

“Towards sustainable built environment through integrating disciplines”

Knowledge-based construction in 2024
8.10.2024, Tallinn, Estonia

Tallinn University of Technology,
Ministry of Climate, EKVÜ and EE

Lundén Architecture Company
Eero Lunden


Strategic
Development


Zero Carbon
Environments

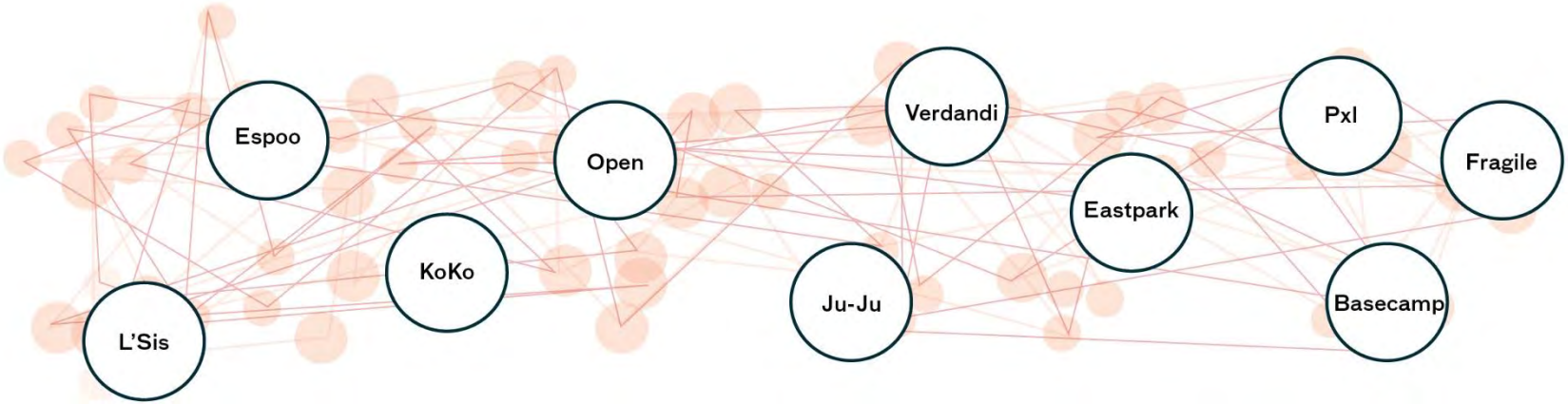

Wellbeing and
Spaces


Sustainable
Living

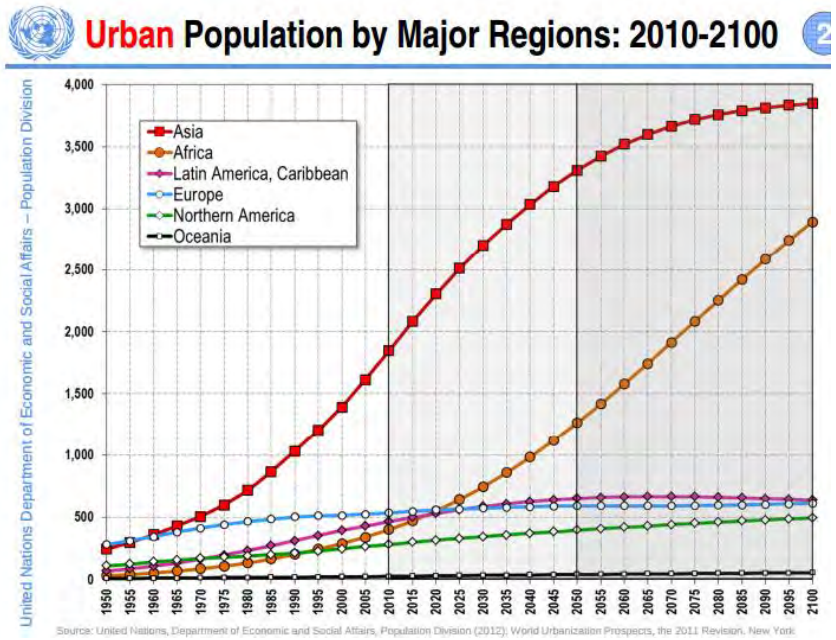

New
Typologies

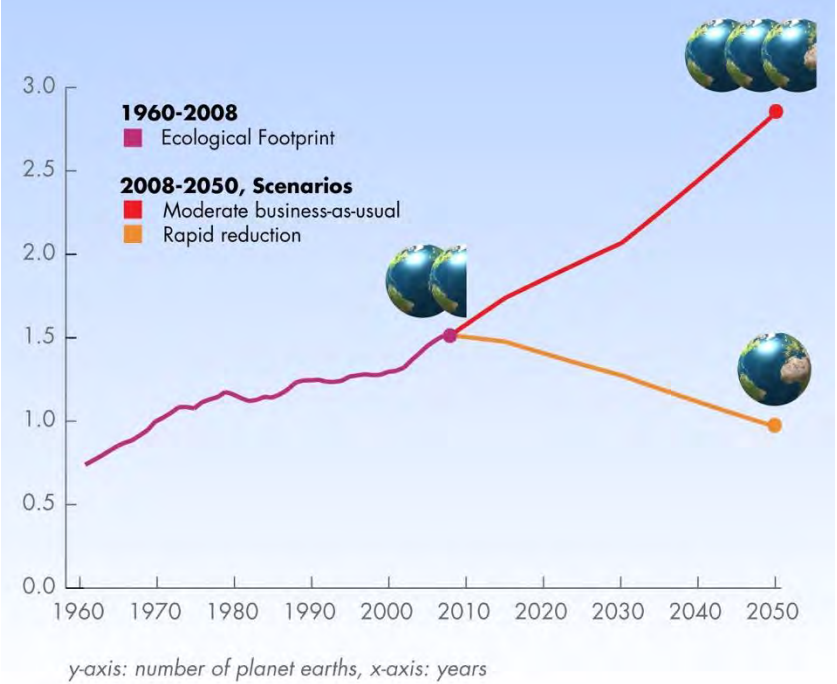

New
Technologies



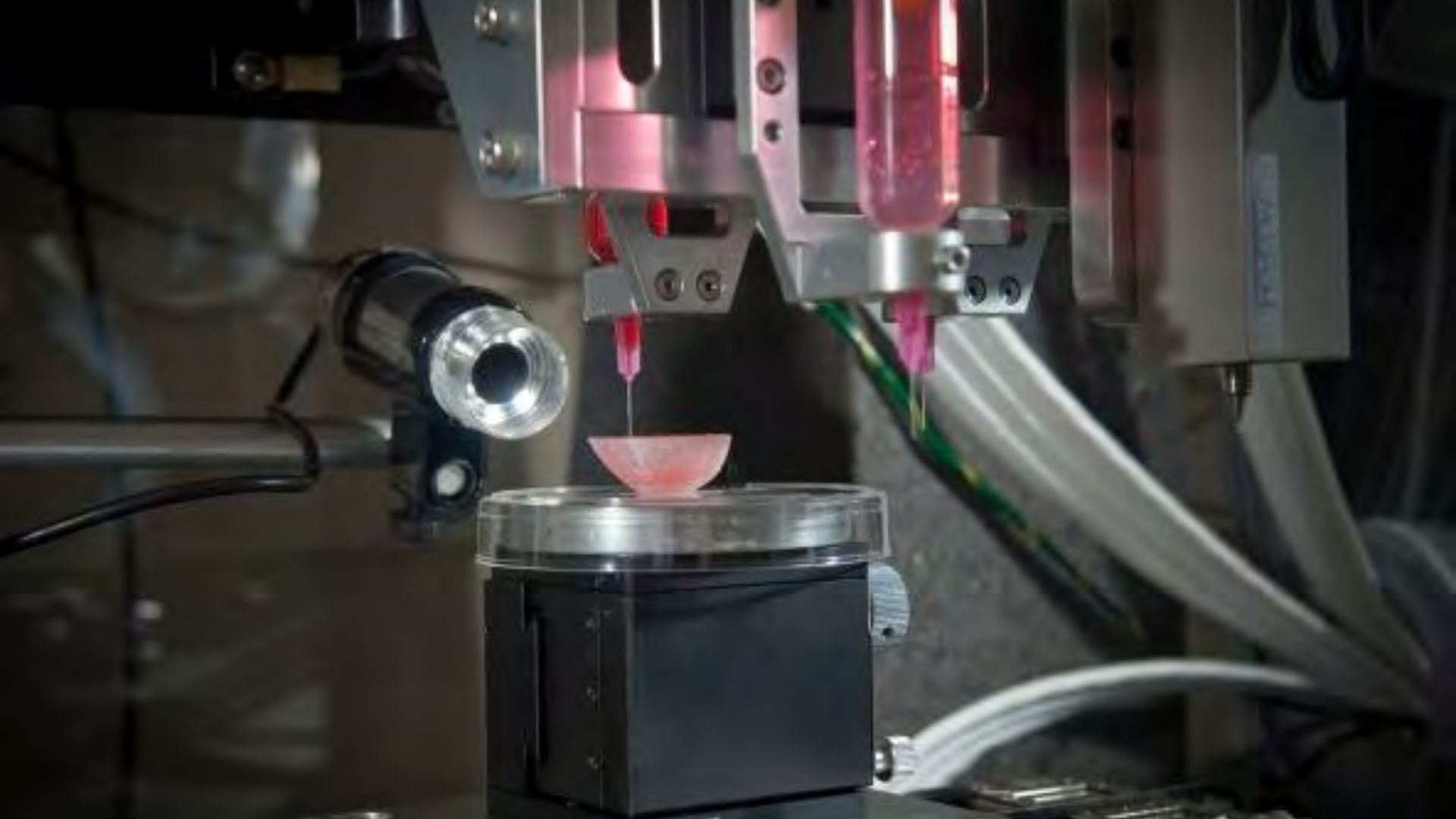

Espoo
Open
Verdandi
Pxl
Fragile
Eastpark
KoKo
L'Sis
Ju-Ju
Basecamp



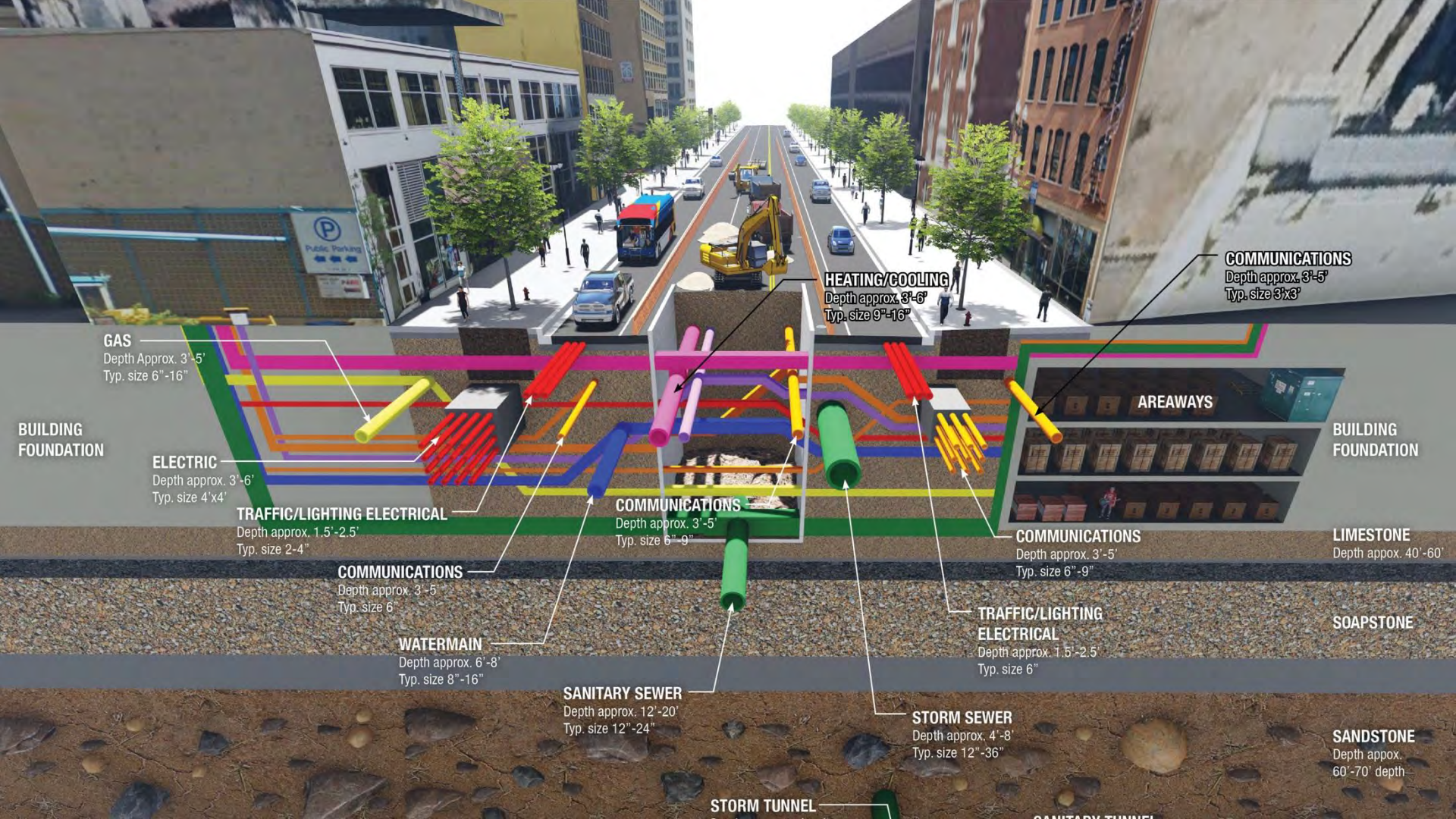

Urban Population by Major Regions: 2010-2100
United Nations Department of Economic and Social Affairs – Population Division
Asia
Africa
Latin America, Caribbean
Europe
Northern America
Oceania
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080 2085 2090 2095 2100
Source: United Nations, Department of Economic and Social Affairs, Population Division (2012): World Urbanization Prospects, the 2011 Revision. New York


