

# PARIS 2024

A cyclist's reinterpretation of movement at  
the Olympic Games



P5

Emma Chris Avramiea  
Robotic Lab+ ExploreLab



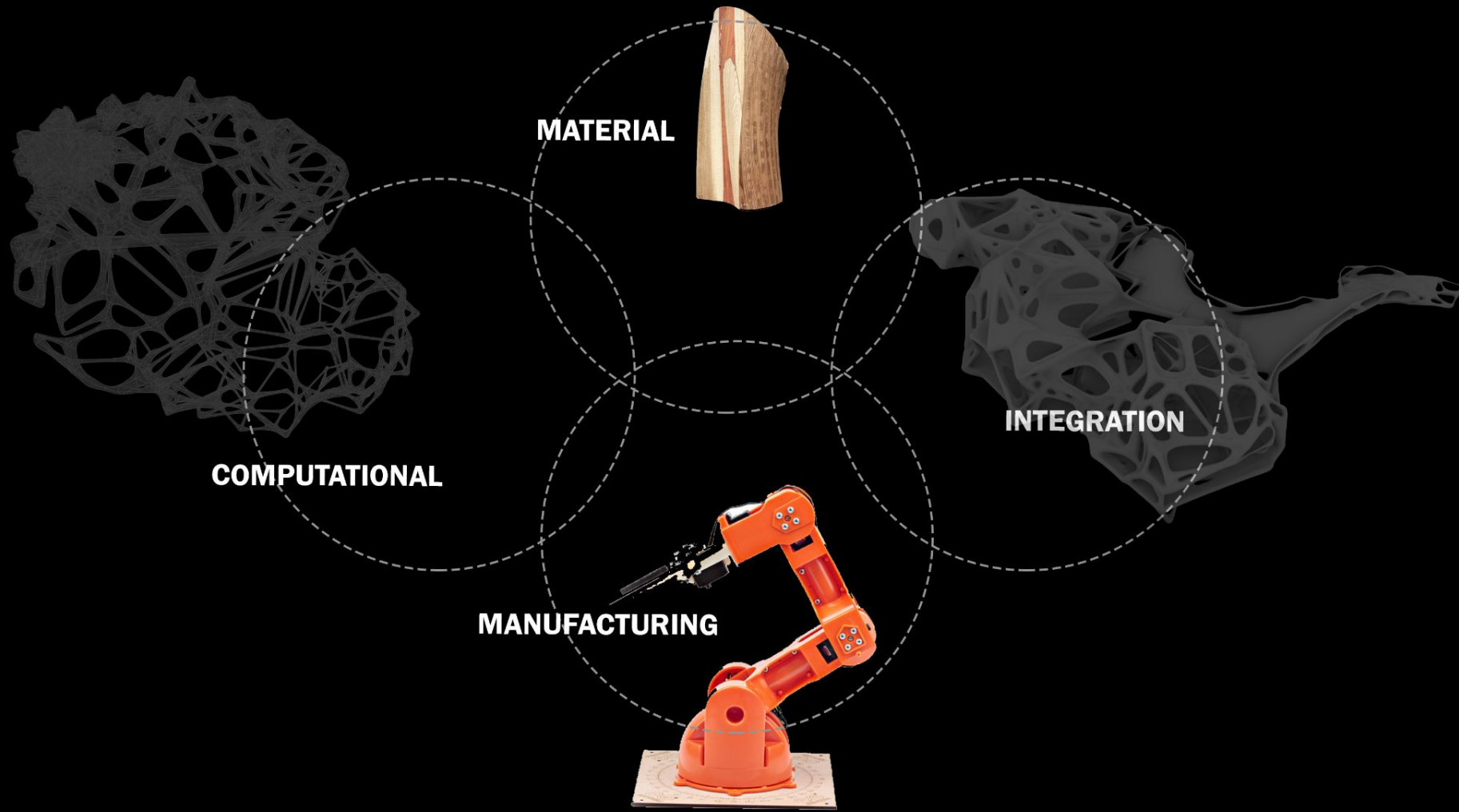
develop the computational design tools  
for a dynamic and continuous space

explore robotic practices to support  
material up-cycling

create the architectural space for a  
new paradigm in sports participation

## GOAL





**MATERIAL**

**COMPUTATIONAL**

**INTEGRATION**

**MANUFACTURING**

‘Without gravity a dome would be flat.

Where would be the excitement in designing a flat structure?

No gravity, no fun!’

**I. CONTEXT**

**II. ANALYSIS AND URBAN STRATEGY**

**III. POSITION - ARCHITECTURAL STRATEGY**

**IV. MATERIALIZATION**

**V. STRUCTURAL STABILITY**

**VI. REFLECTION**

**I. CONTEXT**

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# urban sprawl



Urban Development for the Rio Olympics  
Source: The Wall Street Journal



temporary



A wide-angle, high-angle photograph of a large, empty stadium under construction. The stadium features multiple tiers of white seating, with some sections still under development. The central floor area is a mix of concrete and dirt, with some construction materials and equipment visible. The lighting is bright, highlighting the scale of the venue.

white elephants

**The  
Guardian**

Rio's Olympic Venues, 6 months on  
Source: The Guardian

# new physicality



CYCLISTE 13

- 1 Van Aves Gap
- 2 Haesen 258 m
- 3 Roche 19 m
- 4 De Gendt 28 m
- 5 Stuyven 600 m
- 6 Everspoel 2 m

ELAPSED 00:40:42 28.8 km

REMAINING 2.2 km 00:03:05

kcal 1134 km/h 48.7 rpm 98 watts 518 erg OFF cadence 0 slope 0.9% -2.0%

MORE VIDEOS

56:57 / 1:18:53

GCN SUBSCRIBE

CC HD YouTube

# VIRTUAL TOUR OF FLANDERS LIVESTREAM - LOCKDOWN EDITION



SUBSCRIBE ON YOUTUBE



BY CYCLINGTIPS

APRIL 5, 2020



I. CONTEXT

**II. ANALYSIS AND URBAN STRATEGY**

III. POSITION - ARCHITECTURAL STRATEGY

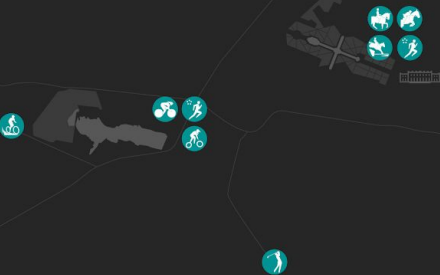
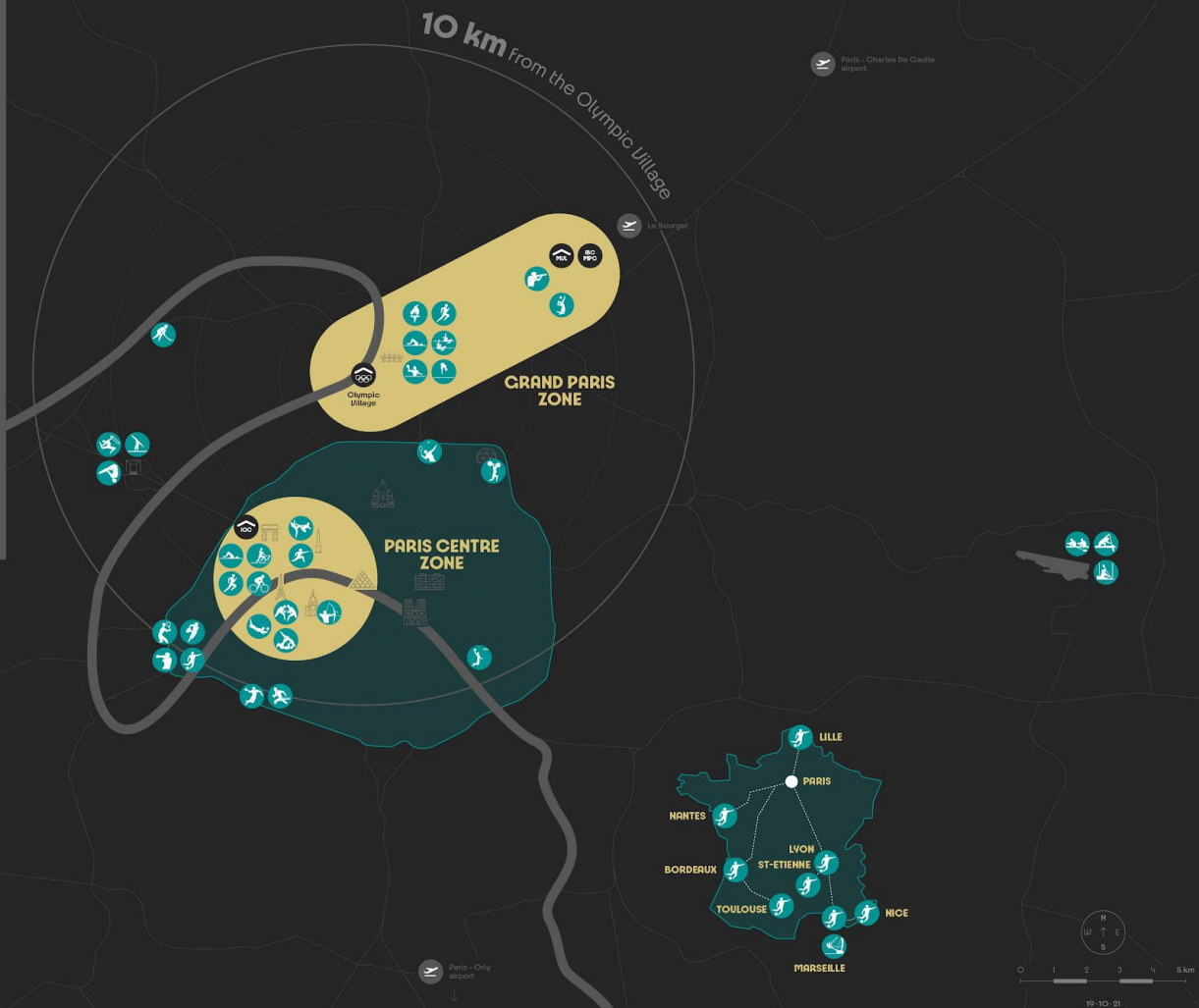
IV. MATERIALIZATION

