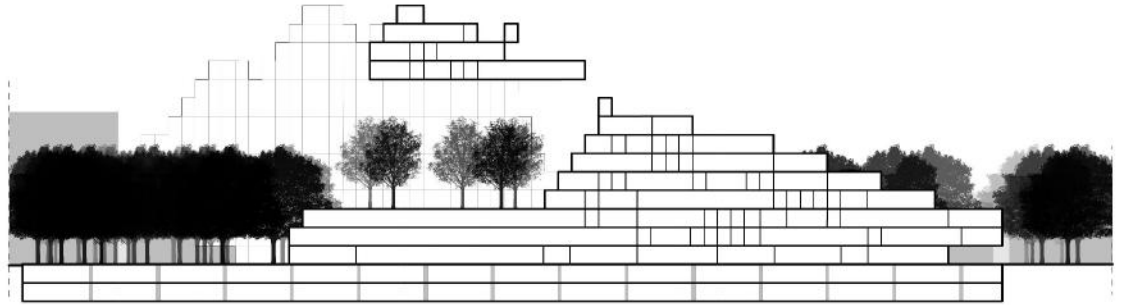
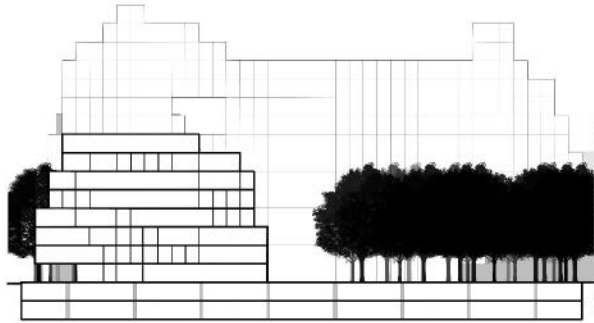
Indoor floor plan 1:200