1960-2008
Ecological Footprint
2008-2050, Scenarios
Moderate business-as-usual
Rapid reduction
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1960 1970 1980 1990 2000 2010 2020 2030 2040 2050
y-axis: number of planet earths, x-axis: years


amazon
PrimeAir
amazon
PrimeAir





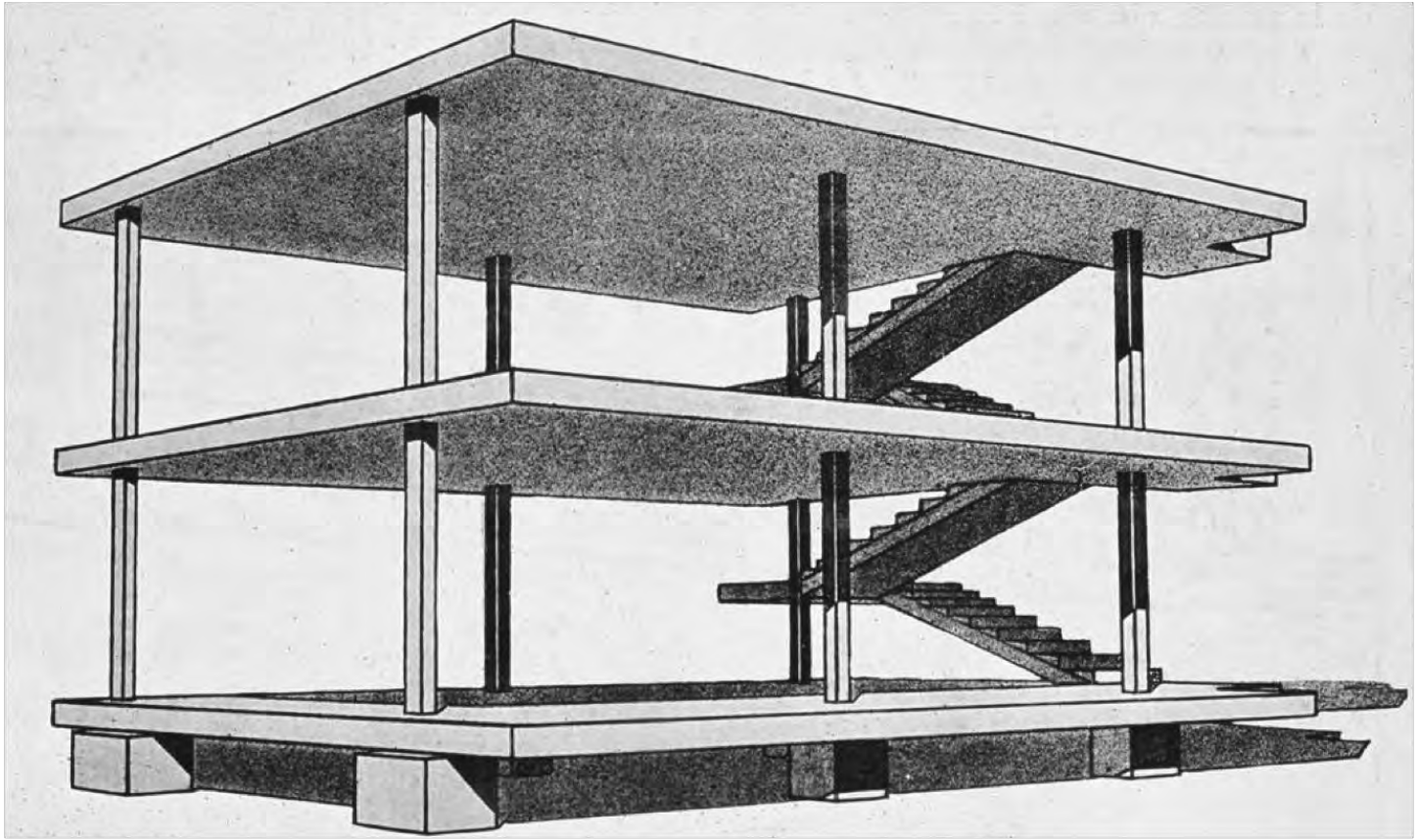

GAS
Depth Approx. 3'-5'
Typ. size 6"-16"
BUILDING FOUNDATION
ELECTRIC
Depth approx. 3'-6'
Typ. size 4'x4'
TRAFFIC/LIGHTING ELECTRICAL
Depth approx. 1.5'-2.5'
Typ. size 2-4"
COMMUNICATIONS
Depth approx. 3'-5'
Typ. size 6"
WATERMAIN
Depth approx. 6'-8'
Typ. size 8"-16"
SANITARY SEWER
Depth approx. 12'-20'
Typ. size 12"-24"
HEATING/COOLING
Depth approx. 3'-6'
Typ. size 9"-16"
COMMUNICATIONS
Depth approx. 3'-5'
Typ. size 6"-9"
STORM SEWER
Depth approx. 4'-8'
Typ. size 12"-36"
STORM TUNNEL
COMMUNICATIONS
Depth approx. 3'-5'
Typ. size 3'x3'
AREAWAYS
BUILDING FOUNDATION
COMMUNICATIONS
Depth approx. 3'-5'
Typ. size 6"-9"
TRAFFIC/LIGHTING ELECTRICAL
Depth approx. 1.5'-2.5'
Typ. size 6"
LIMESTONE
Depth appox. 40'-60'
SOAPSTONE
SANDSTONE
Depth appox.
60'-70' depth


swissôtel


ERANOT
Bar
UTAMOH





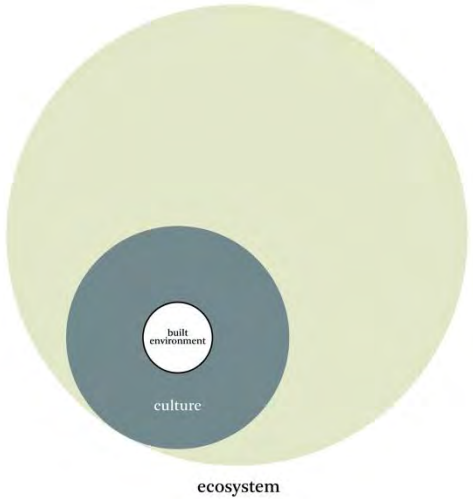


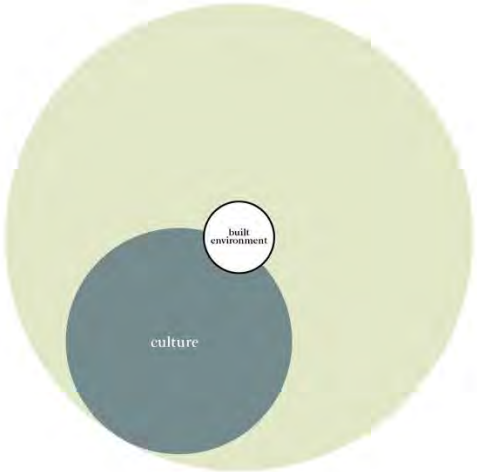







RAM
TopSpeed


built
environment
culture
ecosystem



ecosystem

The shift
a building = *an organism of the ecosystem inhabited and utilized by people*

1. What is a building?

Questioning the fundamentals to find new frontiers

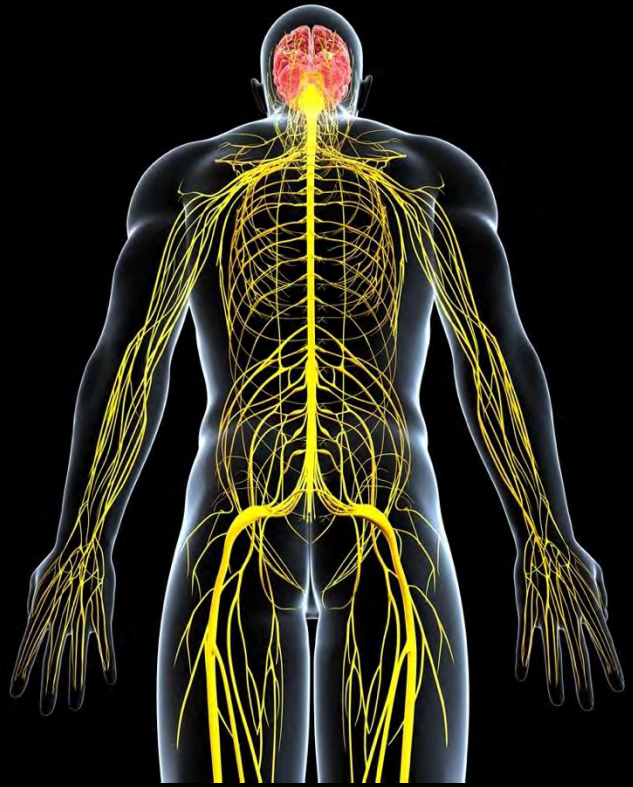

What is a building?

1. Ventilation
2. Water
3. Waste Handling
4. Energy Production
5. Temperature Control
6. Control Systems
7. Structure
8. Spatial Elements

1. Ventilation
2. Water
3. Waste Handling
4. Energy Production
5. Temperature Control
6. Control Systems
7. Structure
8. Spatial Elements



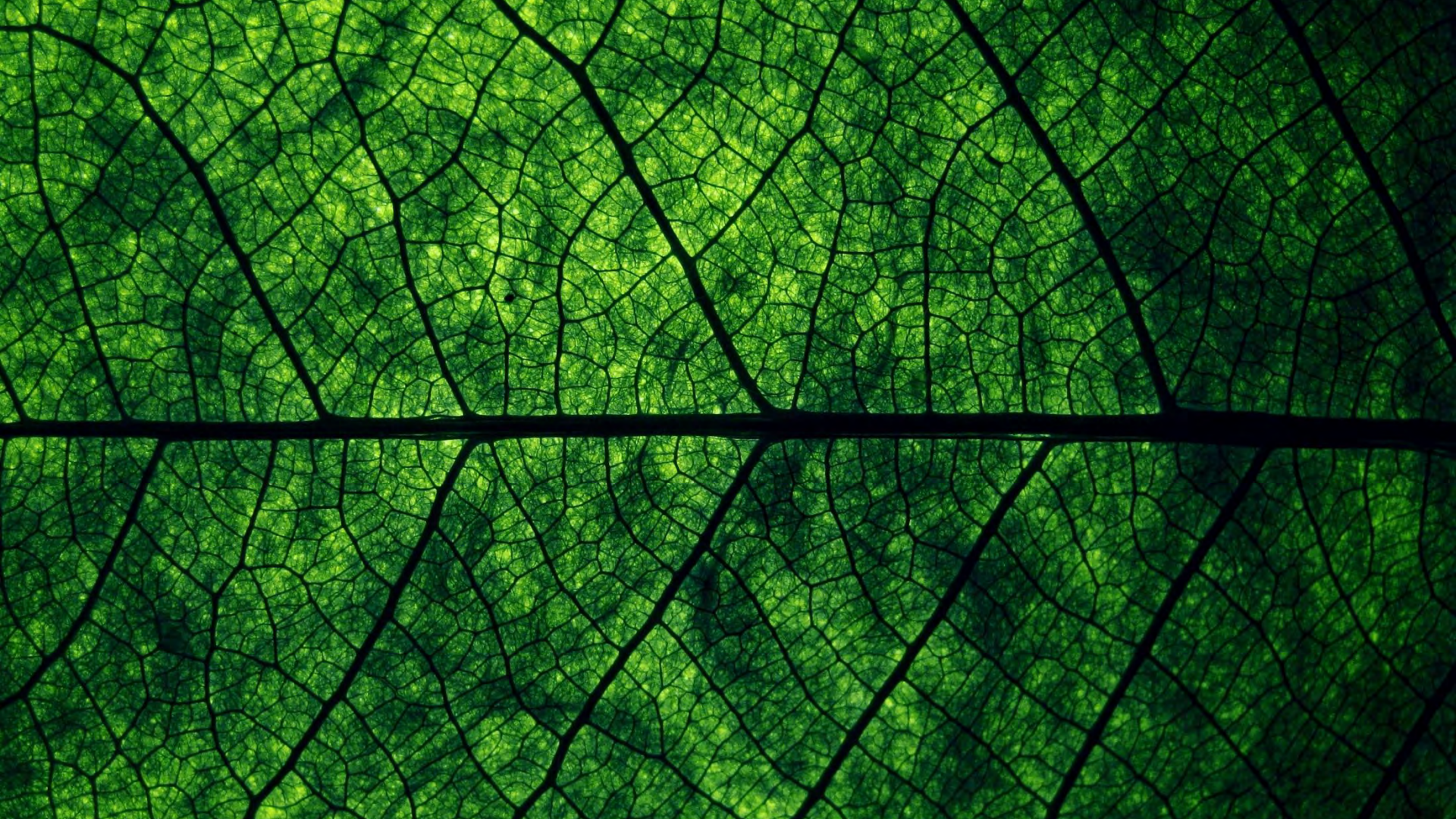

Architecture?