V. STRUCTURAL STABILITY

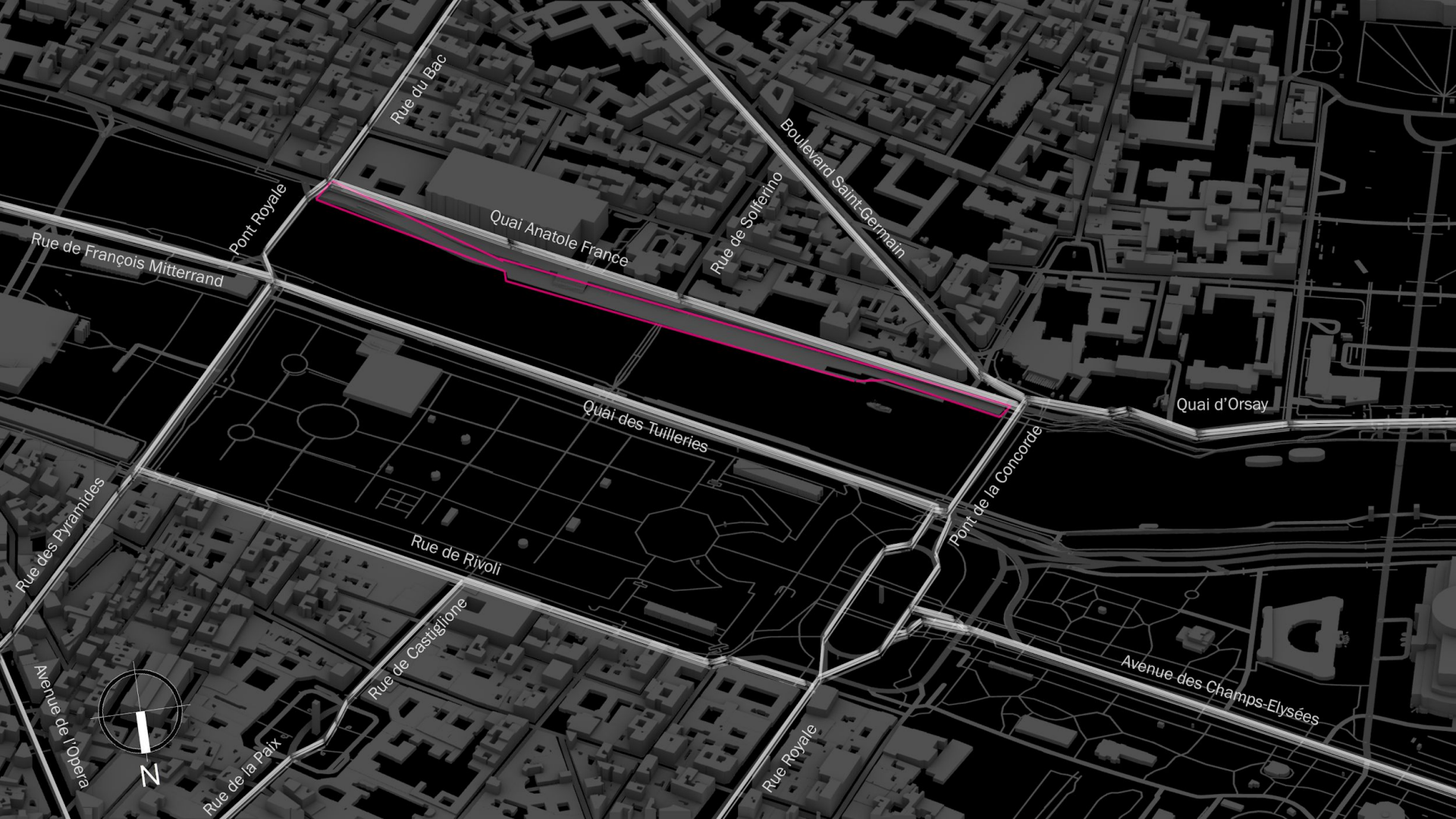
VI. REFLECTION

# PARIS 2024 OLYMPIC VENUE MASTER PLAN

Aquatics Centre #1	<ul style="list-style-type: none"> <li>Aquatics (Swimming)</li> <li>Aquatics (Water-polo)</li> </ul>	Parc des Princes	<ul style="list-style-type: none"> <li>Football</li> </ul>
Aquatics Centre #2	<ul style="list-style-type: none"> <li>Aquatics (Frisco Swimming)</li> <li>Aquatics (Diving)</li> <li>Aquatics (Water-polo)</li> </ul>	Roland-Garros Stadium	<ul style="list-style-type: none"> <li>Tennis</li> <li>Boxing</li> </ul>
Champs-de-Mars Arena	<ul style="list-style-type: none"> <li>Judo</li> <li>Wrestling</li> </ul>	Saint-Quentin-en-Yvelines BFM Stadium	<ul style="list-style-type: none"> <li>Cycling (BMX Race)</li> </ul>
Château de Versailles	<ul style="list-style-type: none"> <li>Equestrian (Dressage/Equestrian)</li> <li>Modern Pentathlon</li> </ul>	Saint-Quentin-en-Yvelines Velodrome	<ul style="list-style-type: none"> <li>Cycling (Track)</li> <li>Modern Pentathlon (Fencing)</li> </ul>
East Paris Arena	<ul style="list-style-type: none"> <li>Basketball</li> </ul>	Shooting Range	<ul style="list-style-type: none"> <li>Shooting</li> </ul>
Eiffel Tower Stadium	<ul style="list-style-type: none"> <li>Uttleyball (Beach)</li> </ul>	South Paris Arena #1	<ul style="list-style-type: none"> <li>Handball</li> </ul>
Blancourt Hill	<ul style="list-style-type: none"> <li>Cycling (Mountain Bike)</li> </ul>	South Paris Arena #2	<ul style="list-style-type: none"> <li>Table tennis</li> </ul>
Grand Palais	<ul style="list-style-type: none"> <li>Fencing</li> <li>Taekwondo</li> </ul>	Stade de France	<ul style="list-style-type: none"> <li>Rugby</li> <li>Football</li> </ul>
Jean-Bouin Stadium	<ul style="list-style-type: none"> <li>Rugby</li> </ul>	Vélodrome de France	<ul style="list-style-type: none"> <li>Cycling (Stalom/Sprint)</li> </ul>
La Chapelle Arena	<ul style="list-style-type: none"> <li>Badminton</li> </ul>	Viel-du-Piano Stadium	<ul style="list-style-type: none"> <li>Hockey</li> </ul>
La Défense Arena	<ul style="list-style-type: none"> <li>Gymnastics (Artistic/Rhythmic/Trampoline)</li> </ul>	Zenith Arena	<ul style="list-style-type: none"> <li>Weightlifting</li> </ul>
Le Bourget Arena	<ul style="list-style-type: none"> <li>Volleyball</li> </ul>	Bordeaux Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
Le Golf National	<ul style="list-style-type: none"> <li>Golf</li> </ul>	Lille Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
Le Pont d'Iéna	<ul style="list-style-type: none"> <li>Roquiatics (Marathon Swimming)</li> <li>Roquiatics (Marathon, Race Walk)</li> <li>Traction</li> <li>Cycling (Road)</li> </ul>	Lyon Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
Les Invalides	<ul style="list-style-type: none"> <li>Archery</li> </ul>	Marseille Marina	<ul style="list-style-type: none"> <li>Sailing</li> </ul>
Olympic Stadium	<ul style="list-style-type: none"> <li>Athletics</li> <li>Ceremonies</li> </ul>	Marseille Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
		Nantes Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
		Nice Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
		Saint-Etienne Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>
		Toulouse Stadium	<ul style="list-style-type: none"> <li>Football</li> </ul>



0 1 2 3 4 5 km



Rue du Bac

Boulevard Saint-Germain

Pont Royal

Rue de François Mitterrand

Quai Anatole France

Rue de Solferino

Quai d'Orsay

Quai des Tuilleries

Pont de la Concorde

Rue des Pyramides

Rue de Rivoli

Avenue des Champs-Élysées

Rue de Castiglione

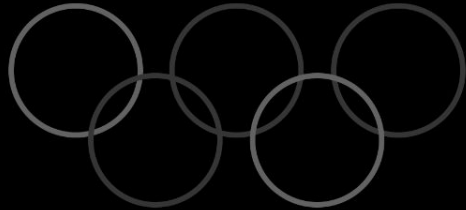
Rue Royale

Avenue de l'Opéra

Rue de la Paix







**UBAN NETWORK**



Skating store

Musée d'Orsay



Proposed Cycling  
Cycling path

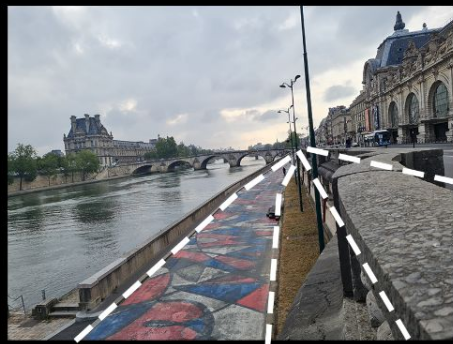




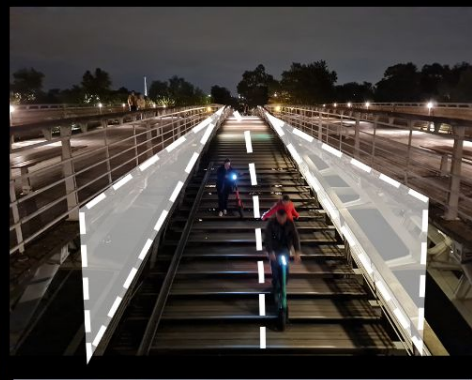














PARIS SEINE

I. CONTEXT

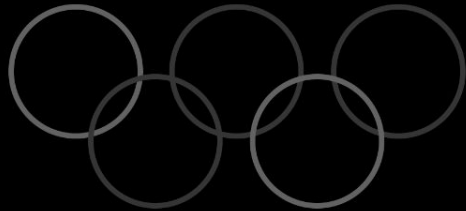
II. ANALYSIS AND URBAN STRATEGY

**III. POSITION - ARCHITECTURAL STRATEGY**

IV. MATERIALIZATION

V. STRUCTURAL STABILITY

VI. REFLECTION



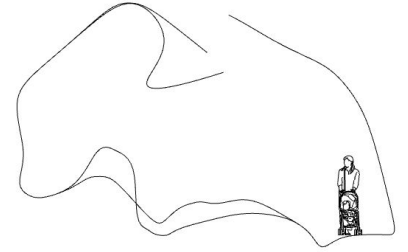
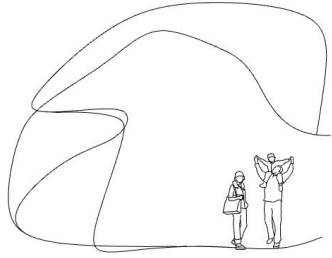
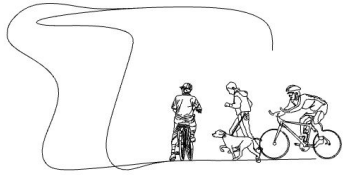
**ARCHITECTURAL  
EXPRESSION**



dynamic

AEDAS Hengqin International Financial Center

Photo by Terrance Zhang



Architectural Cross-section - conceptual

# continuous



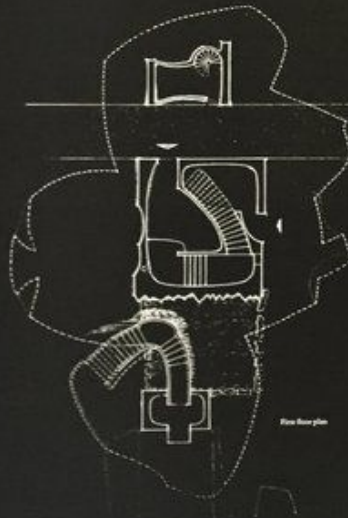
North elevation



West elevation



South elevation



Five floor plan



Ground floor plan



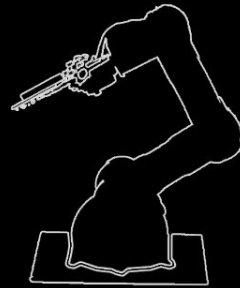
East elevation



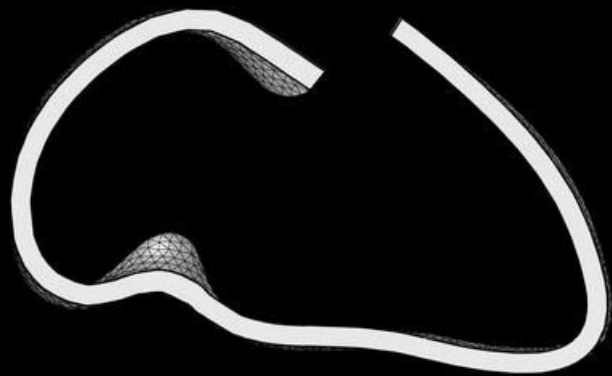
Division plan

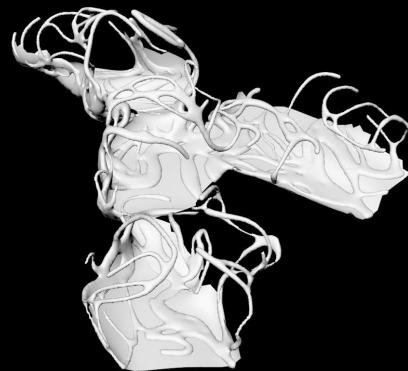
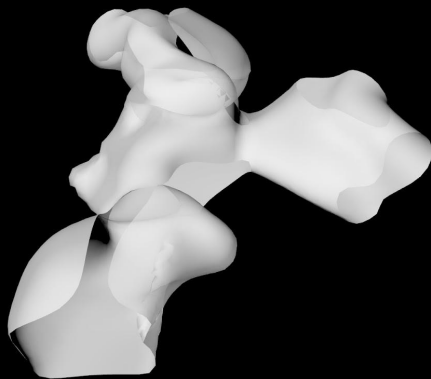
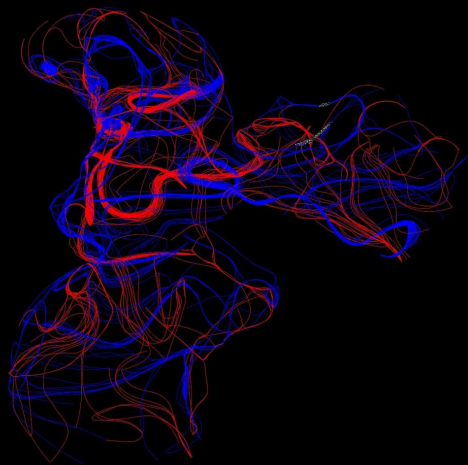
robotic manufacturing  
computation  
optimization