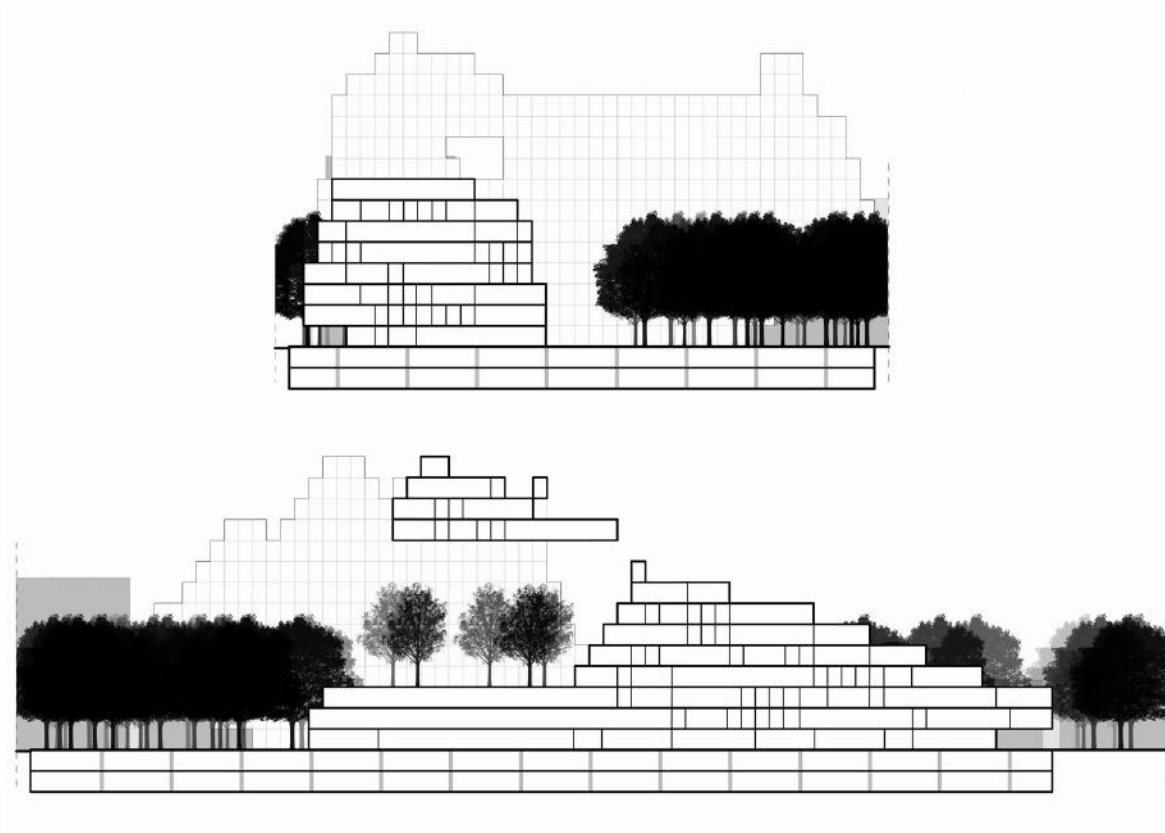
Computer VS Designers



Sections 1:200



Function analysis



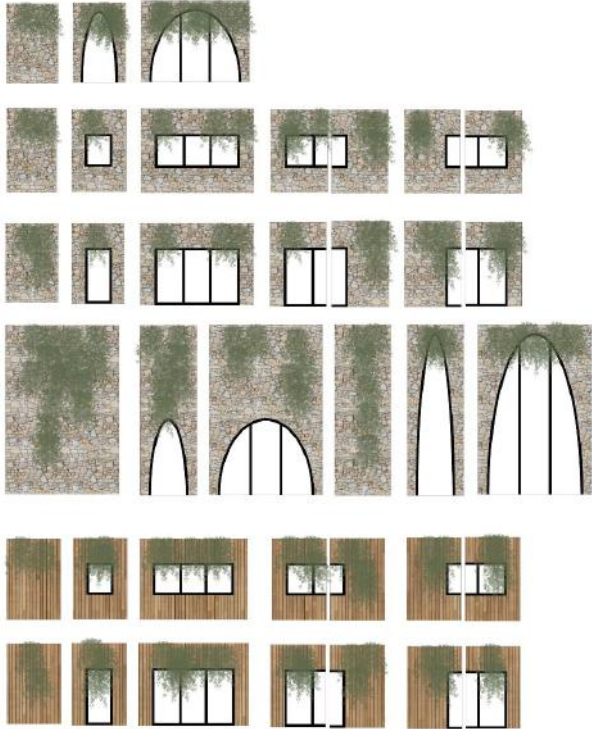
Perspective



View



Elements



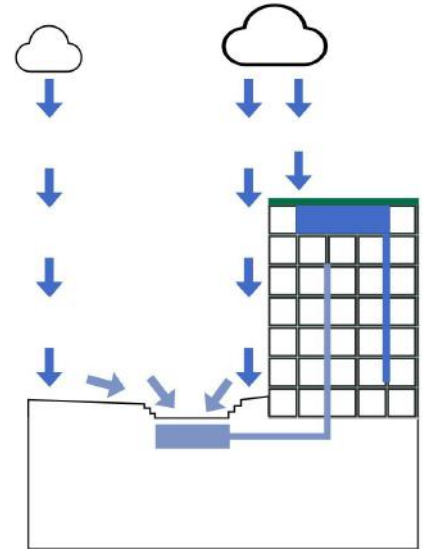
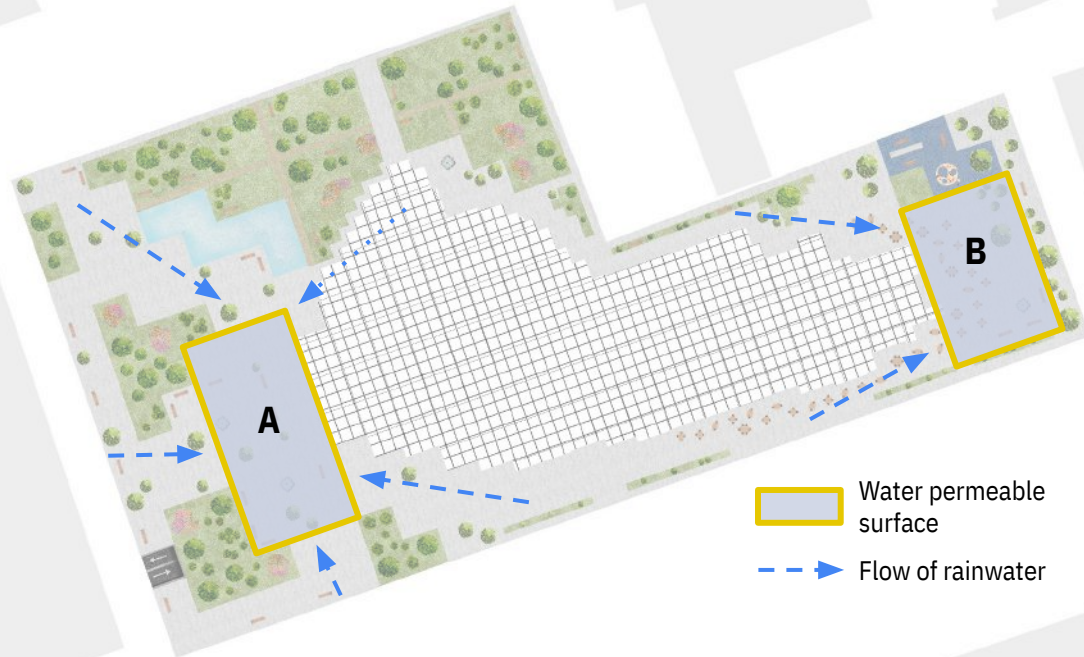
Greenery // Public space