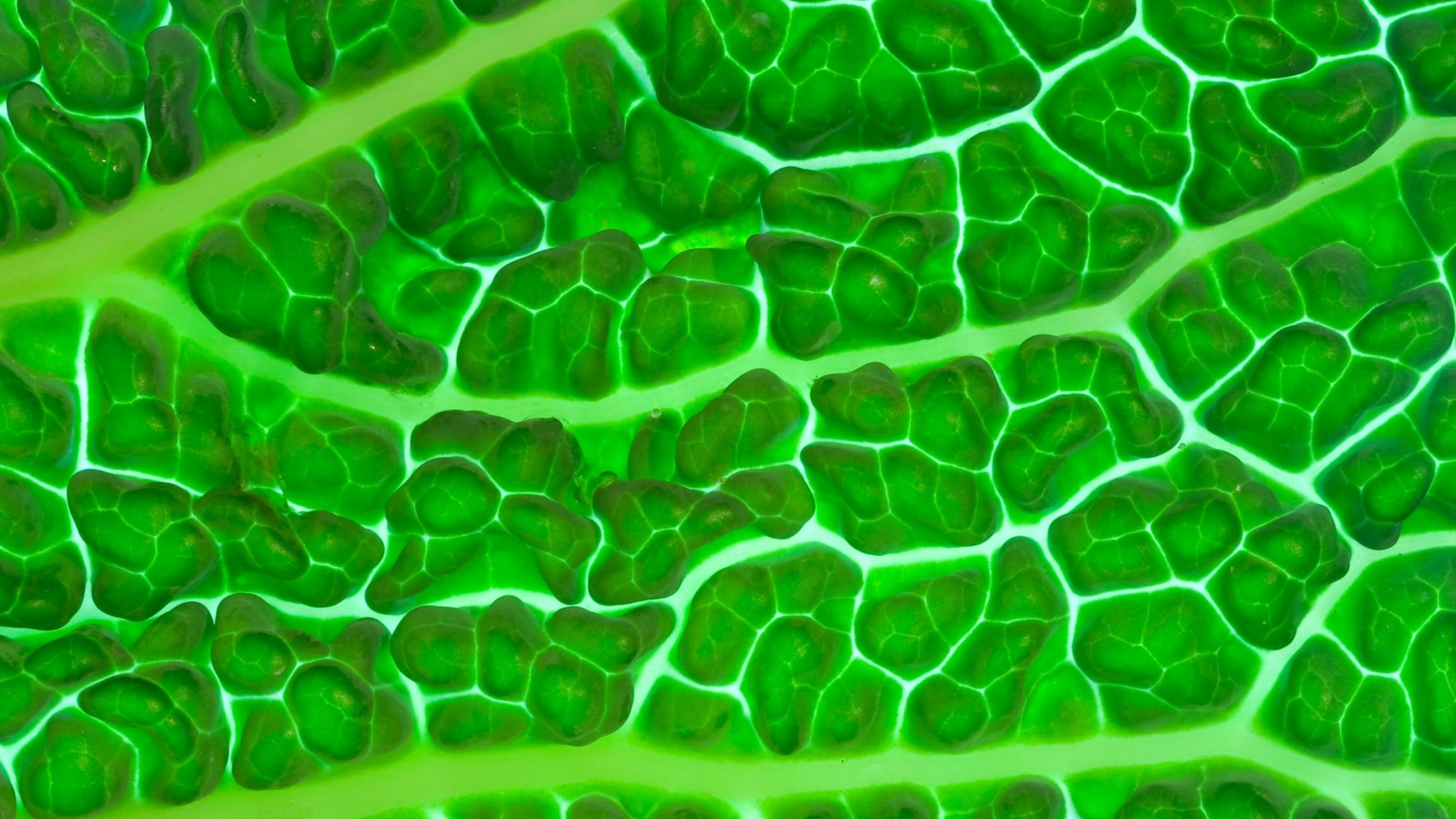




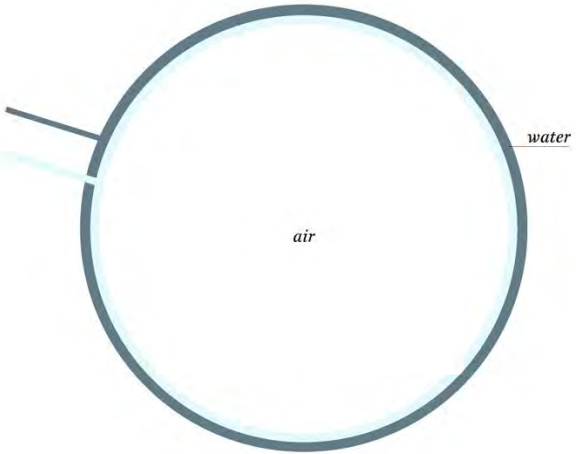




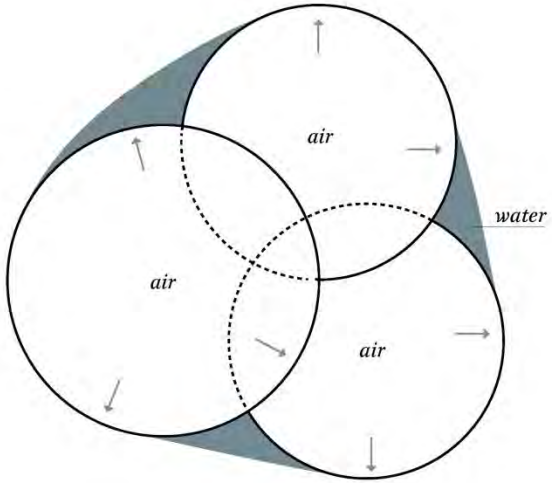





1. Ventilation
2. Water
3. Waste Handling
4. Energy Production
5. Temperature Control
6. Control Systems
7. Structure
8. Spatial Elements

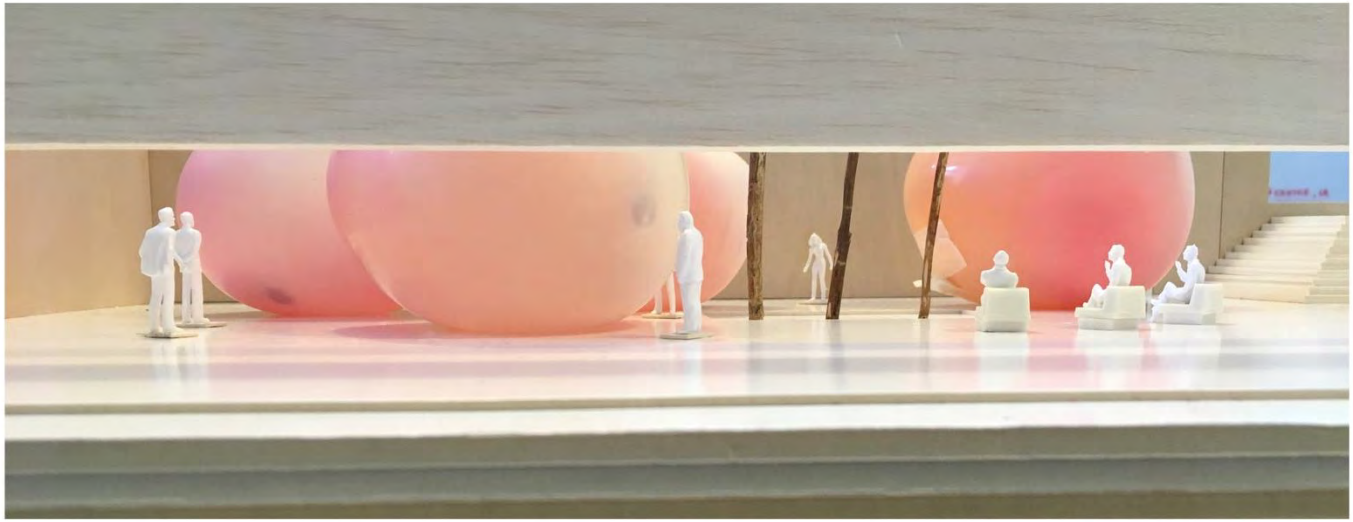


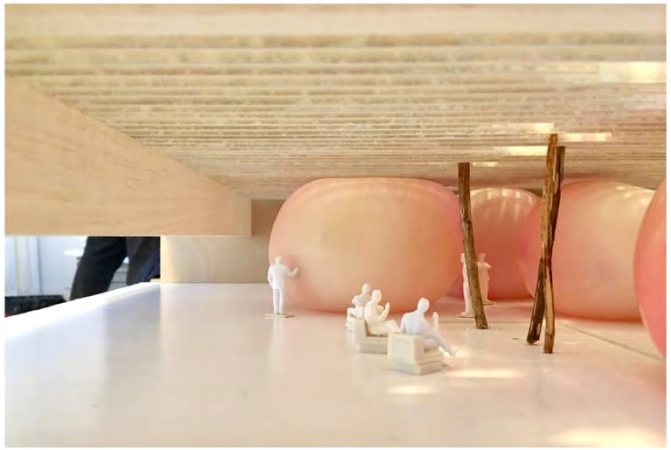
conceptual sketch
simple structure constructed from air and water

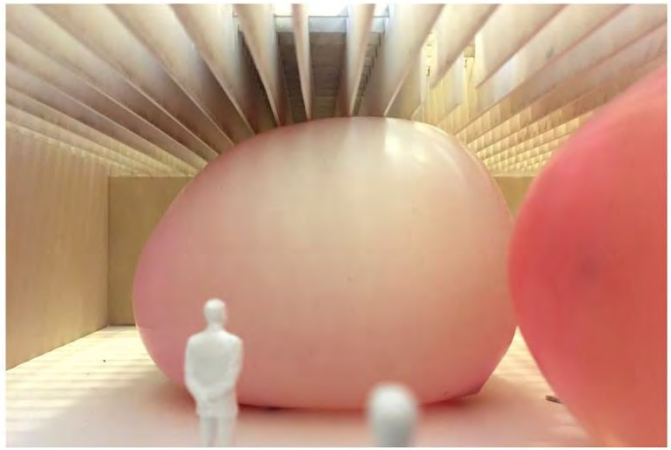


element concept
a visible and dynamic cellular structure

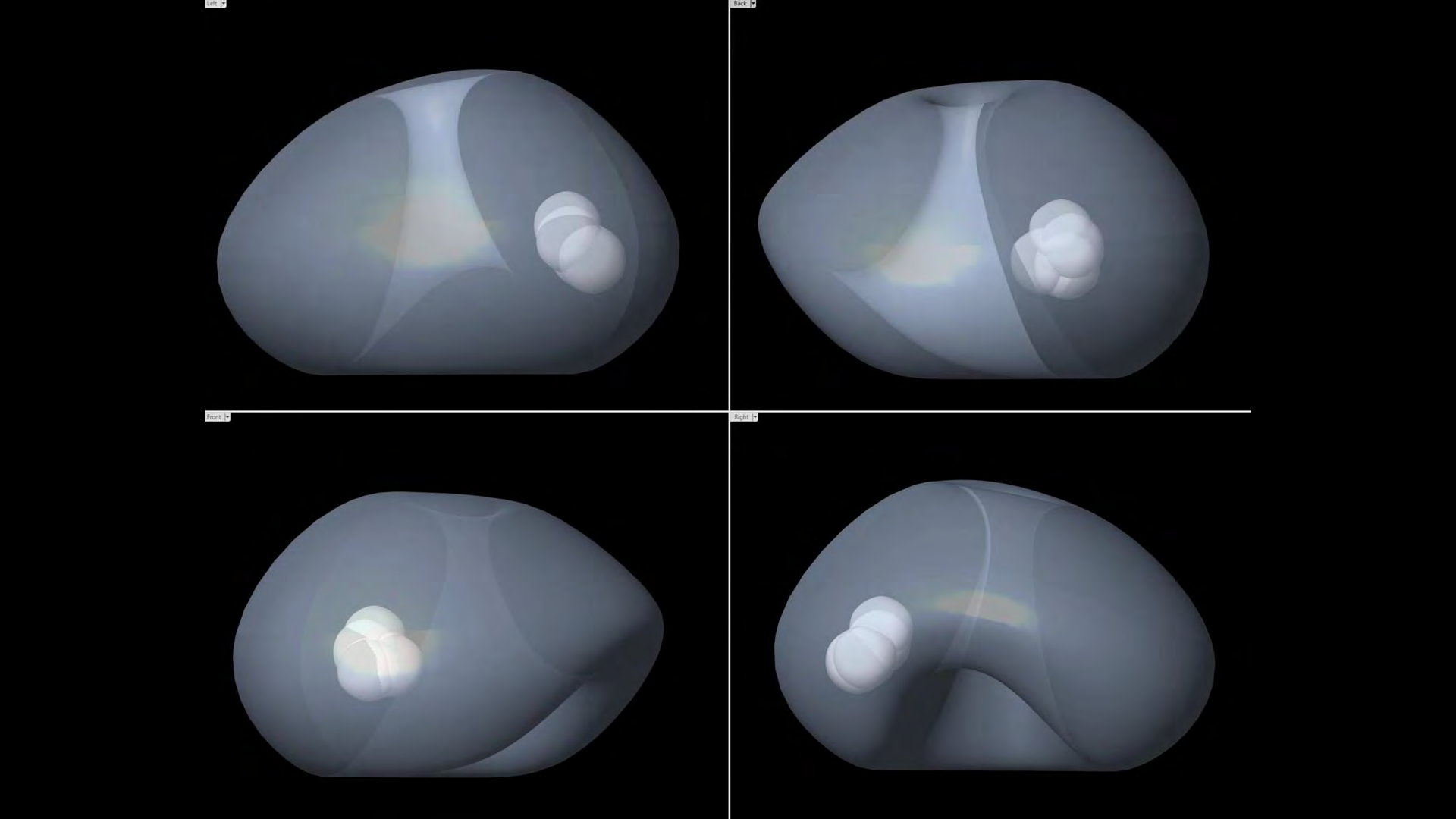








Study models


Left
Back
Front
Right

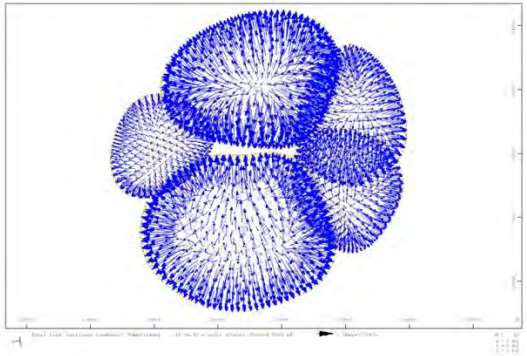


Figure 24: Inner Membrane 04 (Air Pressure – 350Pa)

2.5.4 Membrane 04-Outer Balloon Loading

```
*prog asa gid:1
HEAD
$define radi=1.5  $ m
$define druck=0.2  $ kN/m2
CTRL WARN 197
CTRL SOLV 4
SYST PROB TH3 NMAT YES $col -1 col4 -2 col5 -1       $ 4 NMAT YES not really necessary for
*VOLU NO 1 DEF 1 V0  4*(pi*$[radi]**3)/3  PU 1(outer)  OPT 'full'       $V0  4*$(radi
LC 1 DS2 0 'LT1 \'membrane'
END
```

Figure 25: Outer Membrane 04 (Air Pressure – 200Pa)

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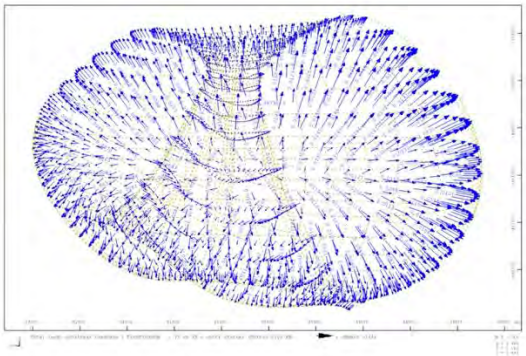
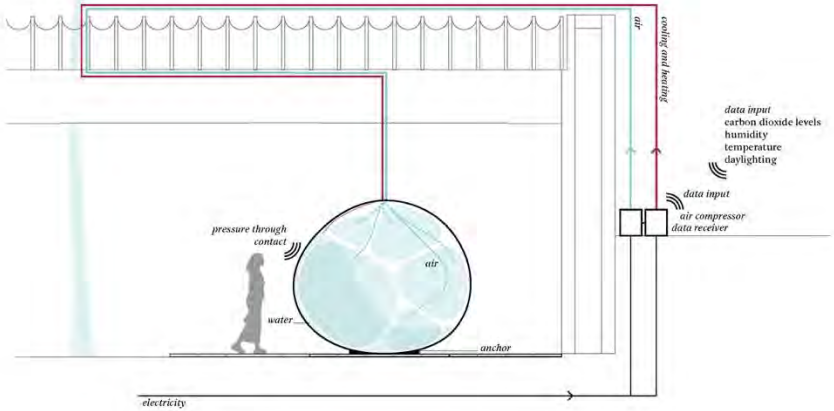


Figure 26: Outer Membrane 04 (Air Pressure – 200Pa)