## **WORKSHOP**



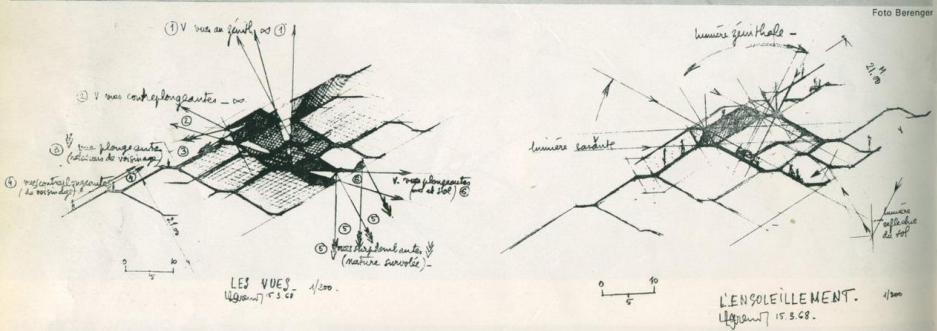
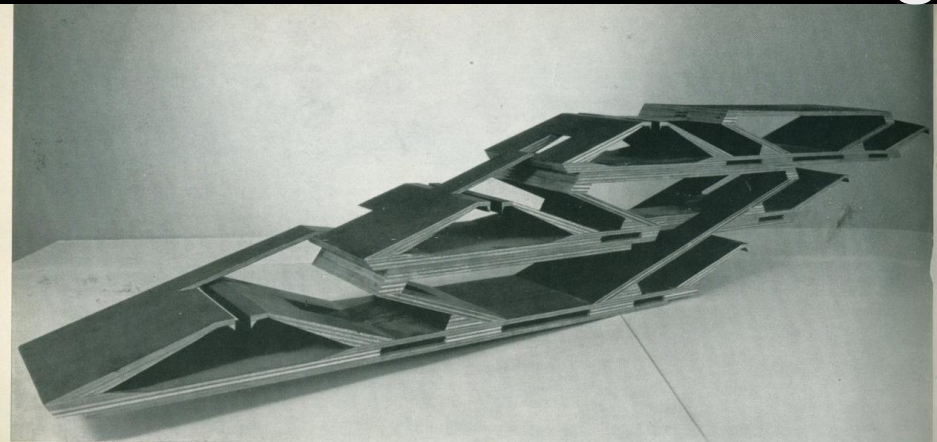






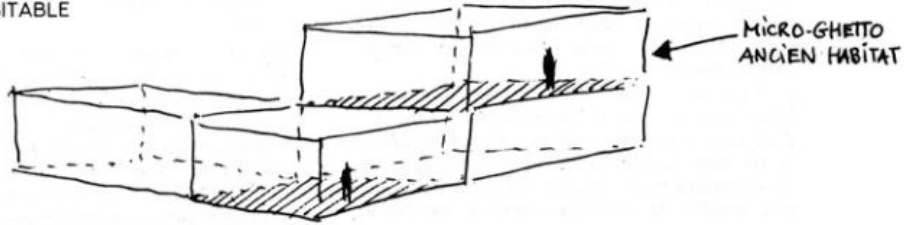
Structural Optimization

# engaging



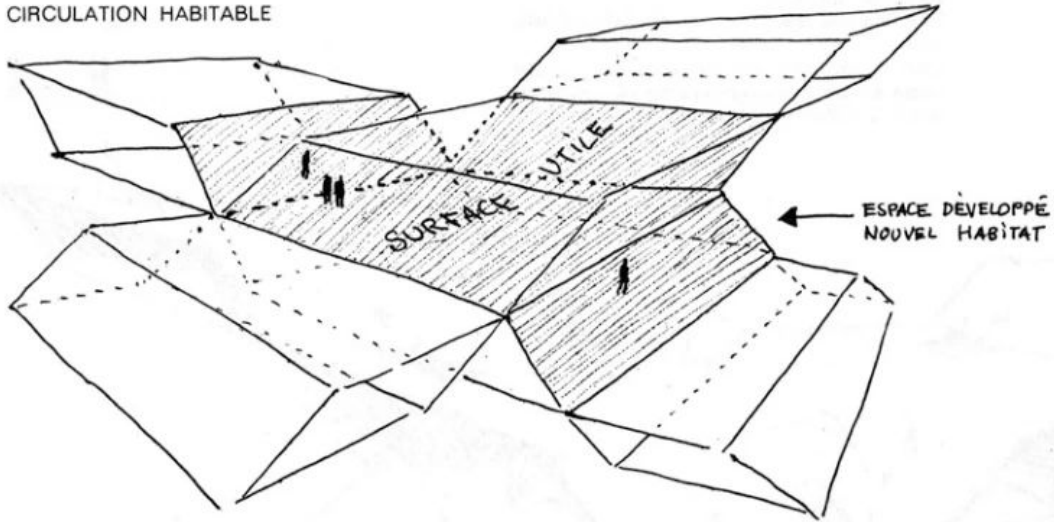
Zaha Hadid - Pierres Vives

STATION HABITABLE

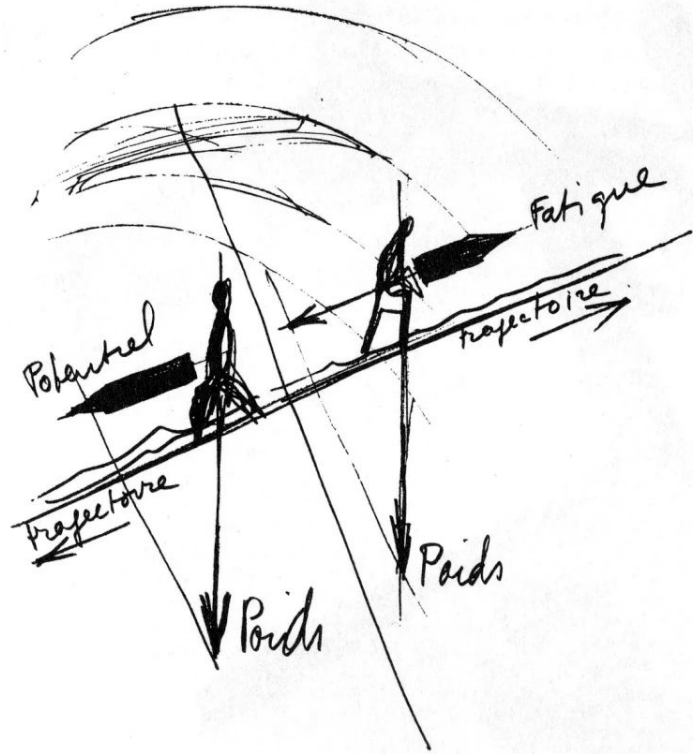


MICRO-GHETTO ANCIEN HABITAT

CIRCULATION HABITABLE



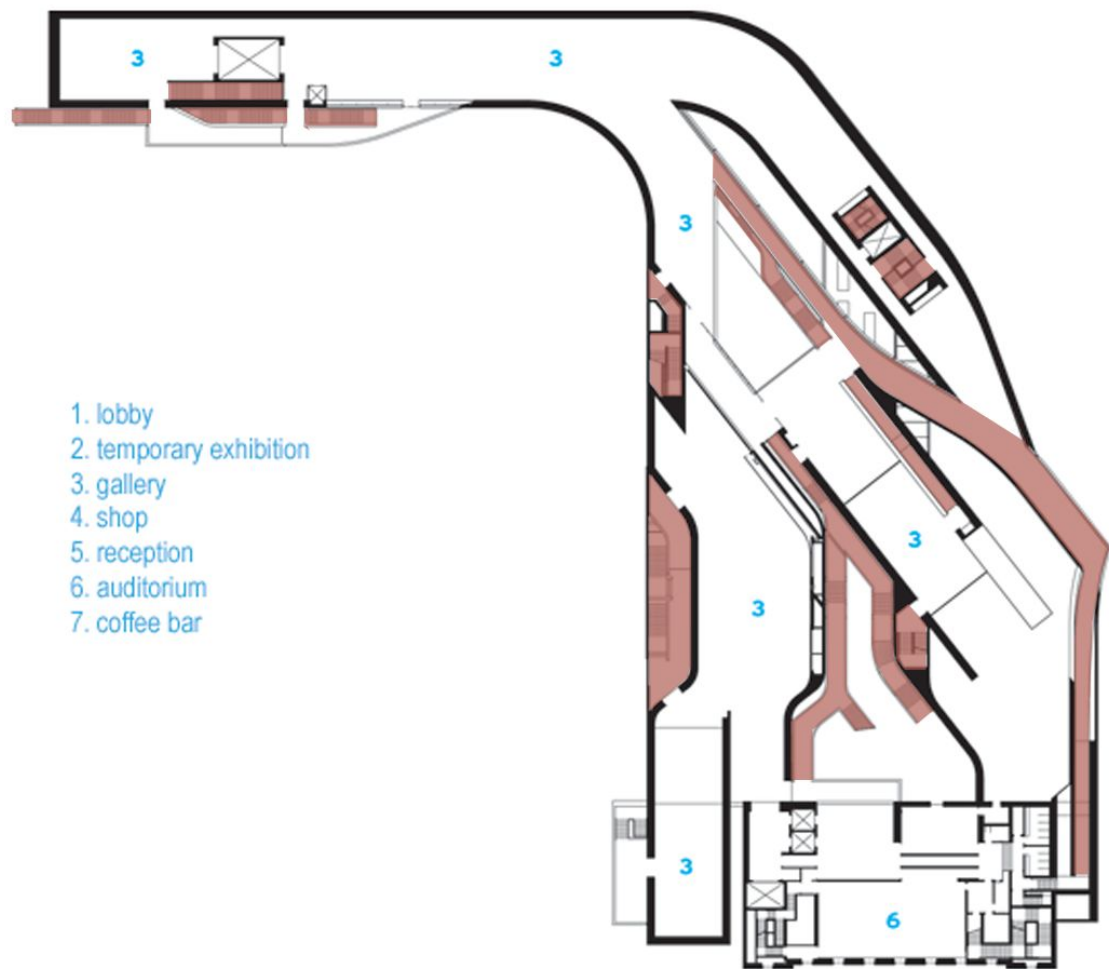
ESPACE DEVELOPPE NOUVEL HABITAT



Claude Parent - The oblique function - tilting the ground - challenging verticality - the wall becomes experiential



Zaha Hadid - Maxxi Museum



1. lobby
2. temporary exhibition
3. gallery
4. shop
5. reception
6. auditorium
7. coffee bar