Greenery // Façade and roof

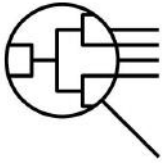


Water Harvesting



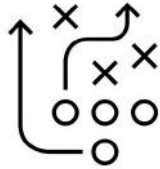
Overview

Design Planning



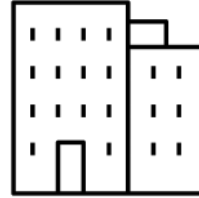
Site investigation
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Urban view

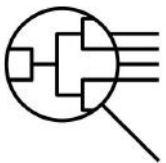
Reflection



Stakeholder alignment
Limitations
For future studies

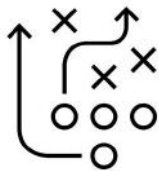
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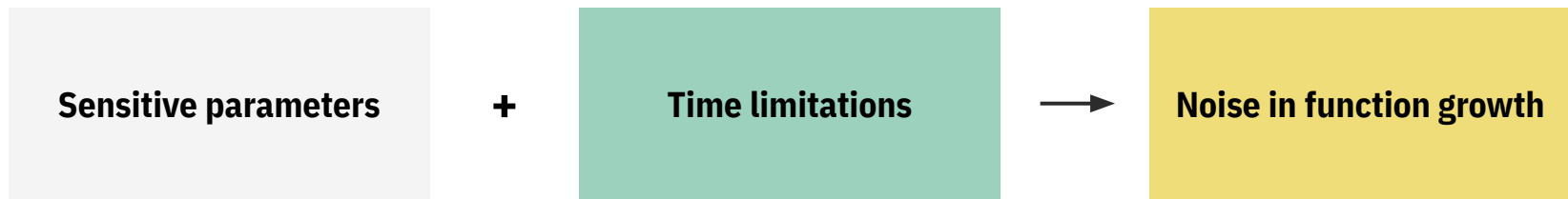
Façade
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Reflection



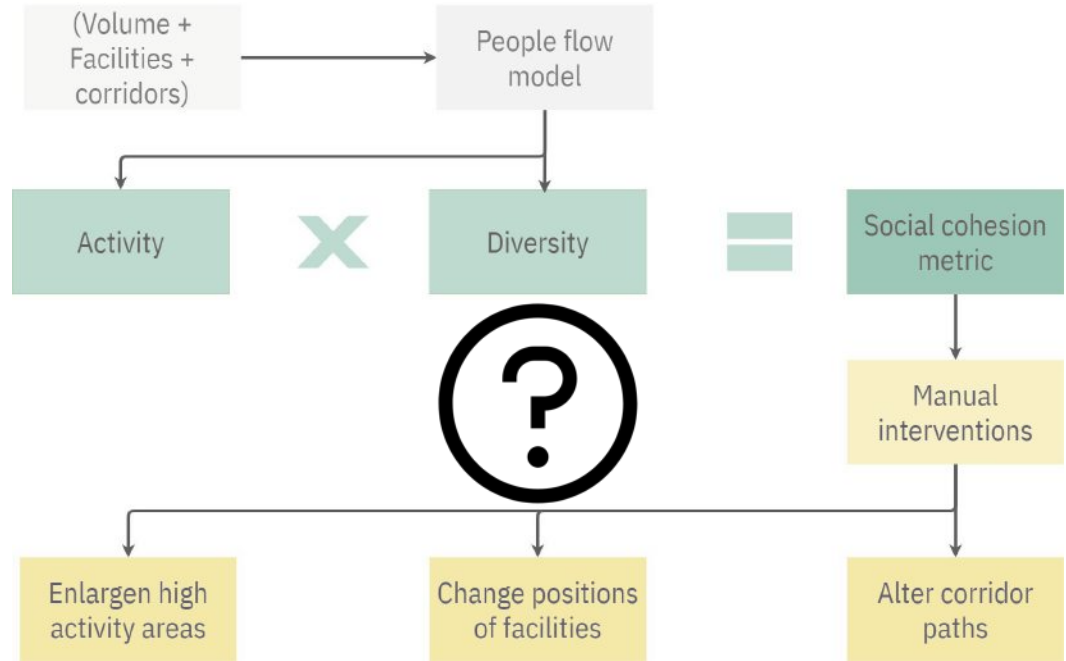
Stakeholder alignment
Limitations
For future studies