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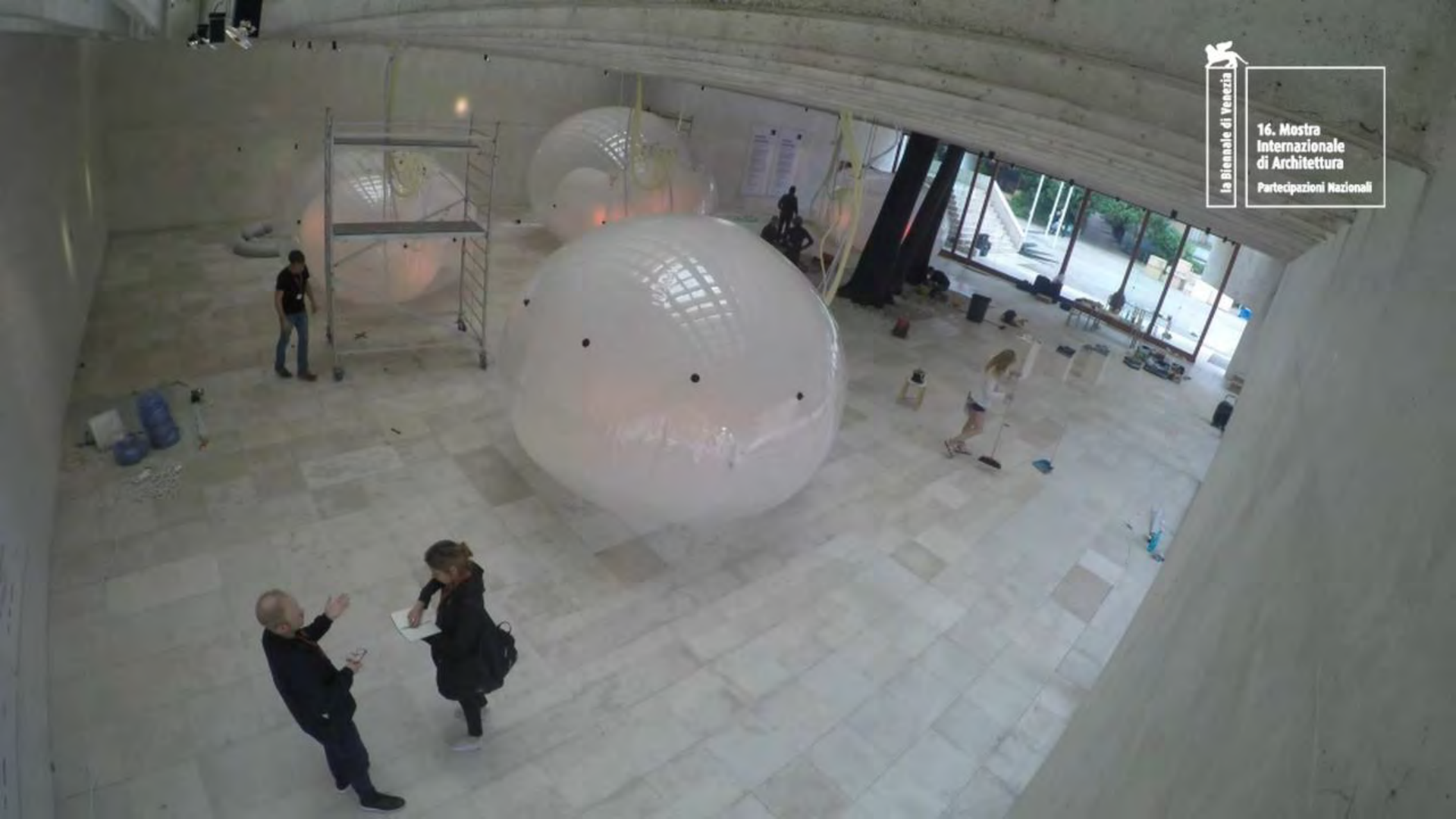
systems diagram
responsive elements heighten our awareness of our relationship with the environment


WATS


RR

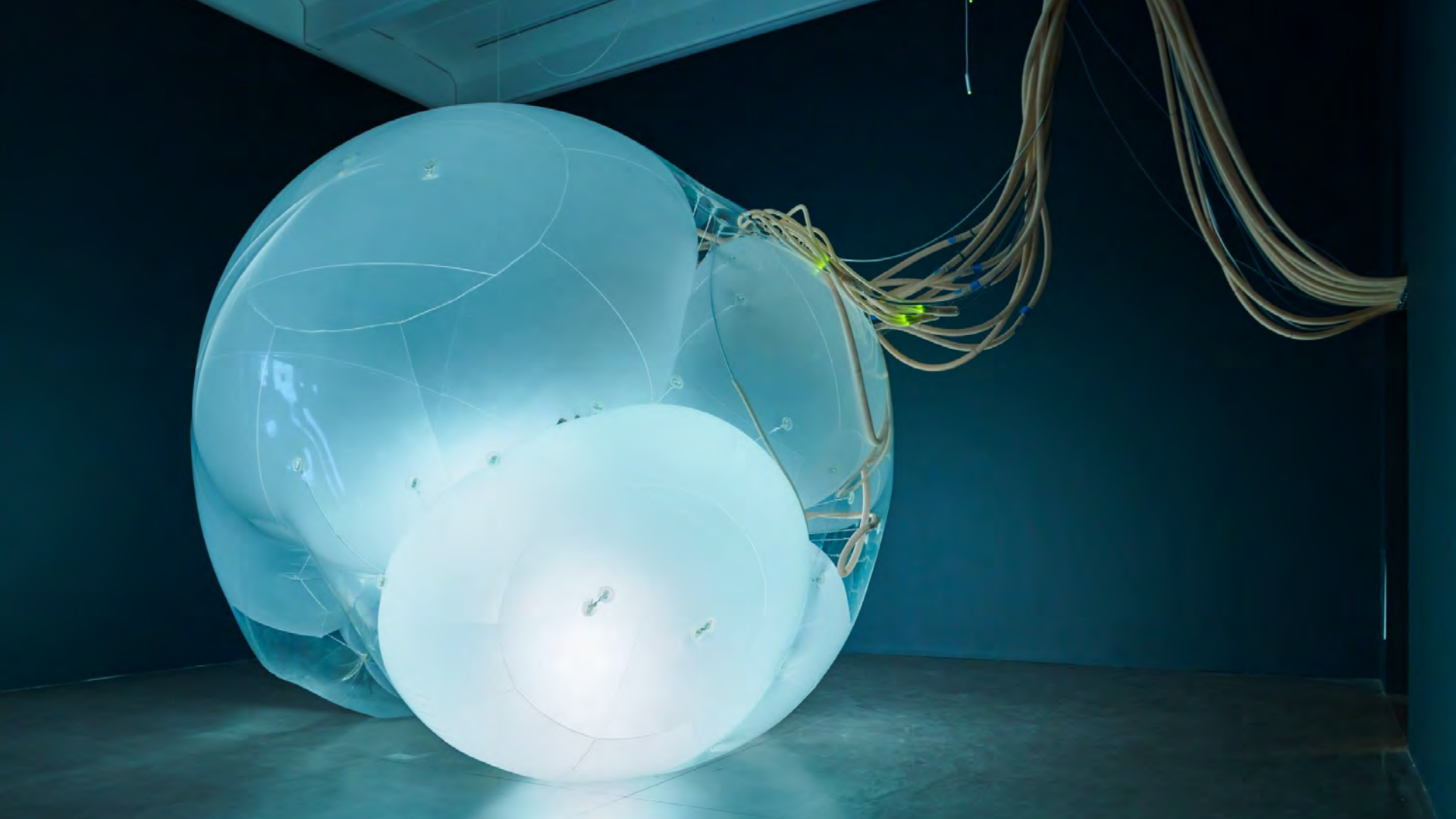



another


la Biennale di Venezia
16. Mostra
Internazionale
di Architettura
Partecipazioni Nazionali


another





2. How do we work together?

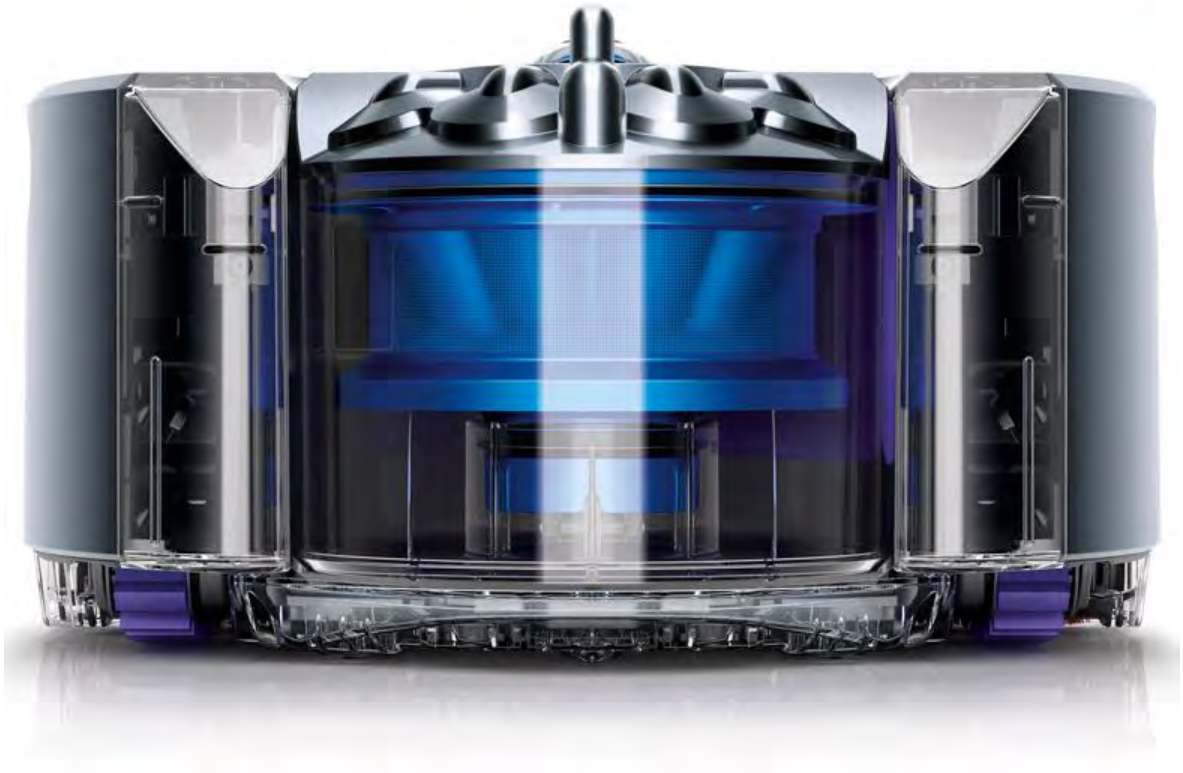
Innovation by integrating disciplines






LEONI
KUKA

1,3%



“Over £28 million has been invested in the 360 Eye, with more than 200 engineers contributing to its development over a period of 16 years. According to Dyson, the navigation system alone required a team of 31 robotic software engineers working for over 100,000 hours, taking into account algebra, probability theory, geometry and trigonometry, and a further £150 million was invested in the Dyson Digital Motor.”