SECOND FLOOR



Coop Himmelb(l)au - BMW bridge



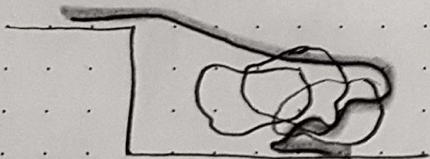
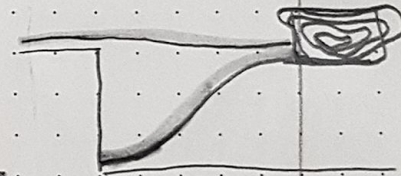
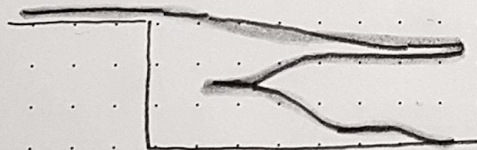
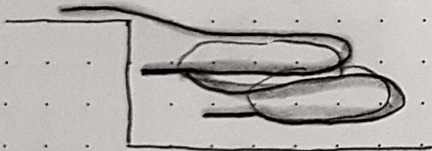
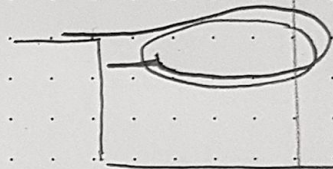
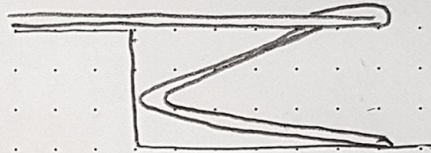
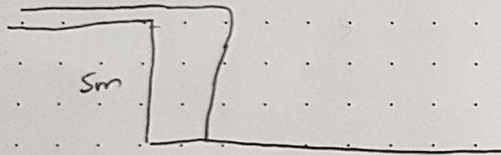


# dynamic ground





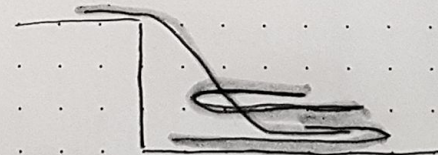
SANAA - Rolex Learning Center



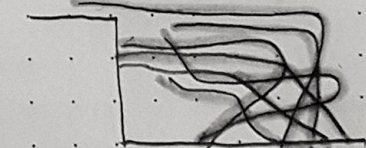
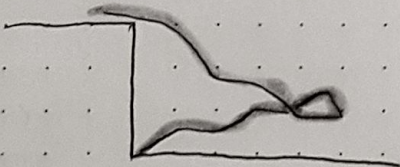
ramp along architecture

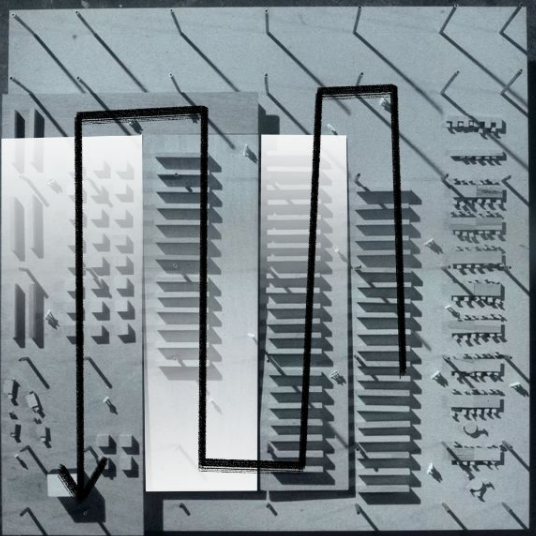
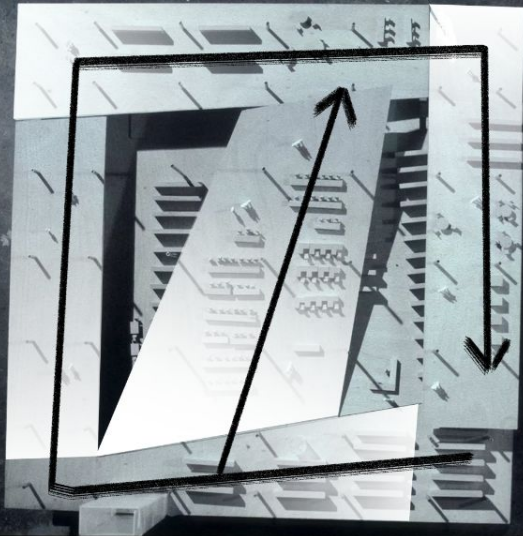


ramp on top of archit.



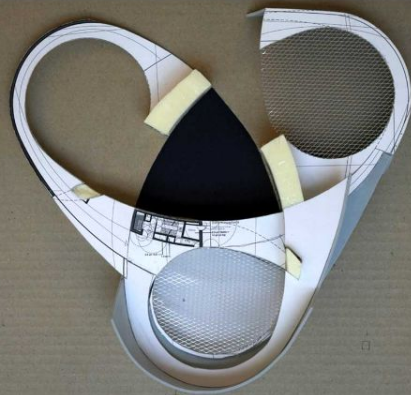
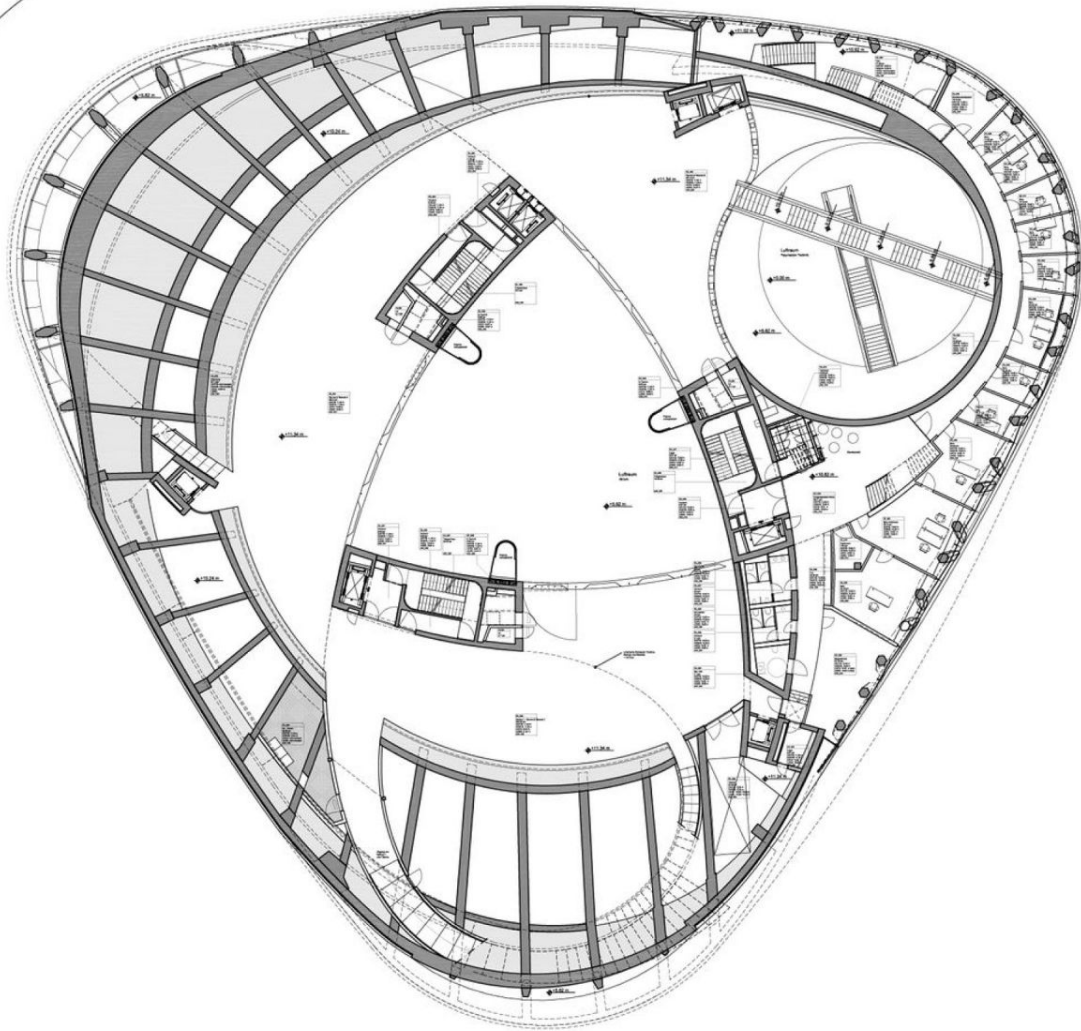
maxxi

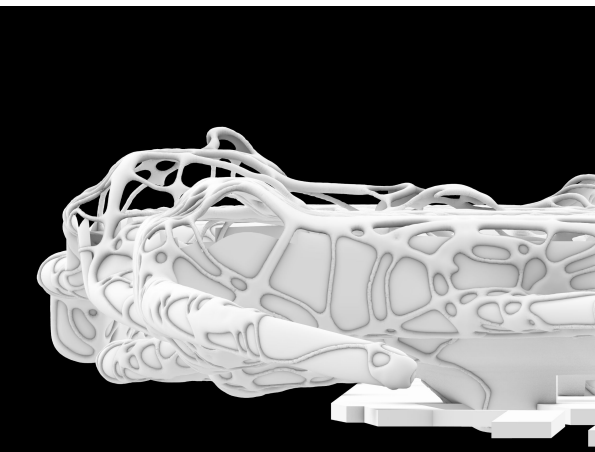




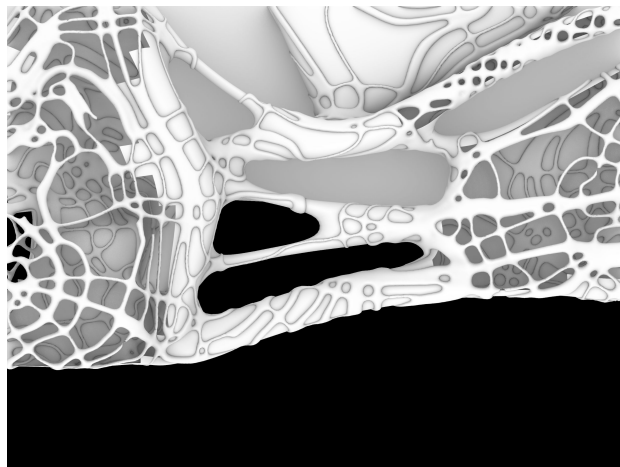


Mercedes Museum, UN Studio

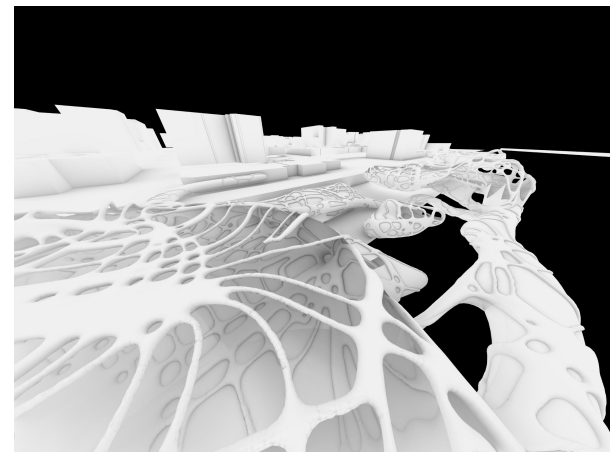




Expressive of Urban Multisensorial Experiences



Localized/optimal transition gradient



Materially Efficient

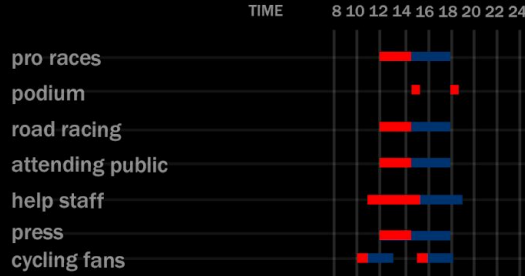
**Patterns of Materiality and Formal Language**