Growth simulation | Reflection

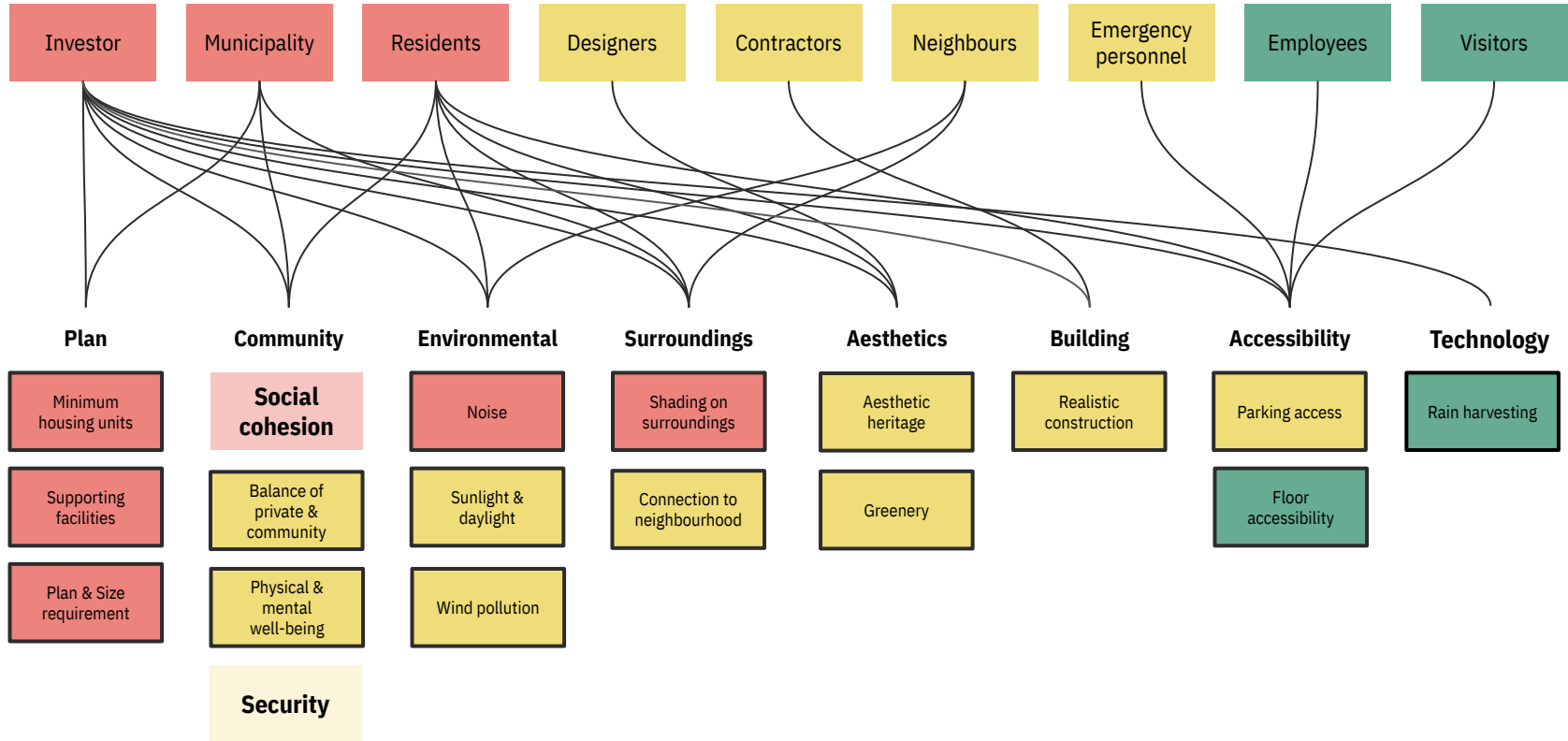


Social Cohesion model | Reflection

**Addressing core vision of
Community:
Social Cohesion model**

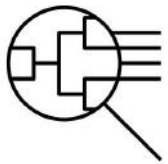


Stakeholder Alignment



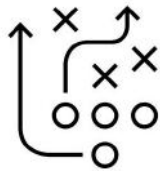
Overview

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Design Process



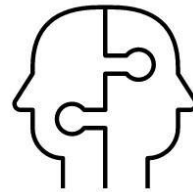
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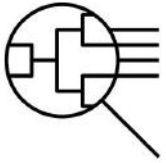
Reflection



Stakeholder alignment
Limitations
For future studies

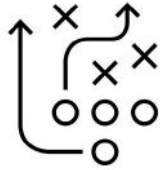
Questions Round

Design Planning



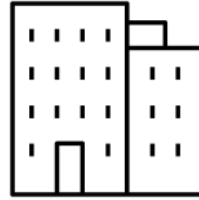
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