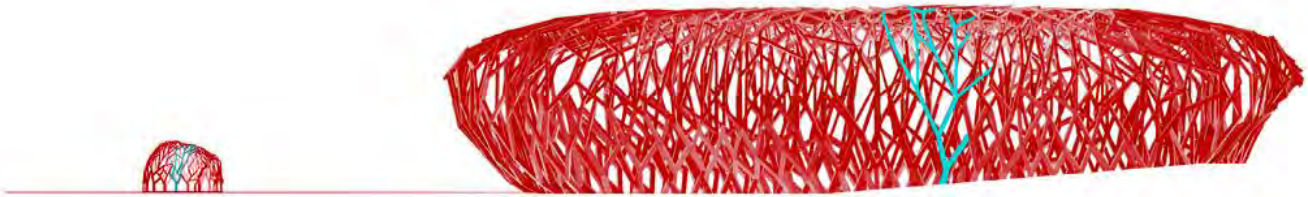






PAVILJONKI

STADION



DESIGN

ANALYSIS

TESTING /
MANUFACTURING

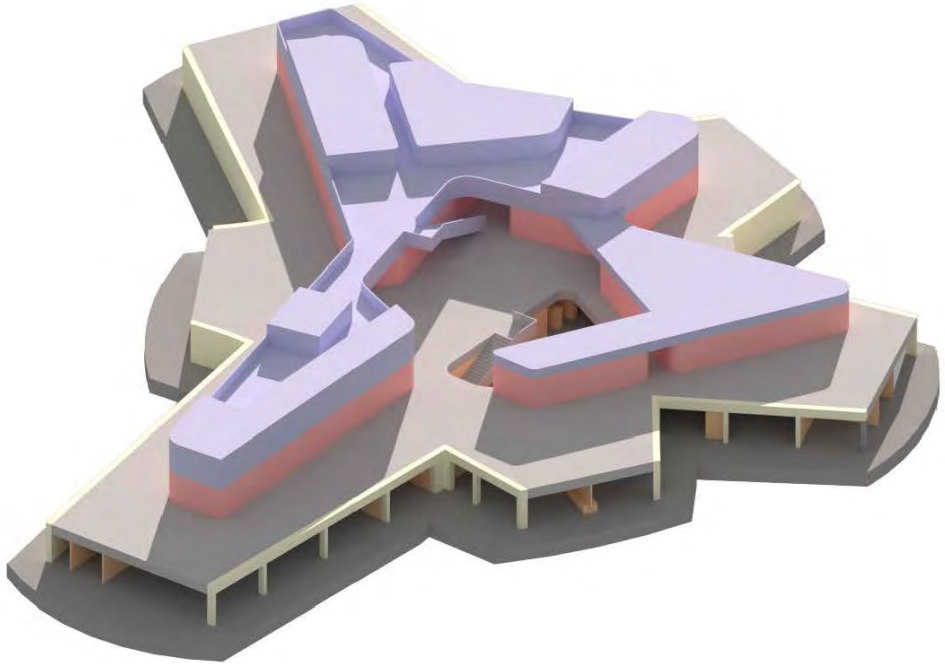
PROTOTYPE

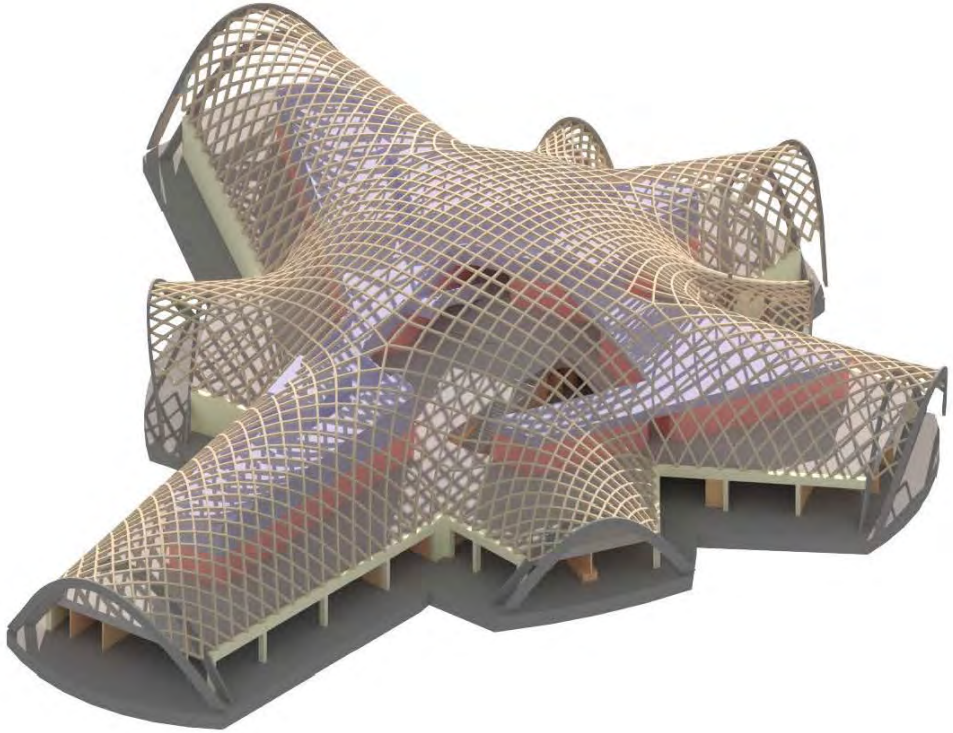
METHOD

STRUCTURAL
SYSTEMS /
BUILDINGS



















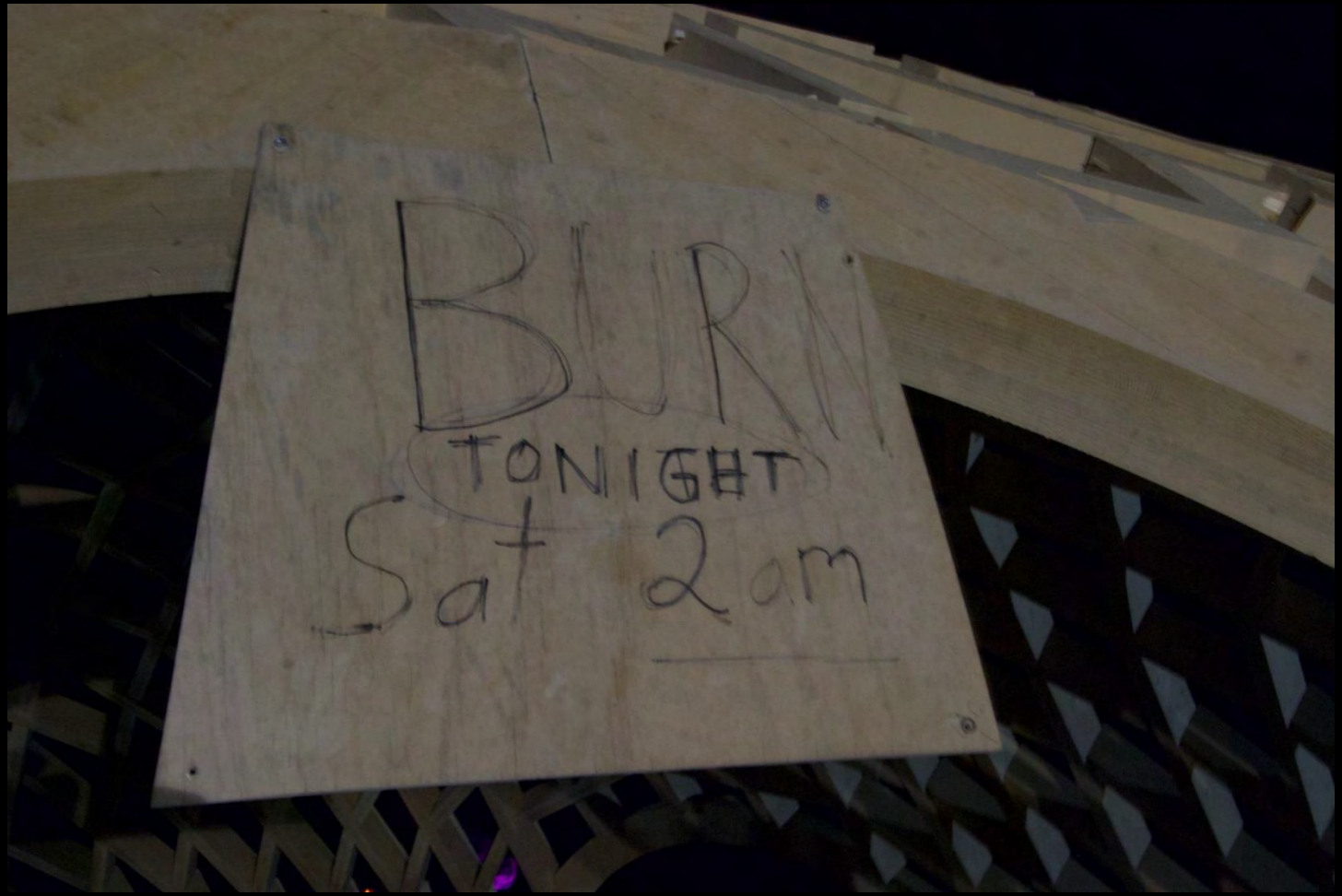










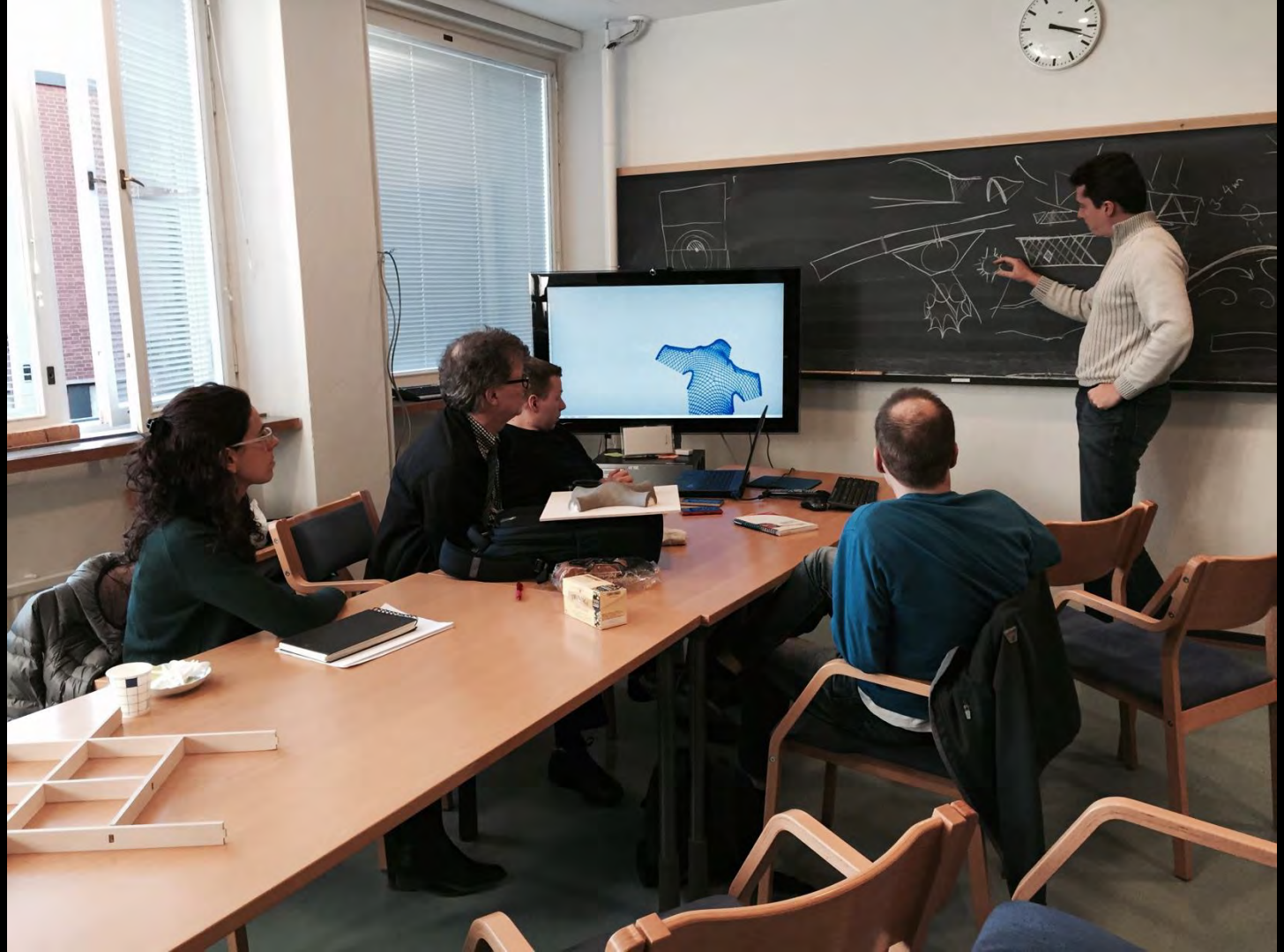

BURN
TONIGHT
Sat 2am

















3. Transforming the existing

From consuming to flourishing environments

ten

FDP



TWO WAYS TO GO

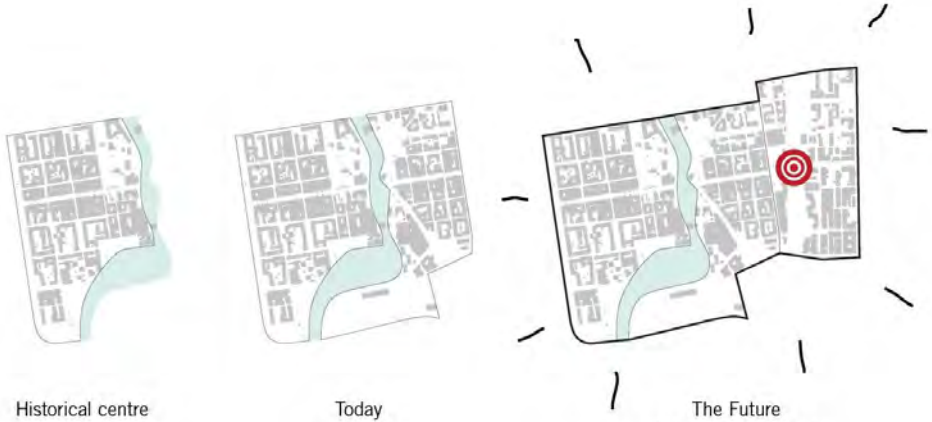


or



design a new station
+ buildings on the available plots

see the city centre as one entity that should be connected

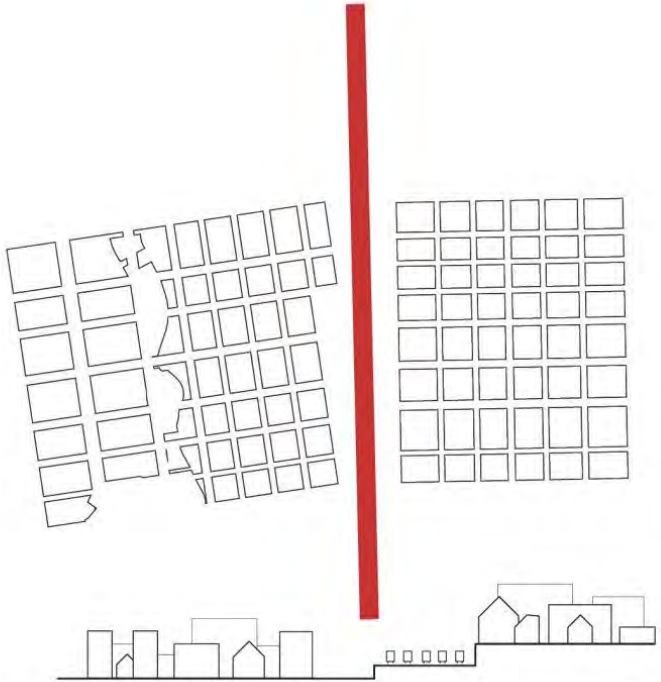


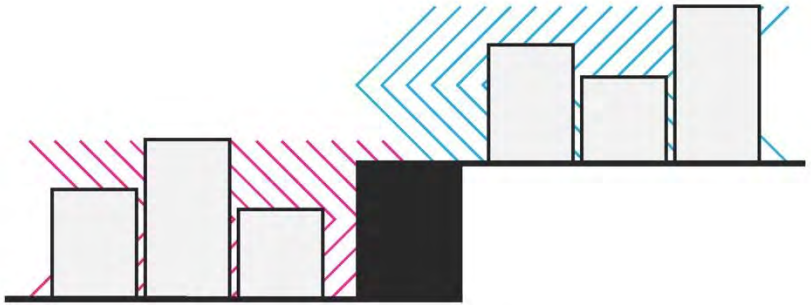
Historical centre

Today

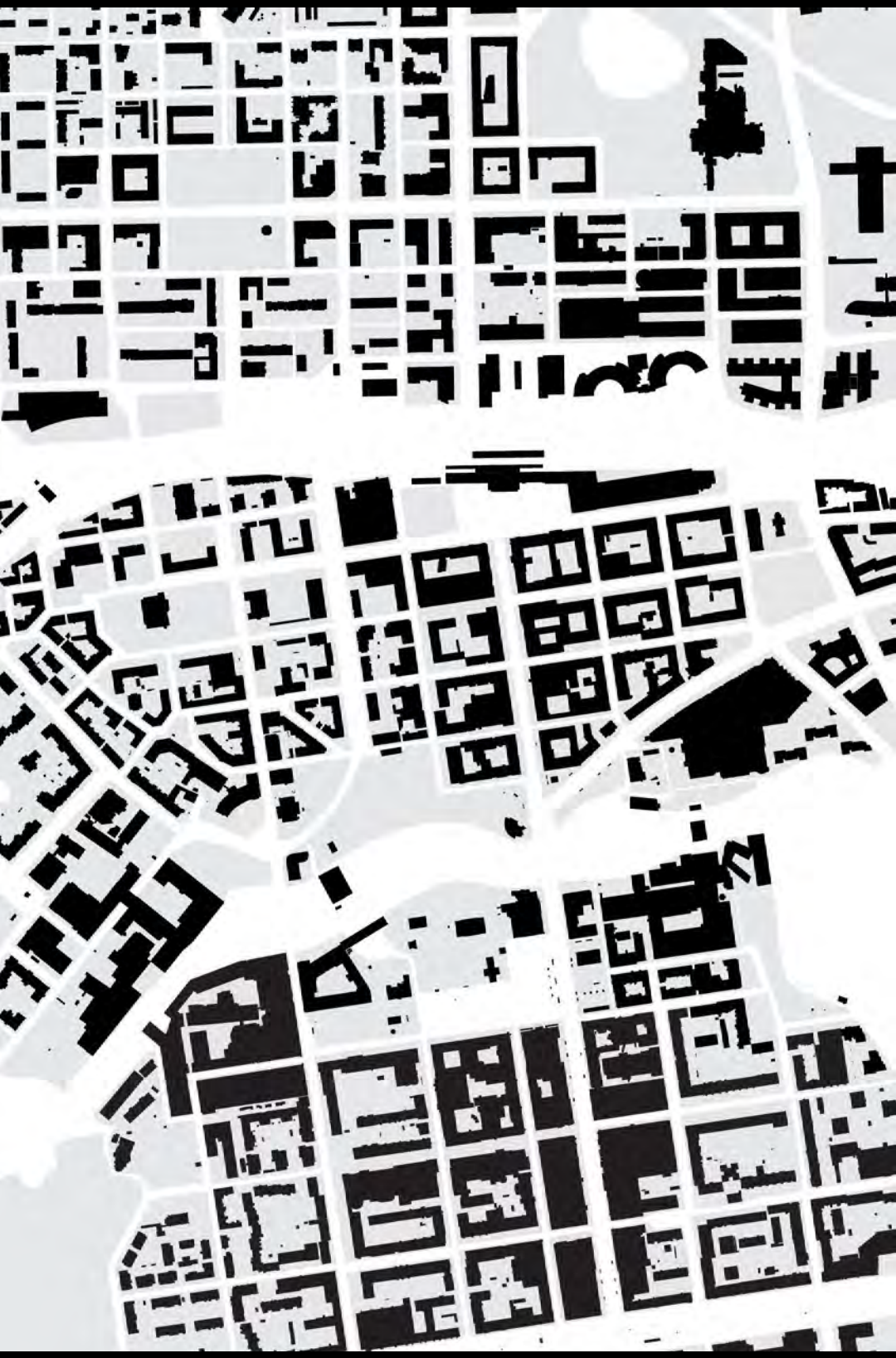
The Future
A united city centre







THE CONCEPT OF RECONNECTING





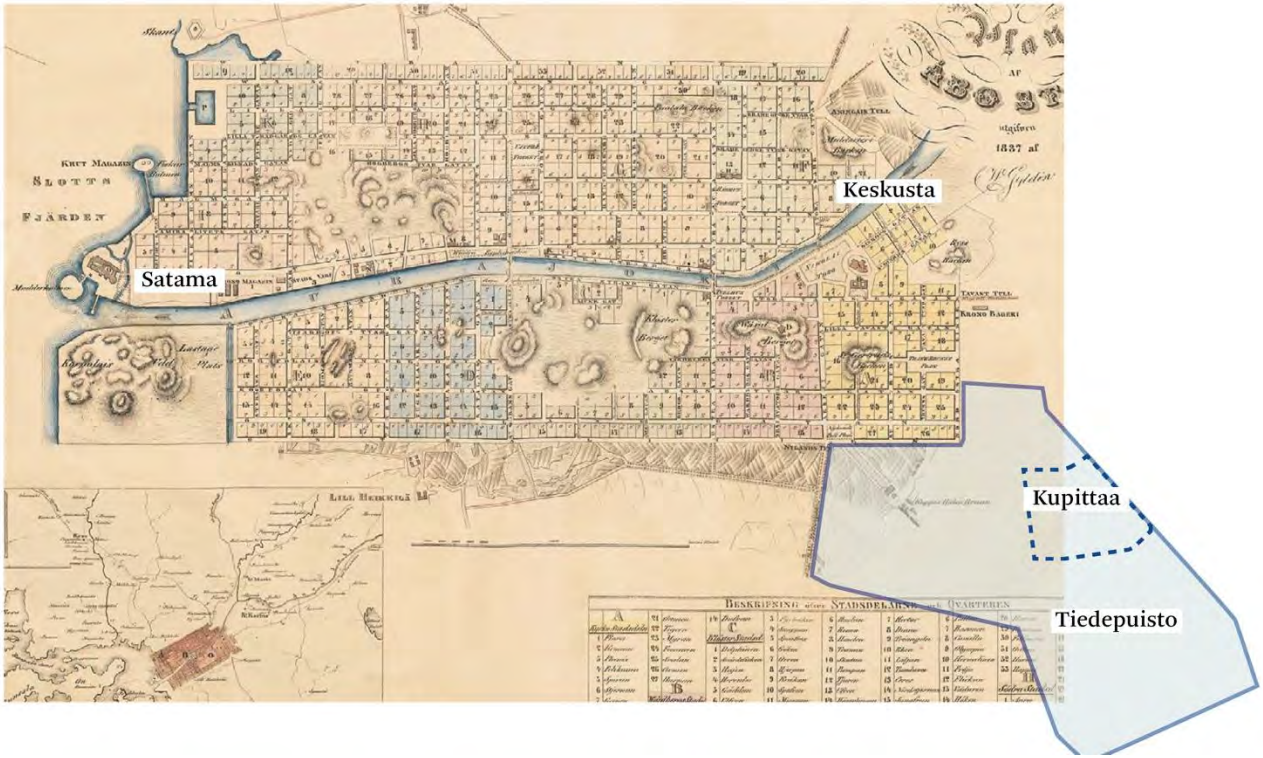











Keskusta
Satama
Kupittaa
Tiedepuisto


ÖSTERÅS
Kalevavägen
Fåbogatan
Ilmarinengatan
Akkupojat Åbo
Bilar99e Turku
Stålgatan
Fillaritalli Oy
Järngatan
Industrigatan
Hesburger
TOOLS Turku
Kuppis bollhall
Helsingfors riksväg
Lemminkäinengatans campus
Kalevarampen
Kalevantiensyrjäkuja
Ionkatu
EduCity
ParkCity (Aimo Park ParkCity)
Untamogatan
Google
Lager