## DATA DRIVEN APPROACH





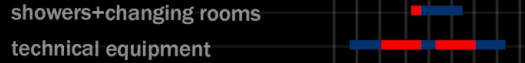
## I. ROAD RACING



## II. BMX CYCLING



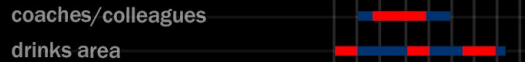
## III. TECHNICAL SPACES



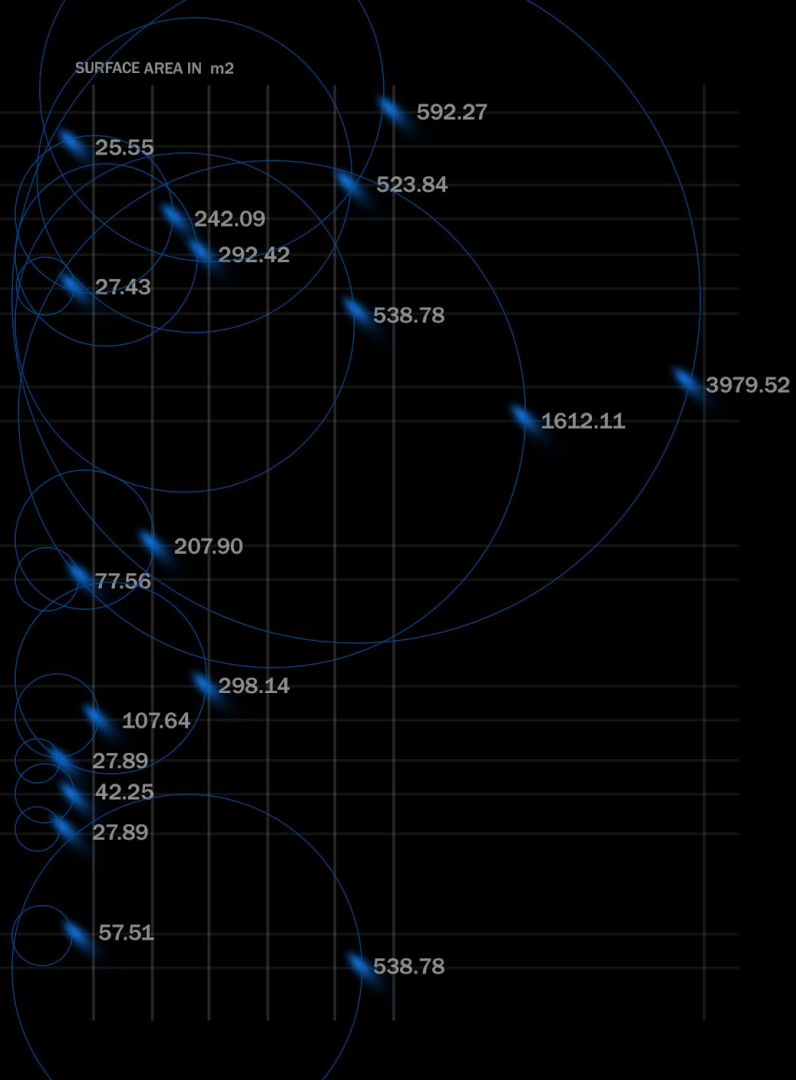
## IV. AMATEUR CYCLISTS



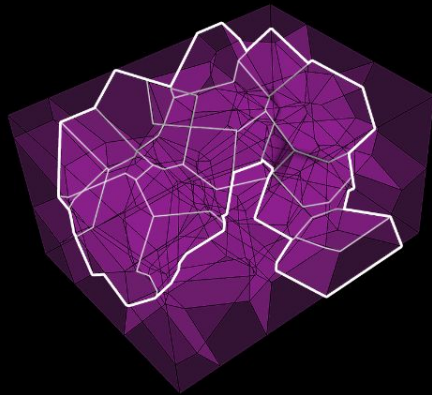
## V. PUBLIC

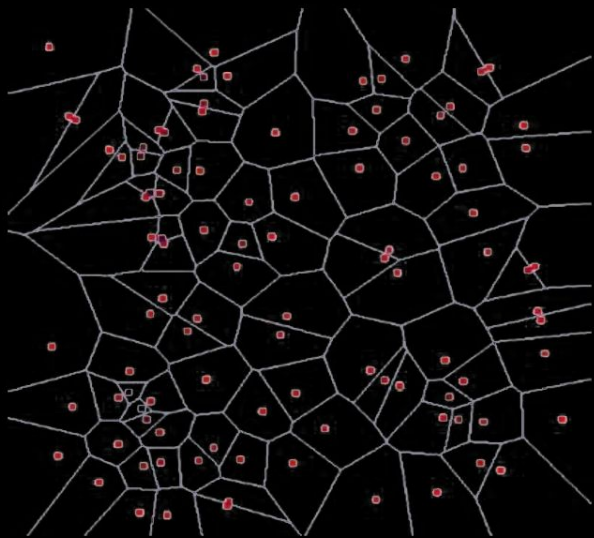


min max

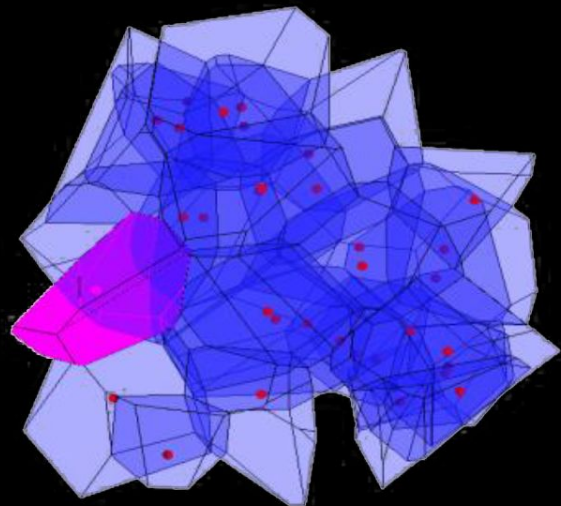


## COMPUTATIONAL TOOLS

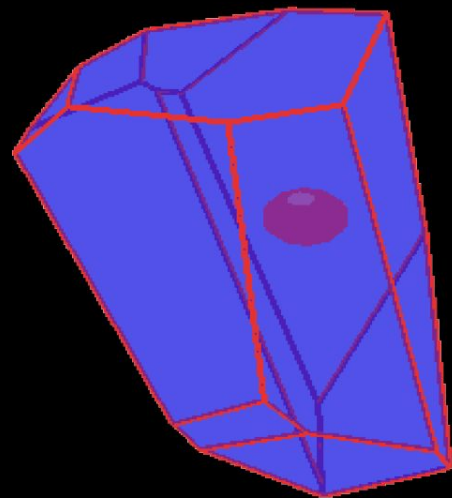




a.  
point cloud generating 2d voronoi  
edges as lines



b.  
3d voronoi with surfaces and lines  
as edges

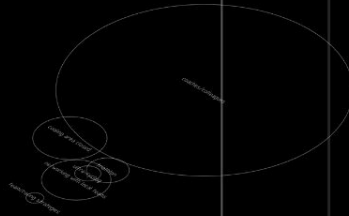


c.  
unique cell

# PARAMETERS FAMILY EVOLUTION

surface per user

coaches/colleagues 2  
cooling area closed 0.5  
**triathlon** 1  
ultra-cycling 3.5  
networking local teams 1  
team/racing strategies 1



number of users. floors height

20  
200  
**15**  
30  
7  
30



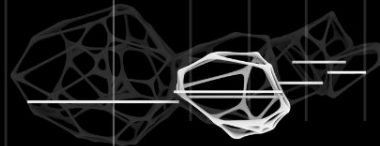
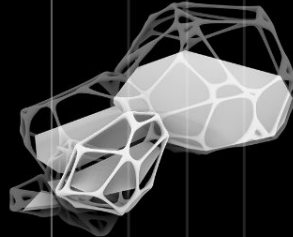
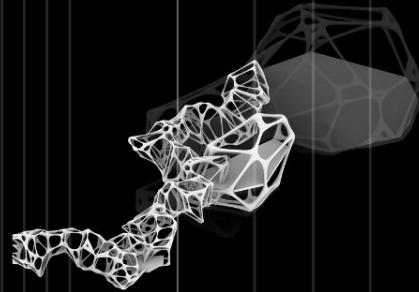
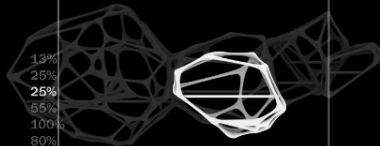
total surface

40  
100  
**15**  
105  
7  
30



visual porosity

13%  
25%  
**25%**  
55%  
100%  
80%



city proximity spots

Not relevant  
Waterfront  
**Waterfront**  
Waterfront  
Rue de Solferino  
Rue de Solferino

stress level

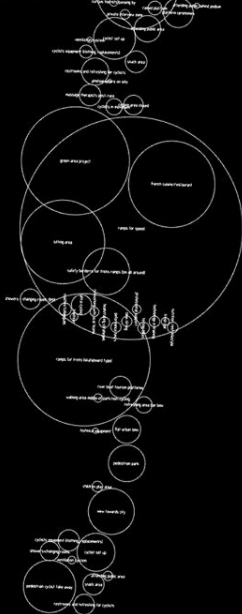
function activity

coaches/colleagues  
cooling area closed  
**triathlon**  
ultra-cycling  
networking local teams  
team/racing strategies

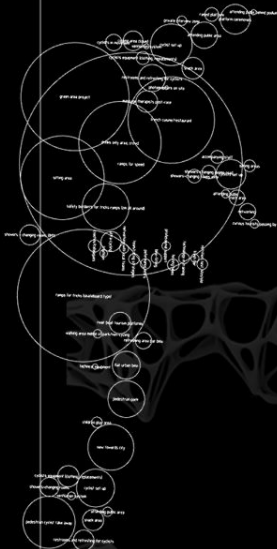
height of function

1.17  
2.25  
**2.25**  
4.95  
9  
7.2

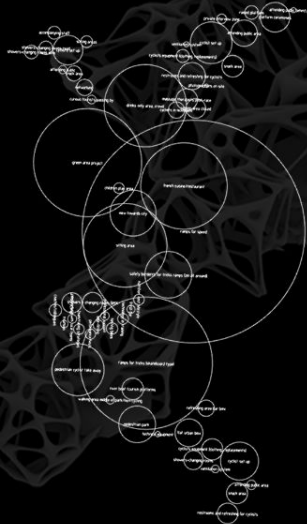
# PROGRAM CONFIGURATIONS



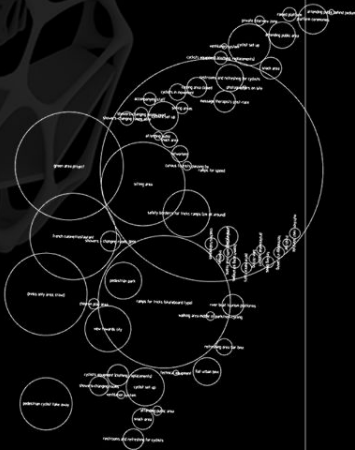
v1\_racing to leisure gradient



v2\_river suspension



v3\_racing nuclea polarization

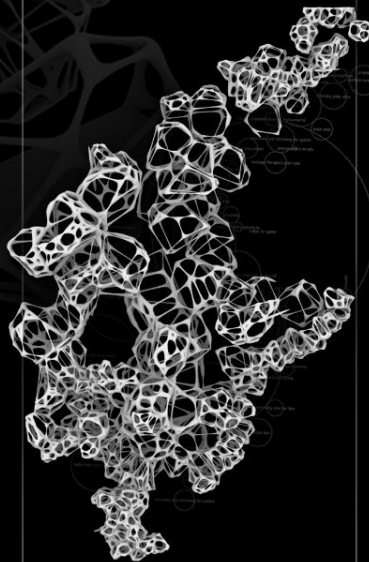
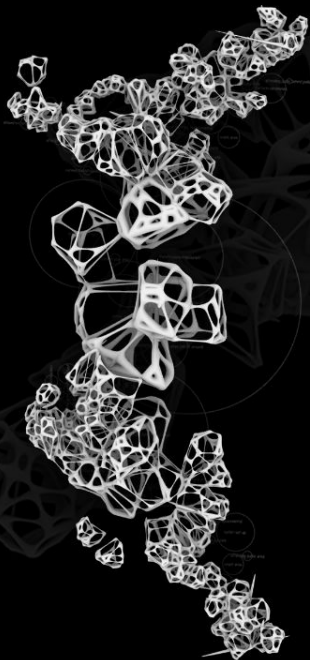
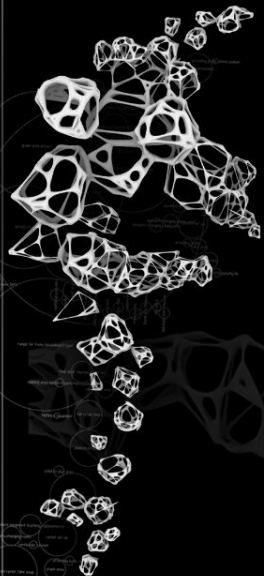
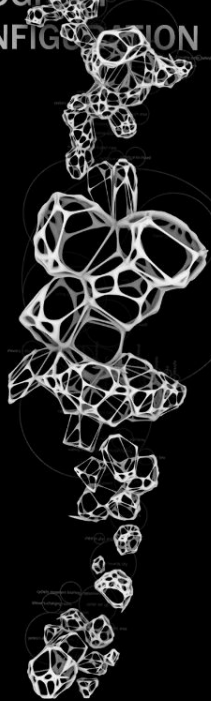


v4\_racing nuclea polarization

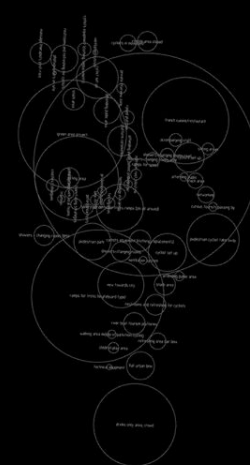
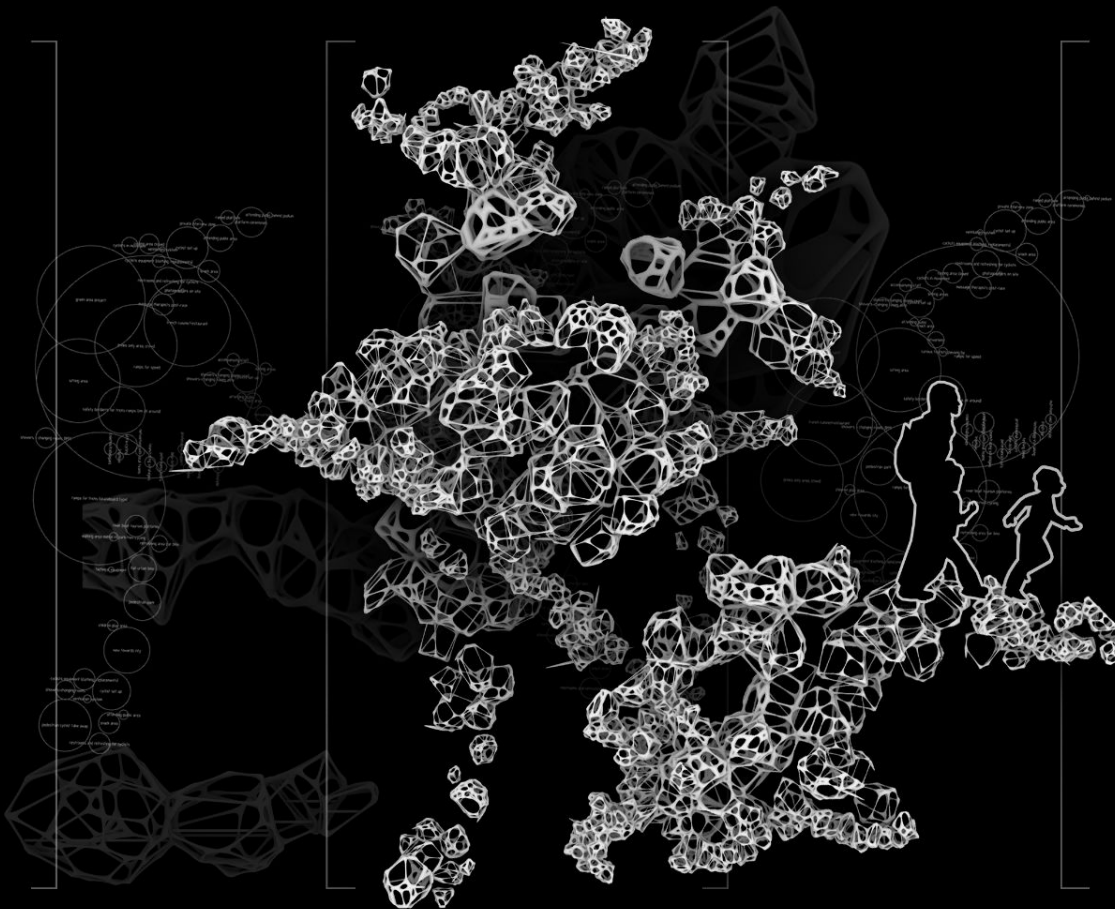
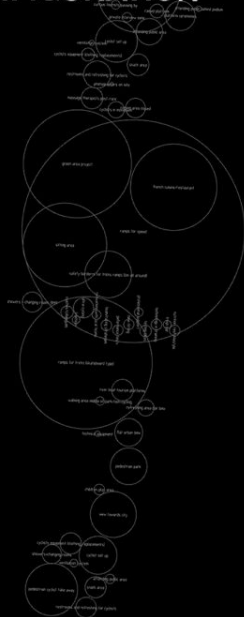


v5\_radiant stacked intensities

PROGRAM  
CONFIGURATION



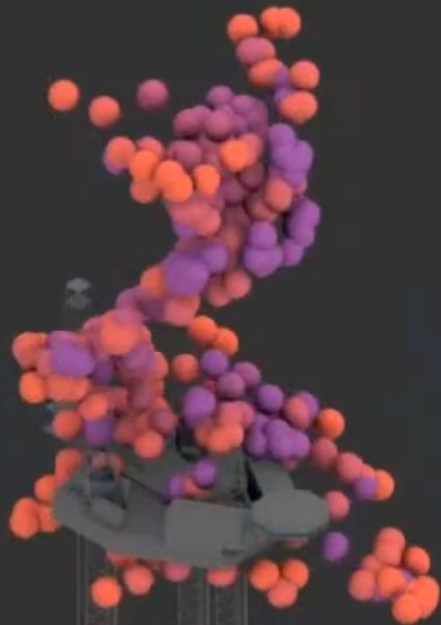
# PROGRAM CONFIGURATION



agent based modeling  
BB C  
ABM 4  
var 4

functions

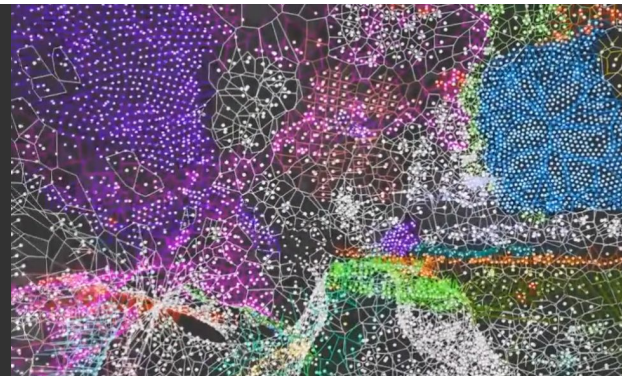
- living
- work
- leisure
- nature
- food
- energy



agent based modeling

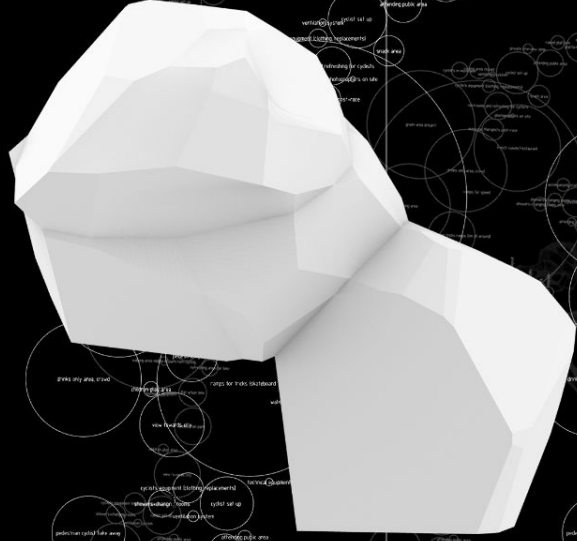
volume swarm

$10^6$





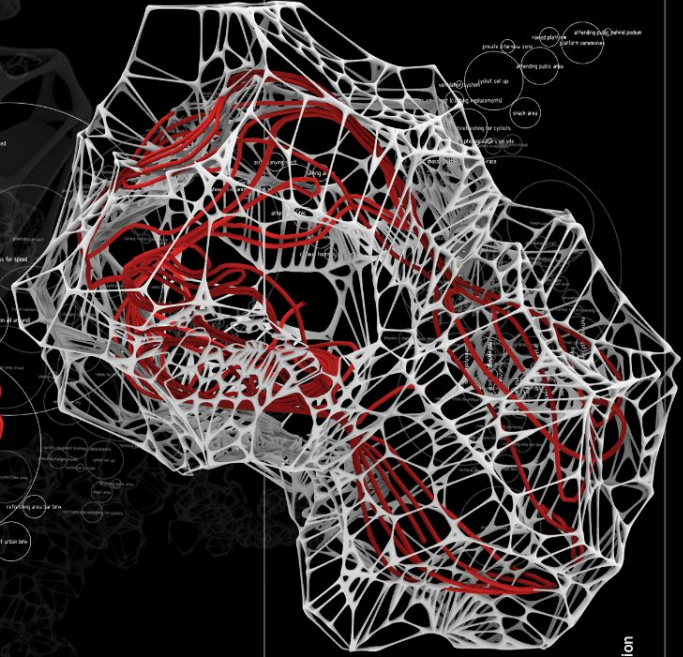
# MATERIALIZATION



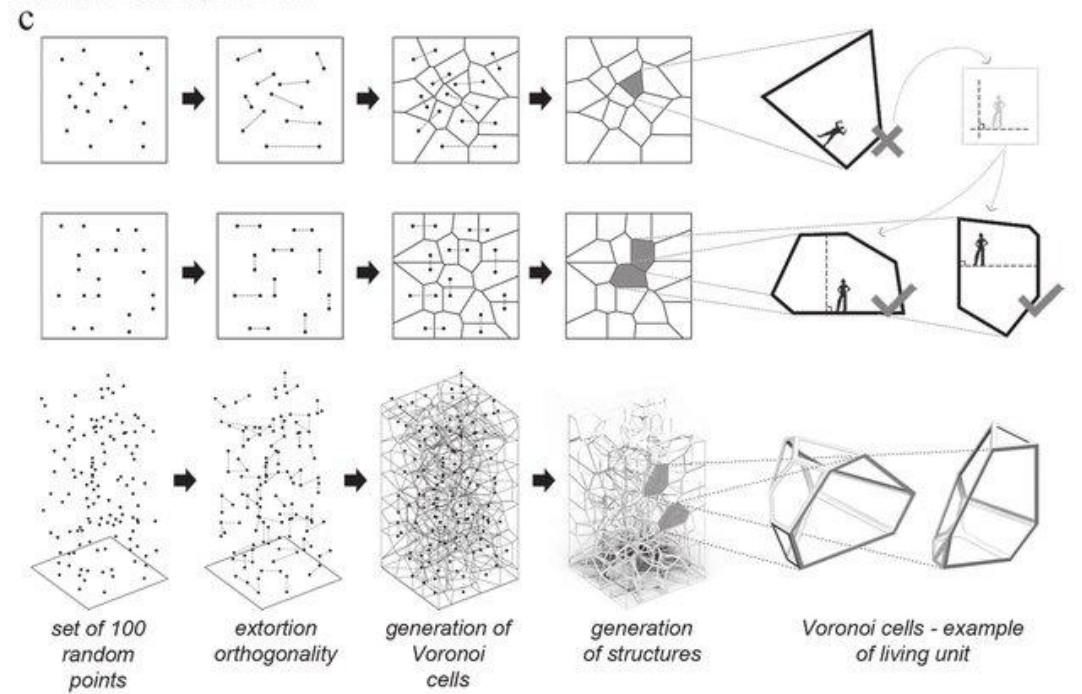
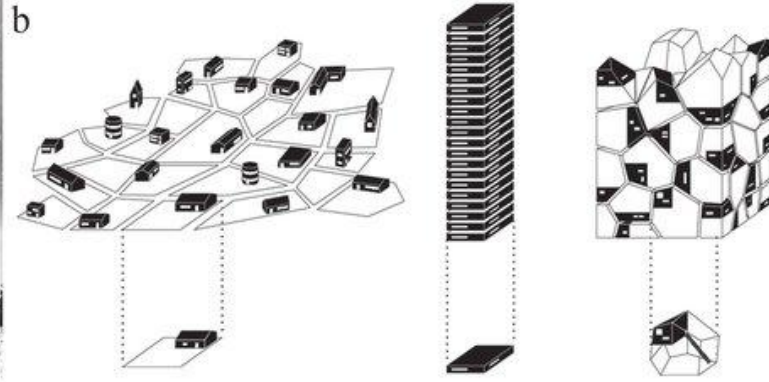
Base Volume