2D




Kauppahalli


Kupittaa kuppis


KUPITTAA





Yhtenäinen viherverkosto

Olemassaolevien Kupittaan puiston ja Itäharjun puisto- ja virkistysalueiden kytkeminen uusilla viheralueilla.

Viheralueista kehitetään yhtenäinen verkosto ja niitä monipuolistetaan niin, että ne tukevat koko alueen biodiversiteetin kasvua



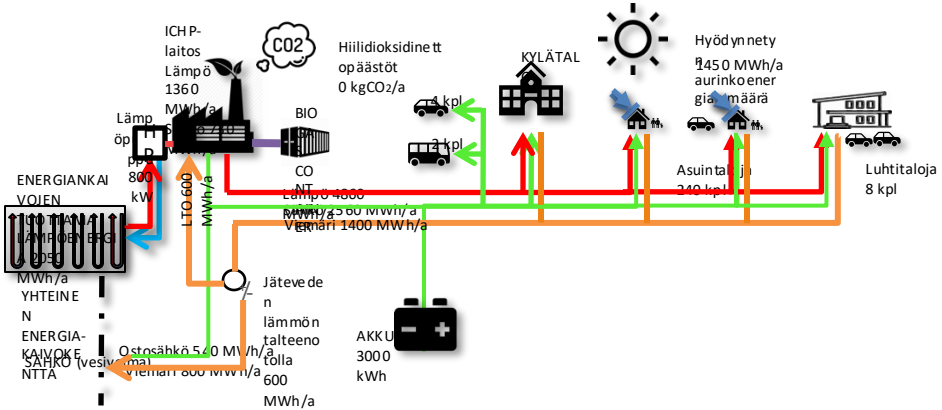






4. Integrating to ecosystem

Re-establishing symbiosis


ICHP-laitos
Lämpö 1360 MWh/a
Hiilidioksidinettopäästöt 0 kgCO2/a
CO2
BIO
CONT
Lämpö 4860 MWh/a
Sähkö 2360 MWh/a
Viemäri 1400 MWh/a
LTO 600 MWh/a
Jäteveden lämmöntalteenotolla 600 MWh/a
AKKU 3000 kWh
ENERGIANKAIVOJEN LÄMPÖPUMPPU LÄMPÖ 1360 MWh/a SÄHKÖ 680 MWh/a
YHTEINEN ENERGIA-KAIVOKENTTÄ
SÄHKÖ (vesivoima)
Ostosähkö 540 MWh/a
Viemäri 800 MWh/a
4 kpl
2 kpl
KYLÄTALO
Hyödynnetty 1450 MWh/a aurinkoenergiamäärä
Asuintaloja 240 kpl
Luhtitaloja 8 kpl







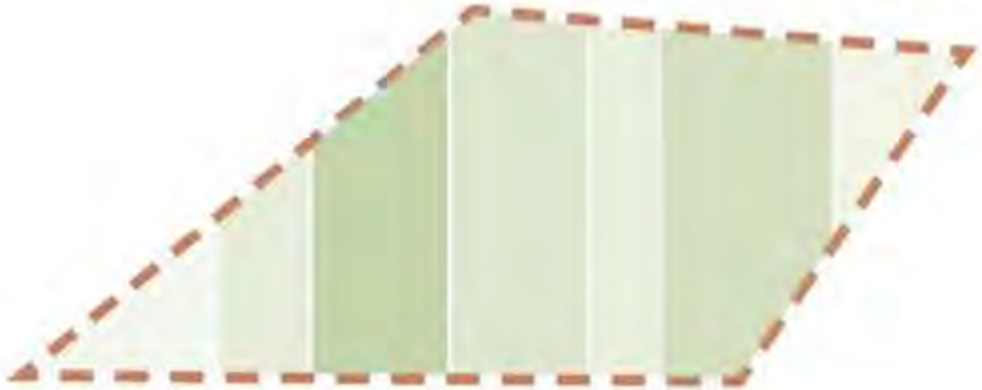


Green factor

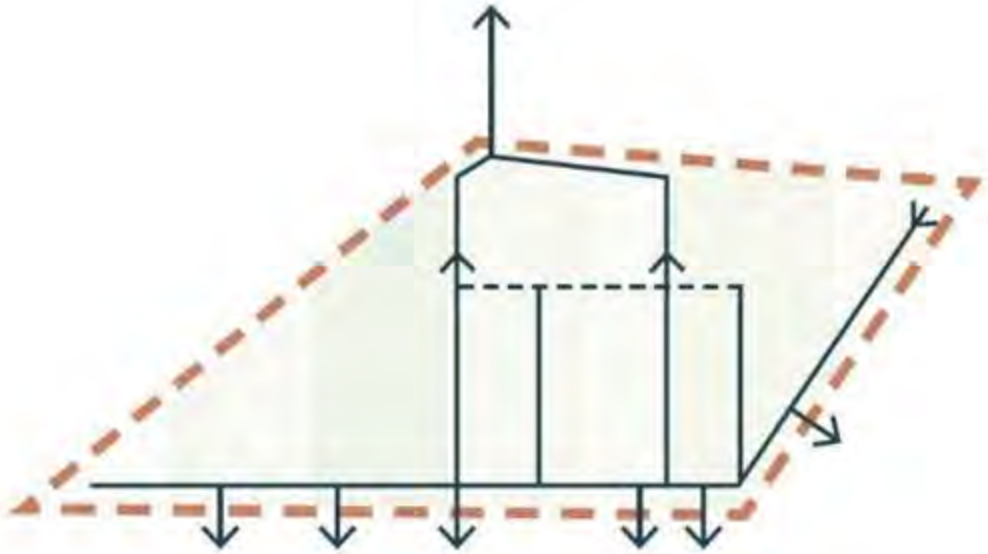
Principles of green design in the block - An urban oasis



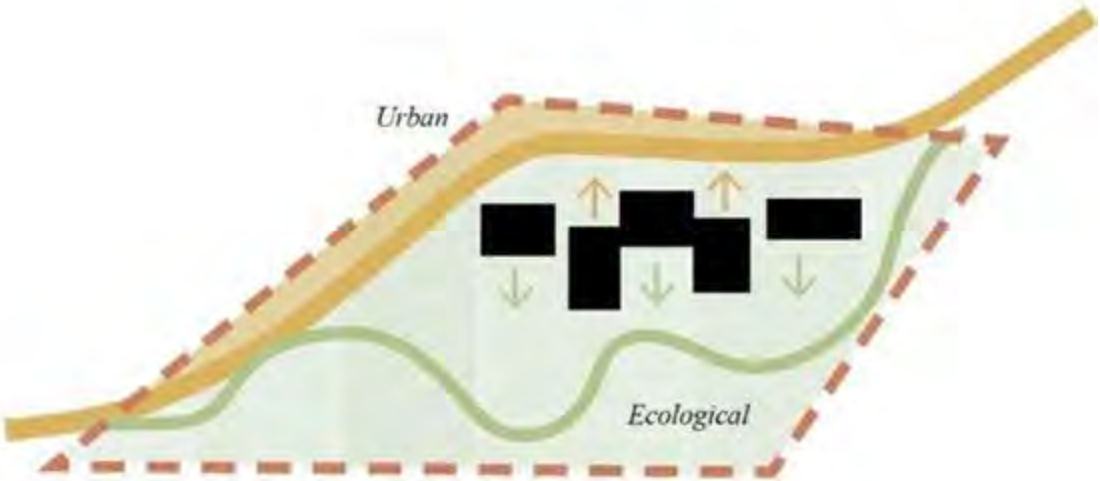




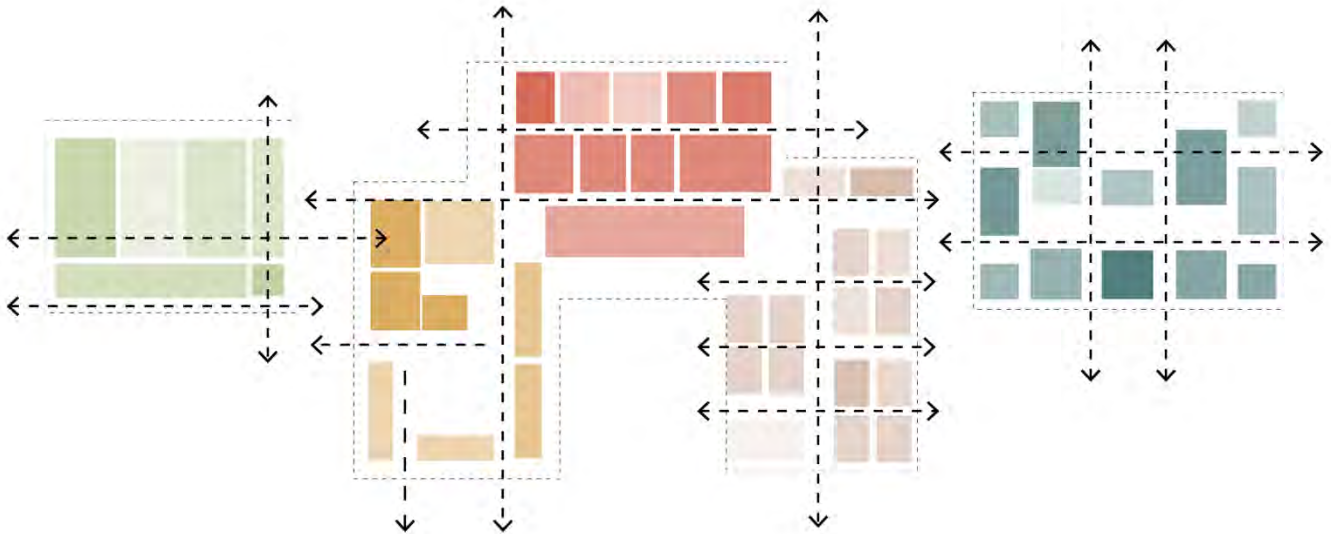
Similar to agricultural systems of the past, the plot is divided into strips of land. The boundaries act as a framework for different landscape possibilities.