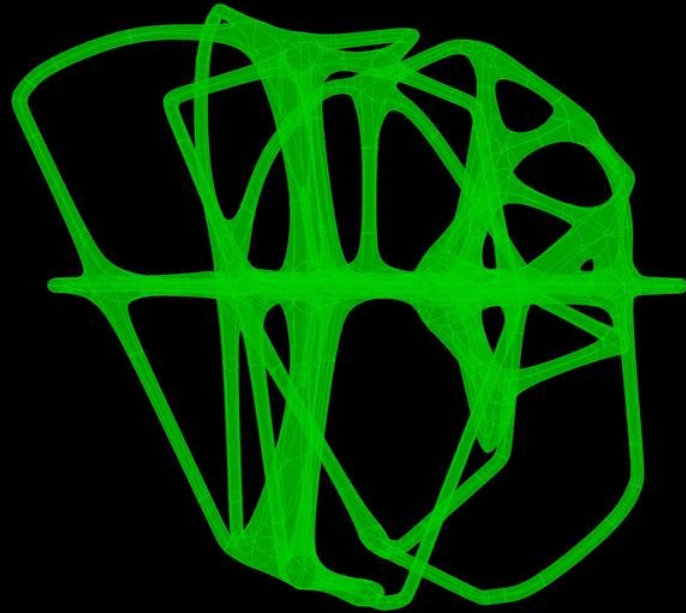


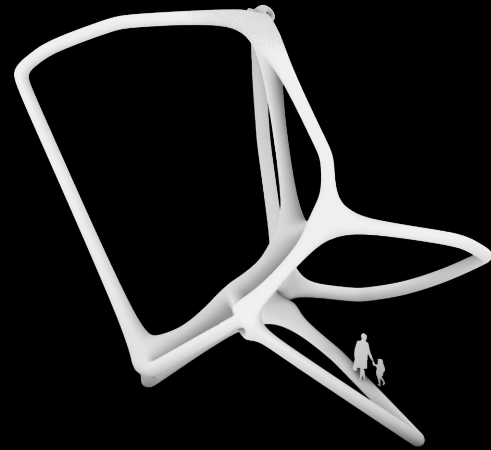
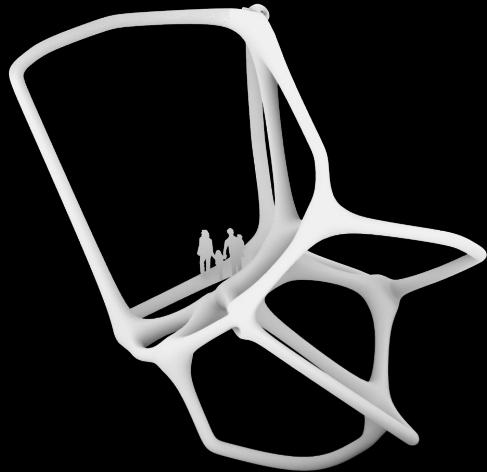
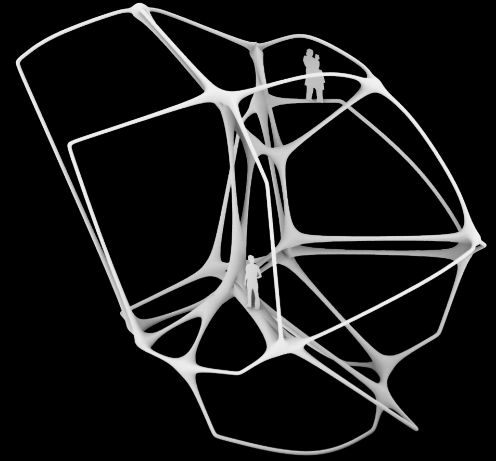
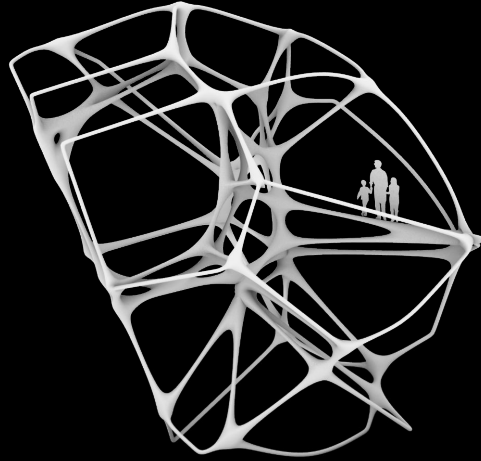
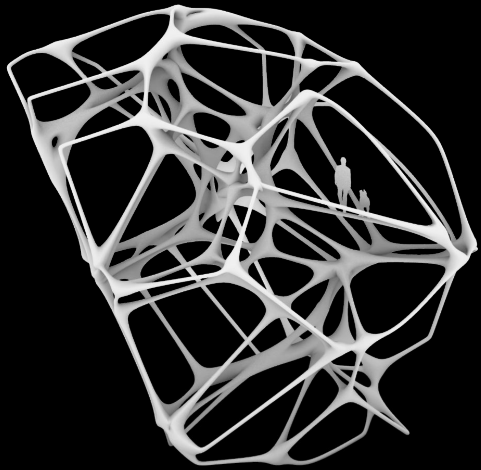
Compression Regions