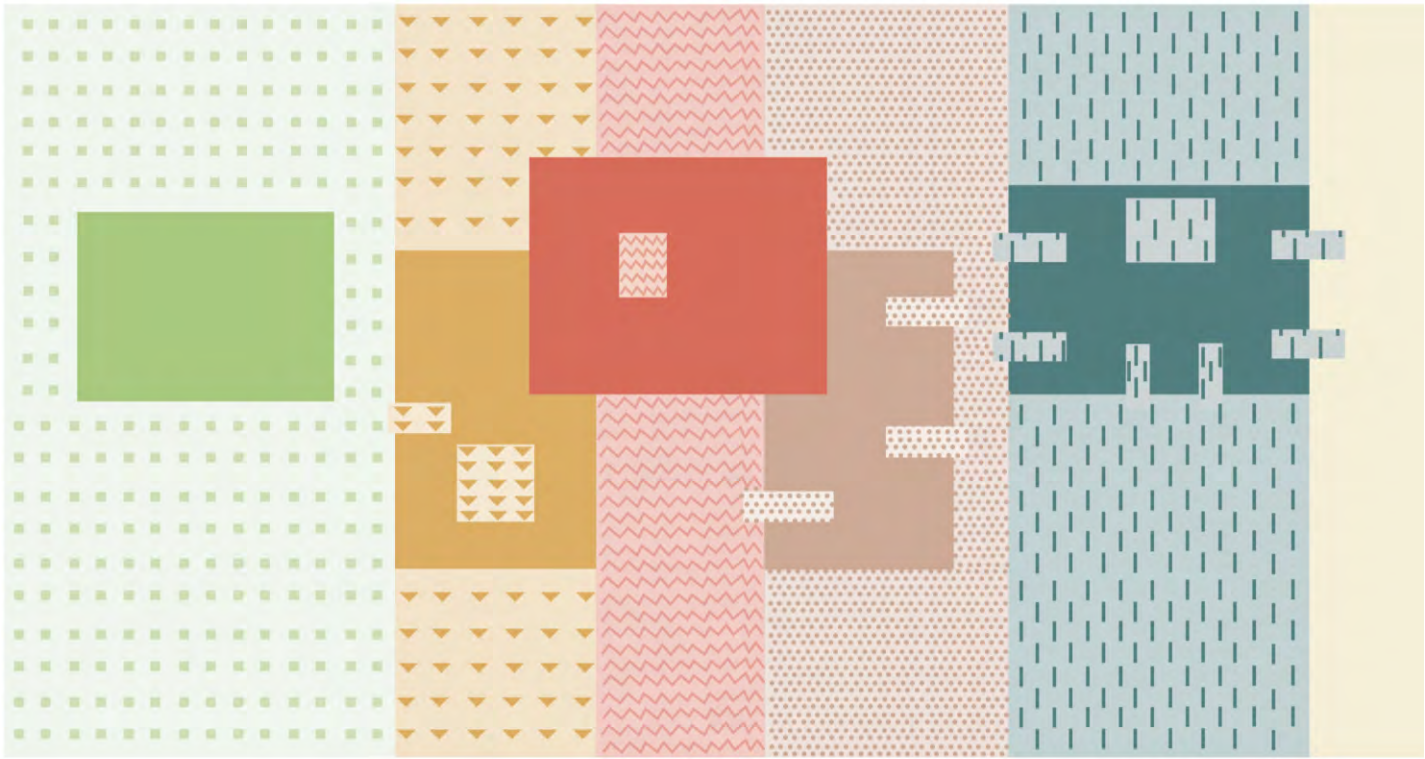


Reflecting the existing waterways, the landscape zones are marked with water channels/bioswales that help with stormwater management and increase opportunities for the community to interact with water.



The buildings act a mediator between a more urban northern and ecological southern section. The mass is broken down, opening up the buildings and strengthening connections to the surroundings.



















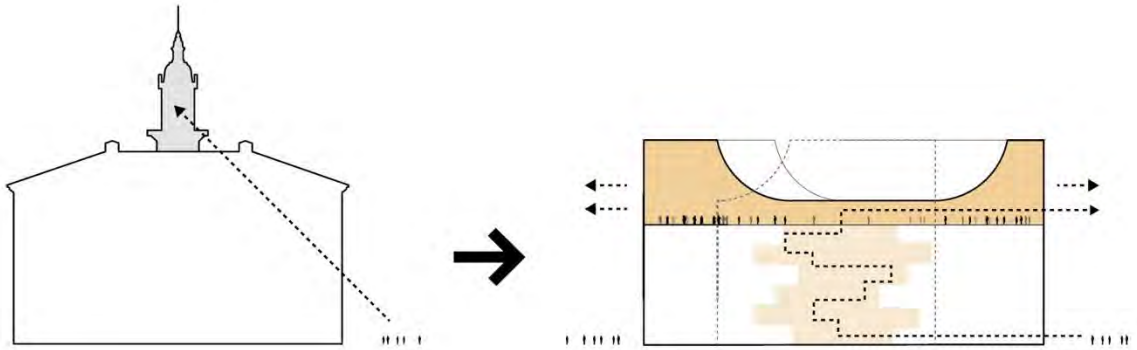


5. Creating a Culture

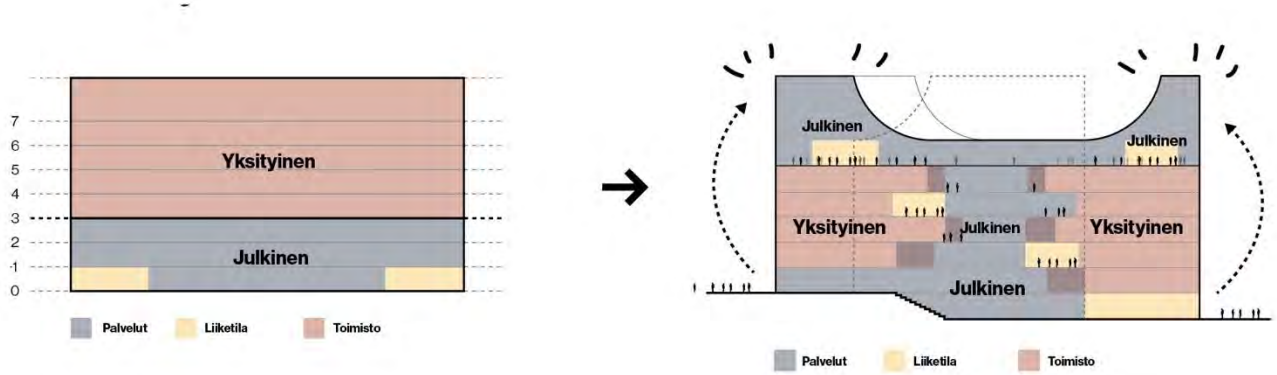
Leading by example



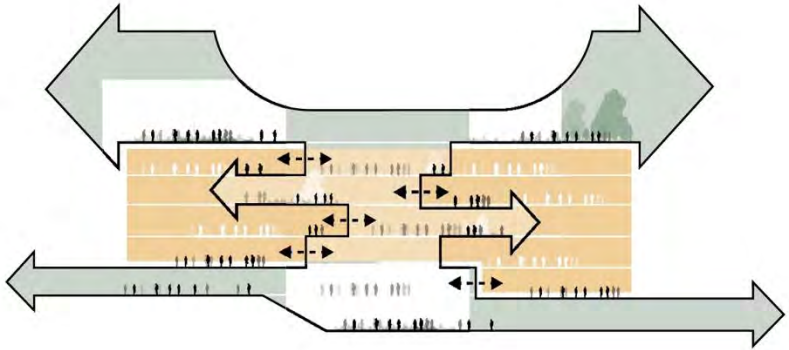




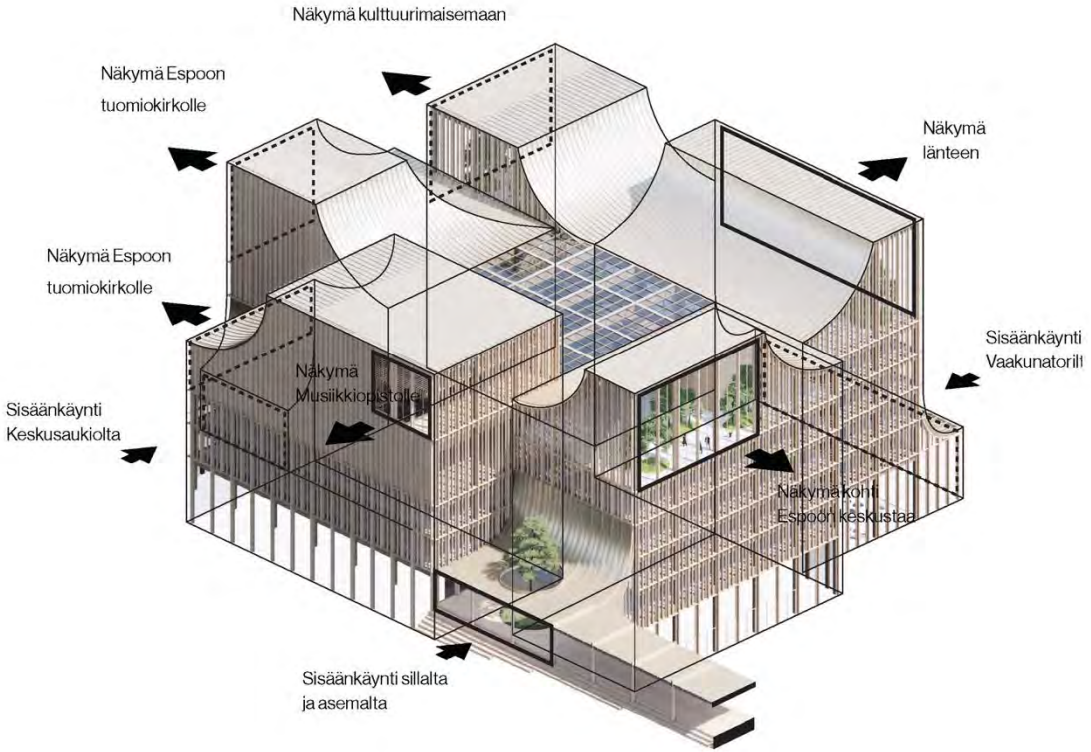
From Exclusive to Inclusive

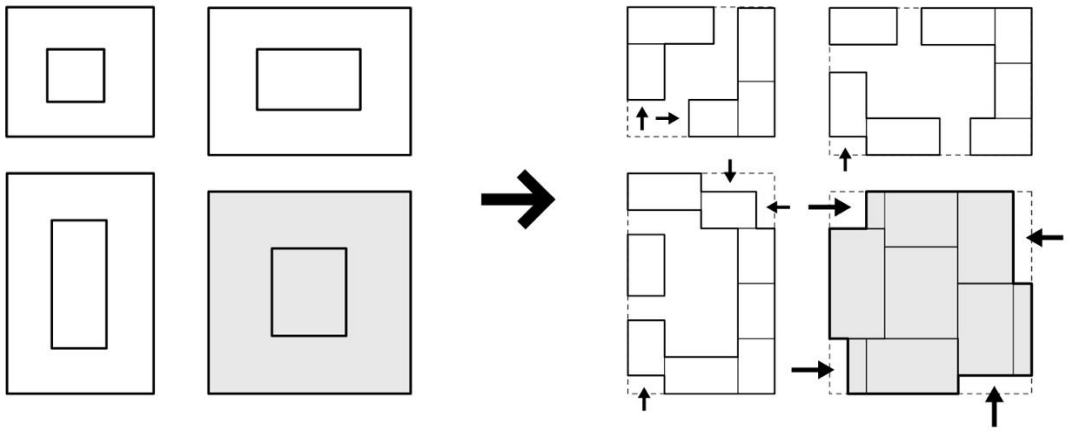


Reorganizing the program to claim the building to public



By transforming its typology
Building becomes a place for interaction and engagement


Näkymä kulttuurimaisemaan
Näkymä Espoon tuomiokirkolle
Näkymä länteen
Näkymä Espoon tuomiokirkolle
Sisäänkäynti Vaakunatorilt
Näkymä Musiikkiopistolle
Sisäänkäynti Keskusaukiolta
Näkymä kohti Espoon keskustaa
Sisäänkäynti sillalta ja asemalta




Musiikkiopisto
Maisemaportaat
penkki
Kannusali
+13,8
+12,0
penkki
Amphiaukio
Viherportaat
+10,5
Kulttuuriakseli
P
IV
V
V
Leikkipaikka
C
VII
Yksityinen vyöhyke
V
penkki
Kulttuuriaukio
Näkymäakseli
+13,0
IV
VI
VII½
Yksityinen vyöhyke
V
Yksityinen vyöhyke
Yrttitarha
D
Sadepuutarha
X
Leikkipaikka
Puukujanne
Kahvila
istuma-alue
V
VI½
Kahvila istuma-alue
Yksityinen vyöhyke
P
+10,5
Keskusaukio
+13,0
Kulttuuriakseli
VI½
VI
Yksityinen vyöhyke
H+P
VI½
Yrttitarha
B
+13,0
VIII½
VIII½
Yksityinen vyöhyke
Kosteikko
istuinryhmä
Portaat
Leikkipaikka
Sadepuutarha
VI
X
Kannusillankatu
Päivittäistavara-kauppa
VIII½
+9,0
+16,0
VII
A
Espoolaistentalo
Vihertasku
Puukujanne
Espoonkatu
Vihertasku
+9,0
Yrttitarha
Kosteikko
penkki
Leikkipaikka
taide
+9,0
Vaakunatori





Julkisivu itään (Espoonkatu), 1: 400

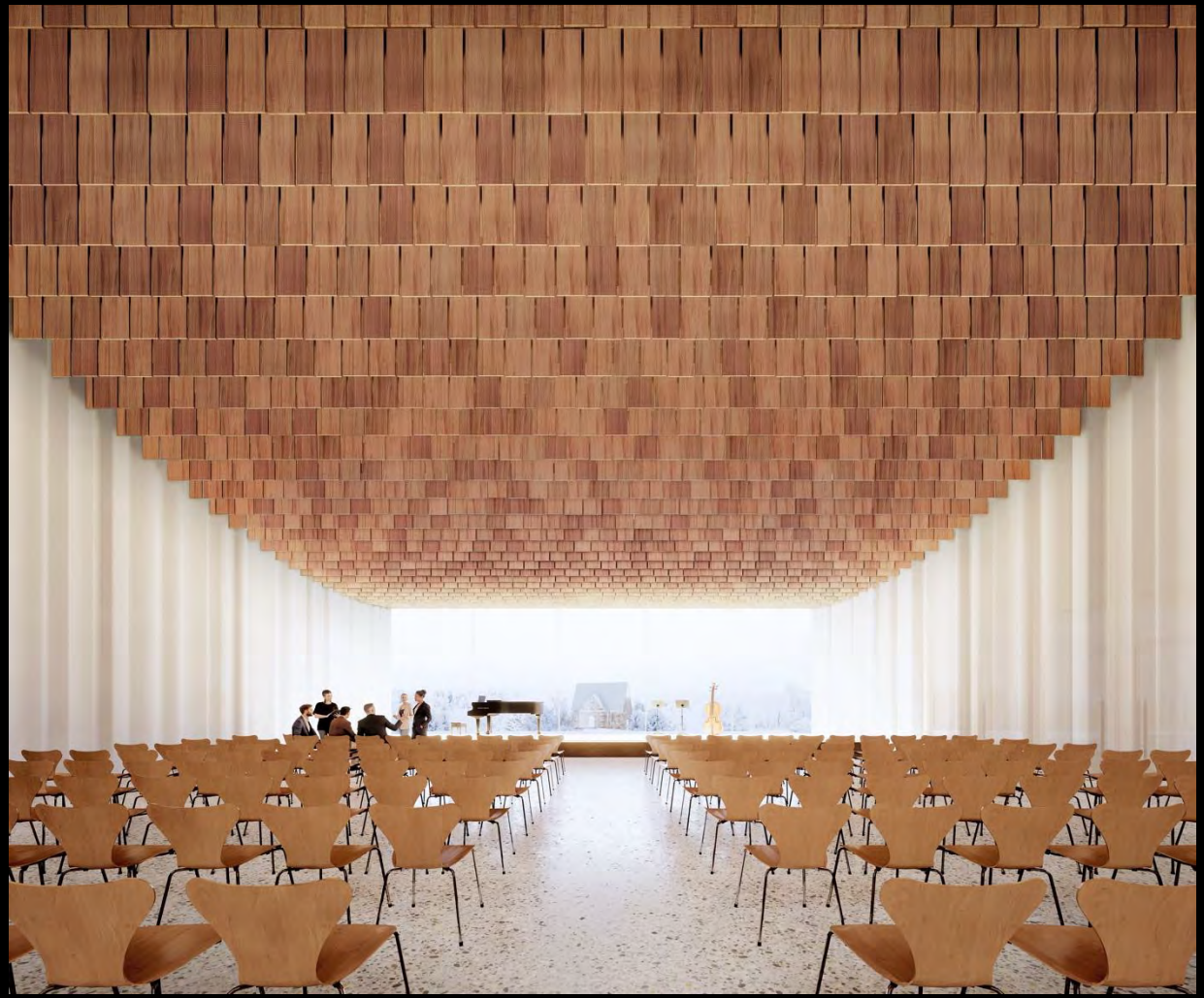










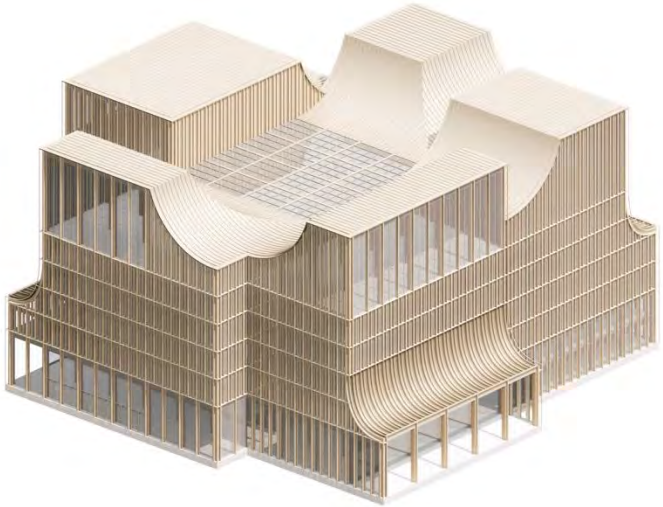


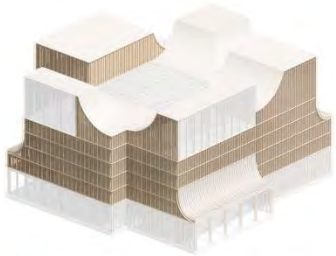



ESPOO
ESBO

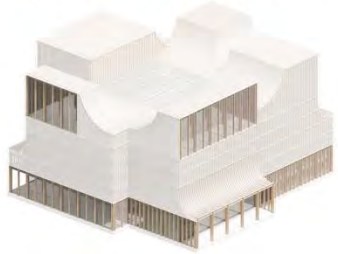


Facade types

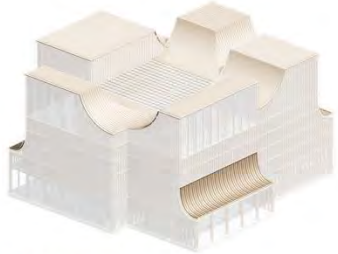




FT01_Semi-open facade panels



FT02_Open facade panels



FT03_Roof

Facade exterior and interior

Visualizations

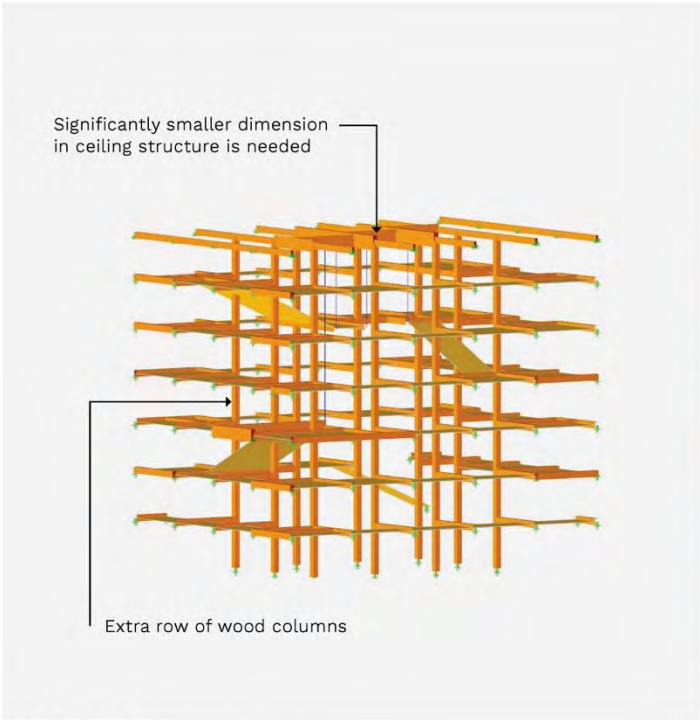


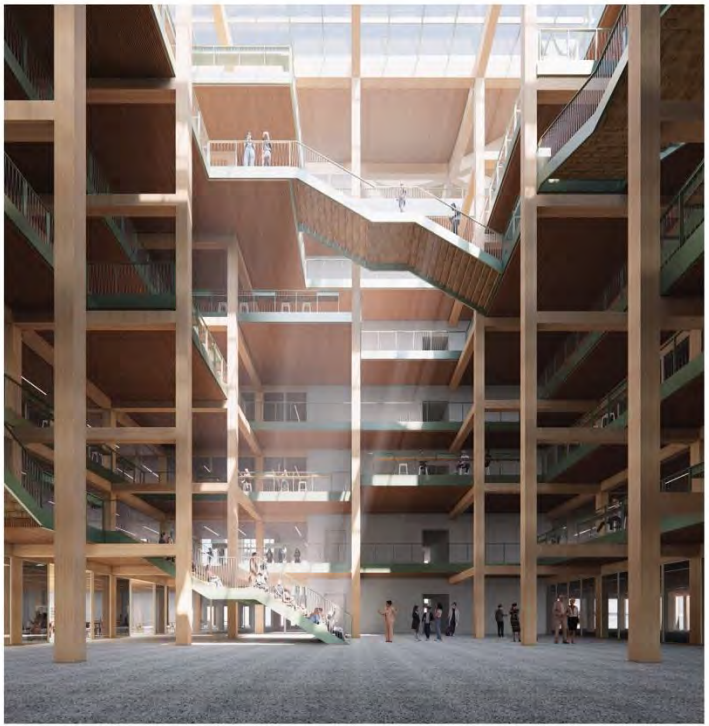
Exterior



Interior

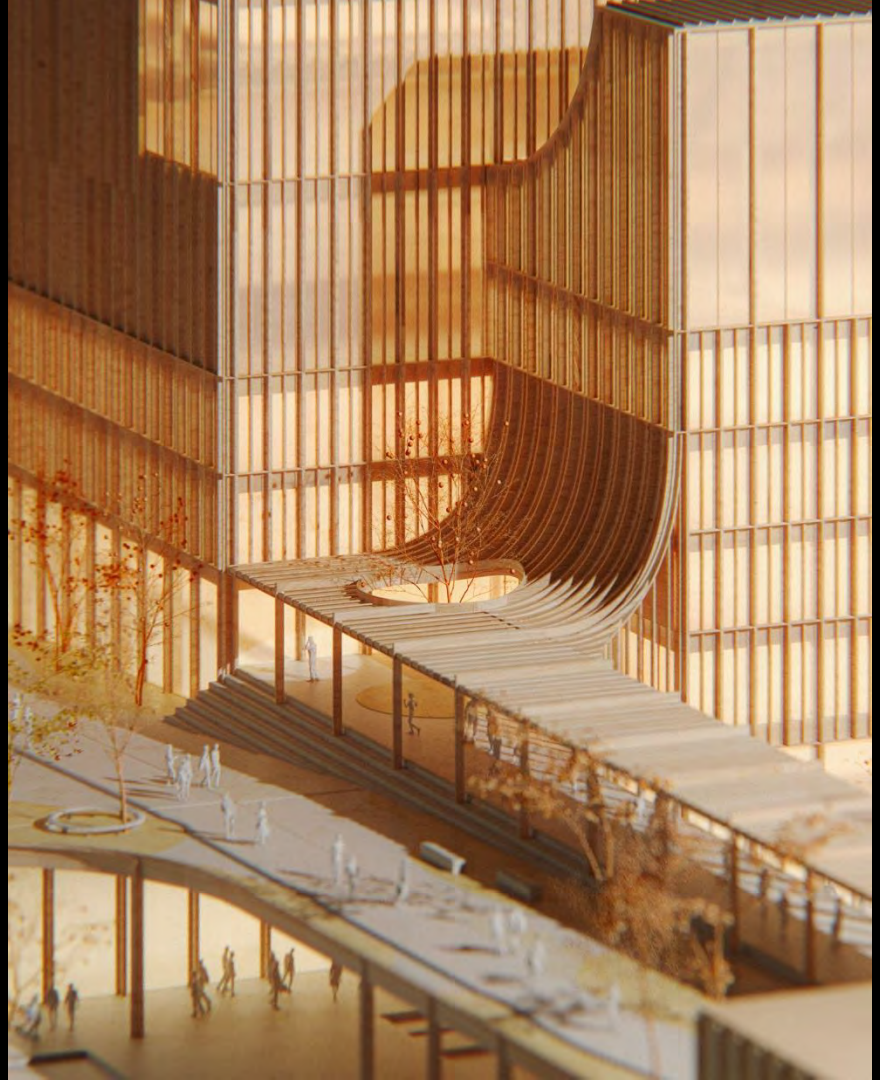
E2 - Rungon optimointi
Atriumin rakenne: vaihtoehto

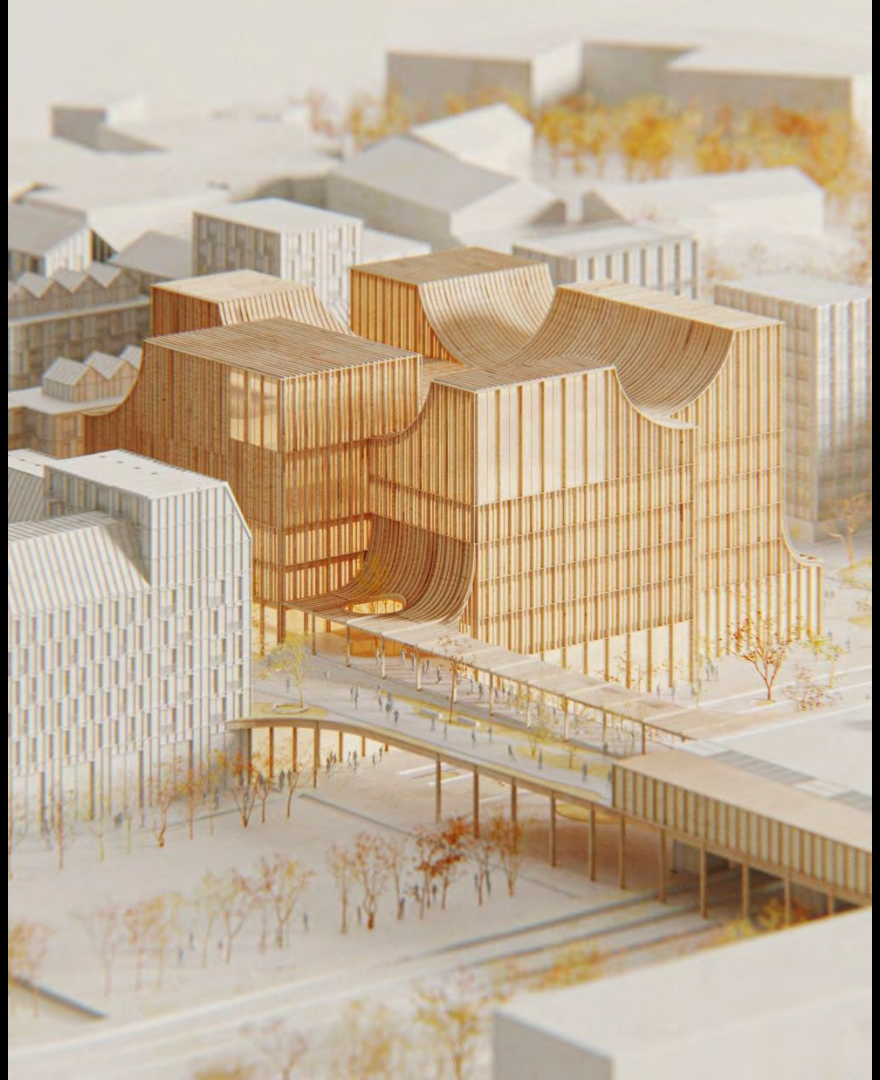




Vaihtoehto
Kuormat pystyrakenteilla suoraan alas







Epilogue

What should we do?

“Make the world work, for 100% of humanity, in the shortest possible time, through spontaneous cooperation, without ecological offense or the disadvantage of anyone.”



< 5%






Thank you!
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