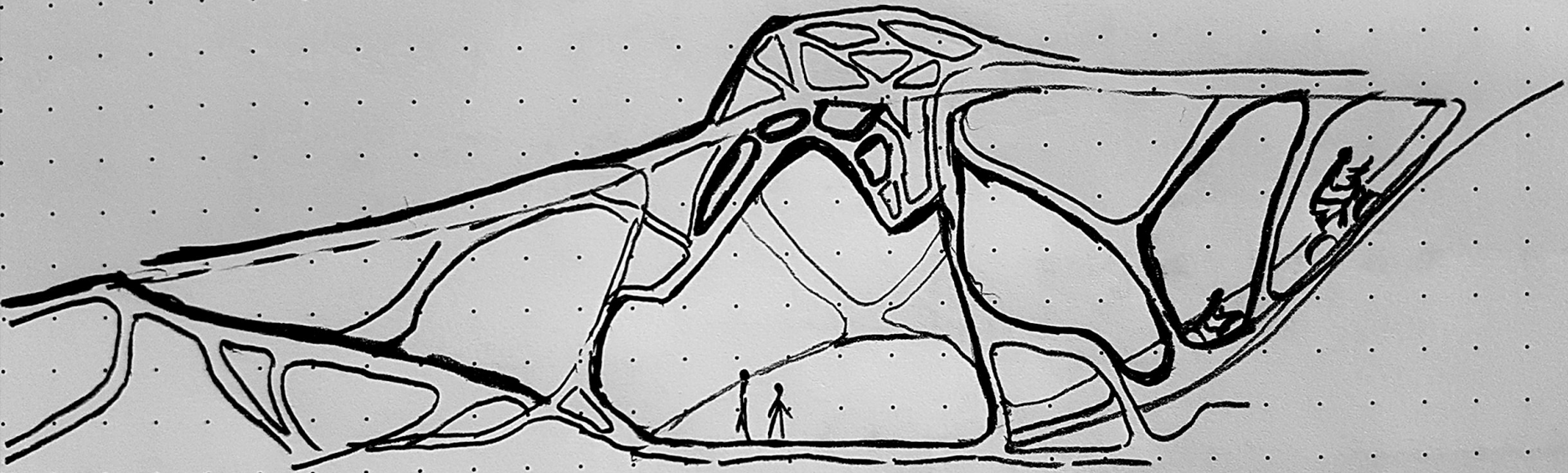


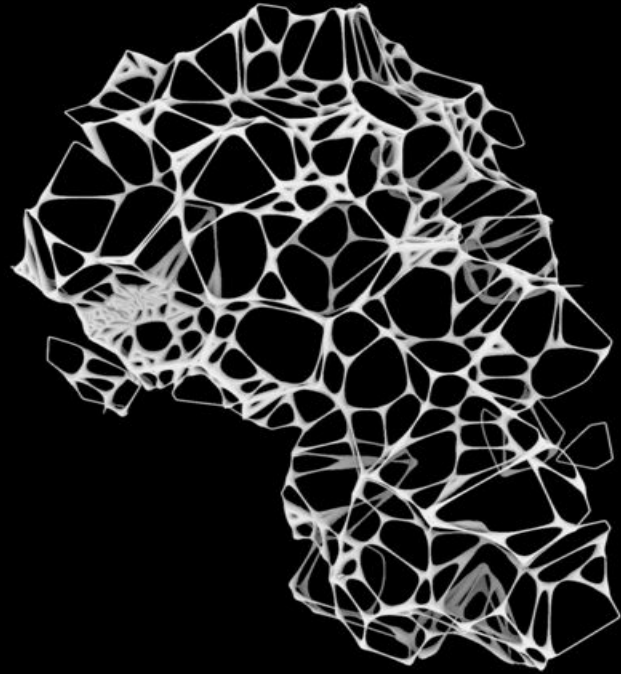
Materialization





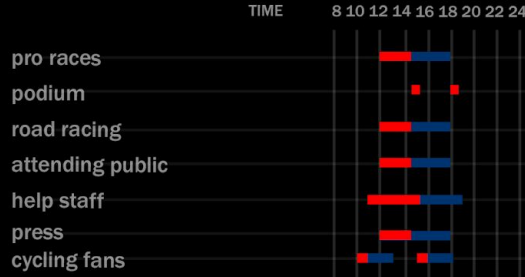




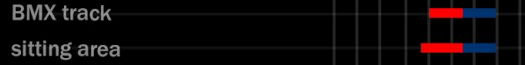


# **ARCHITECTURAL PROPOSAL**

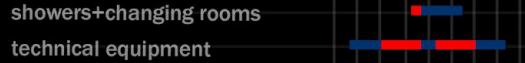
## I. ROAD RACING



## II. BMX CYCLING



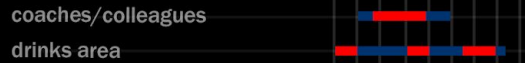
## III. TECHNICAL SPACES



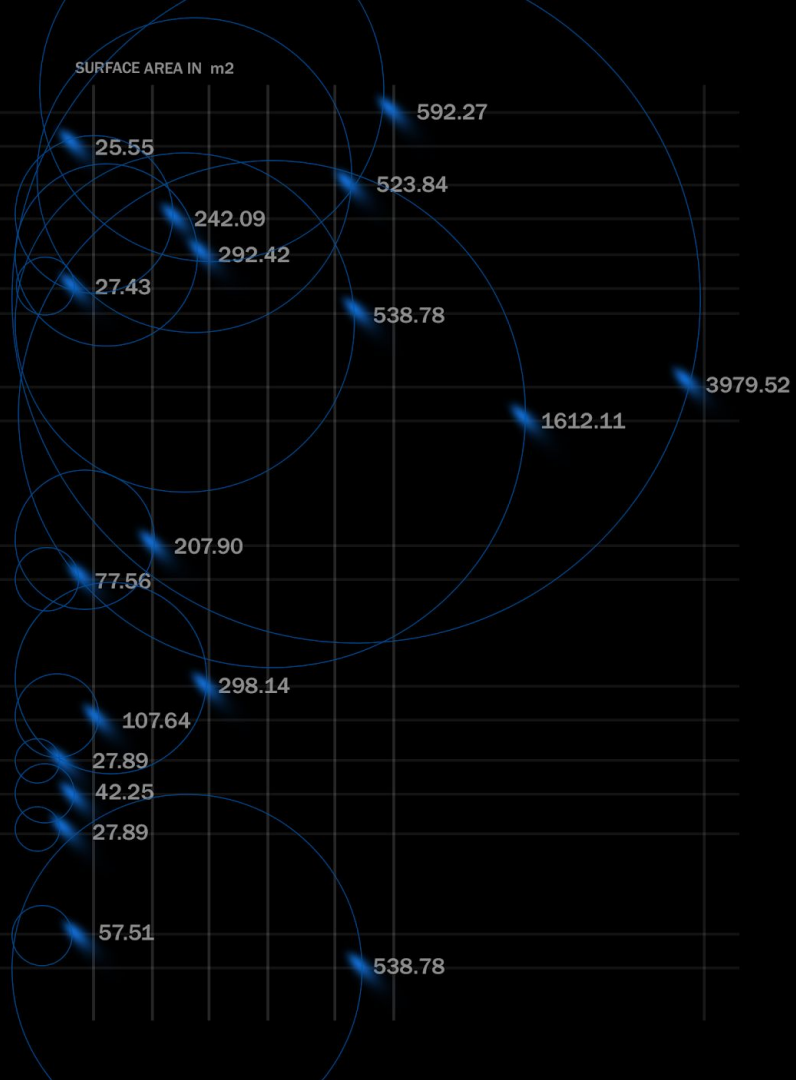
## IV. AMATEUR CYCLISTS



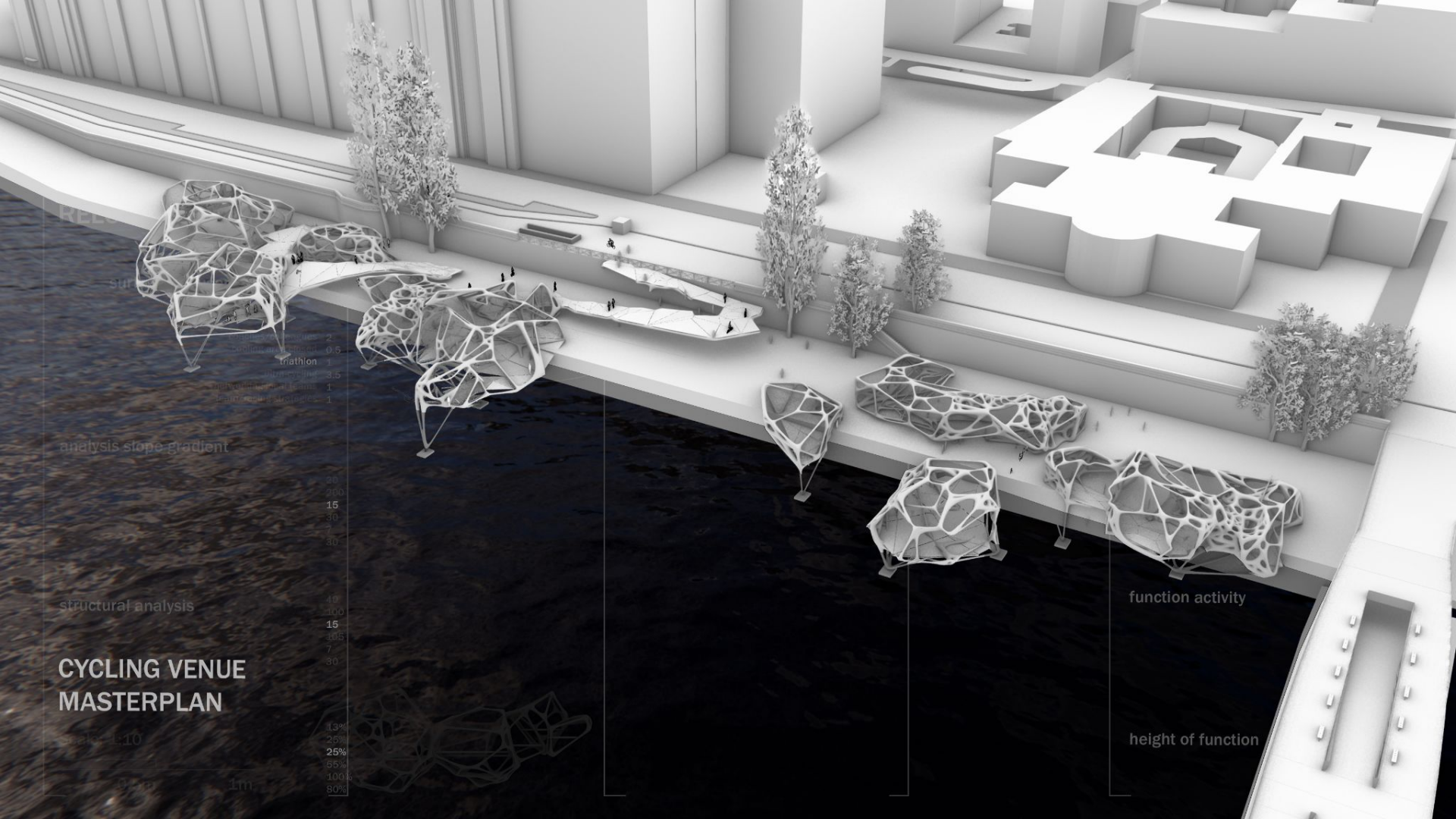
## V. PUBLIC



min max







RIEL

su

2  
0.6  
1  
3.5  
1  
1

analysis slope gradient

25  
15  
10  
5  
0

structural analysis

15  
100  
7  
30

# CYCLING VENUE MASTERPLAN

scale 1:10

13%  
25%  
25%  
55%  
100%  
80%

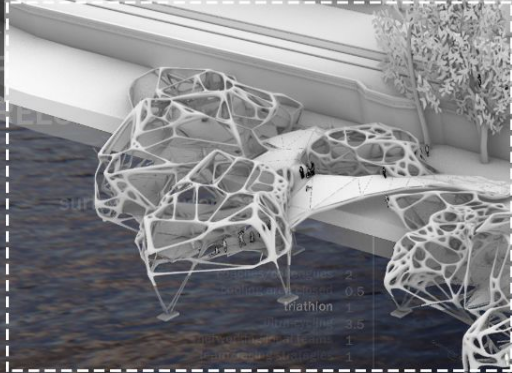
function activity

height of function

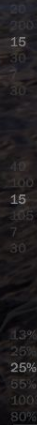
1m

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m<sup>2</sup>



analysis slope gradient



structural analysis

# CYCLING VENUE MASTERPLAN

scale 1:10

city proximity spots

- Not relevant
- Waterfront
- Waterfront
- Rue de Safering
- Rue de Safering

stress level

function activity

- coaches / colleagues
- cooling / area closed
- triathlon**
- ultra-cycling
- networking local teams
- team / racing strategies

height of function

- 1.17
- 2.25
- 2.25**
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# DESIGN FRAGMENT STUDY

surface per user

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

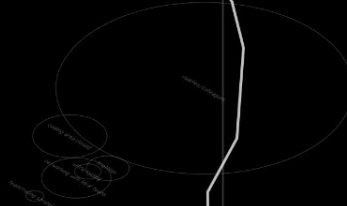
- 20
- 200
- 15
- 30
- 7
- 30

structural analysis

- 40
- 15
- 105
- 7
- 30

voronoi support structure

- 13%
- 25%
- 25%
- 55%
- 100%
- 80%



city proximity spots

- Not relevant
- Waterfront
- Waterfront
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

function activity

- coaches/colleagues
- cooling area closed
- triathlon
- ultra-cycling
- networking local teams
- team/racing strategies

height of function

- 1.17
- 2.25
- 2.25
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# FUNCTIONAL DISTRIBUTION

surface per user

coaches/colleagues 2  
cooling area closed 0.5

networking  
team

analysis slope gradient

restaurant french cuisine

circulation  
space

restroom

snack area

attending  
public

cycling events

showers  
cyclists

showers

activity spots

cycling  
equipment

Not relevant  
Waterfront  
Waterfront  
Rue de Solferino  
Rue de Solferino

function activity

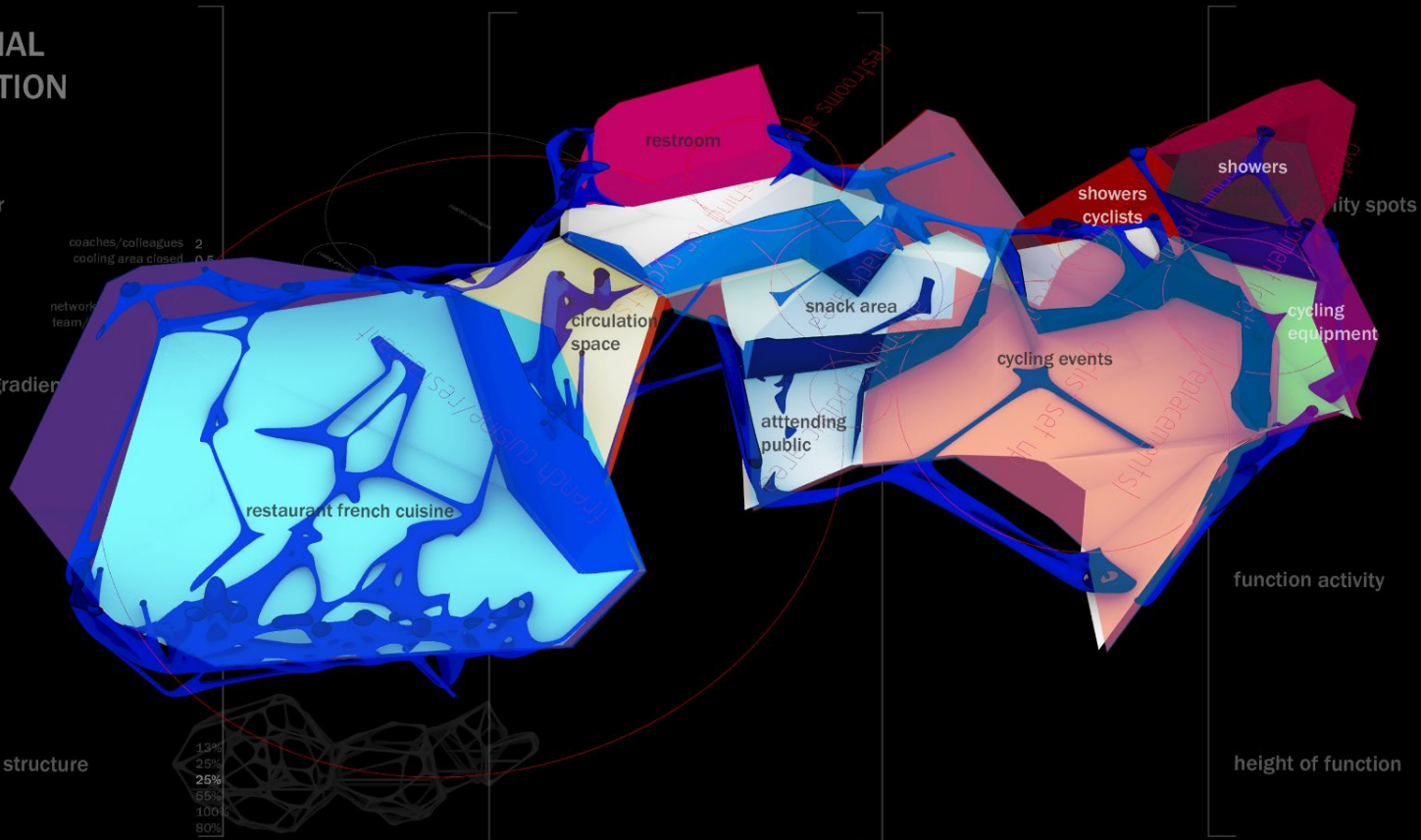
coaches/colleagues  
cooling area closed  
triathlon  
ultra-cycling  
networking local teams  
team/racing strategies

voronoi support structure

13%  
25%  
**25%**  
65%  
100%  
80%

height of function

1.17  
2.25  
**2.25**  
4.95  
9  
7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# SPATIAL NETWORK

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient

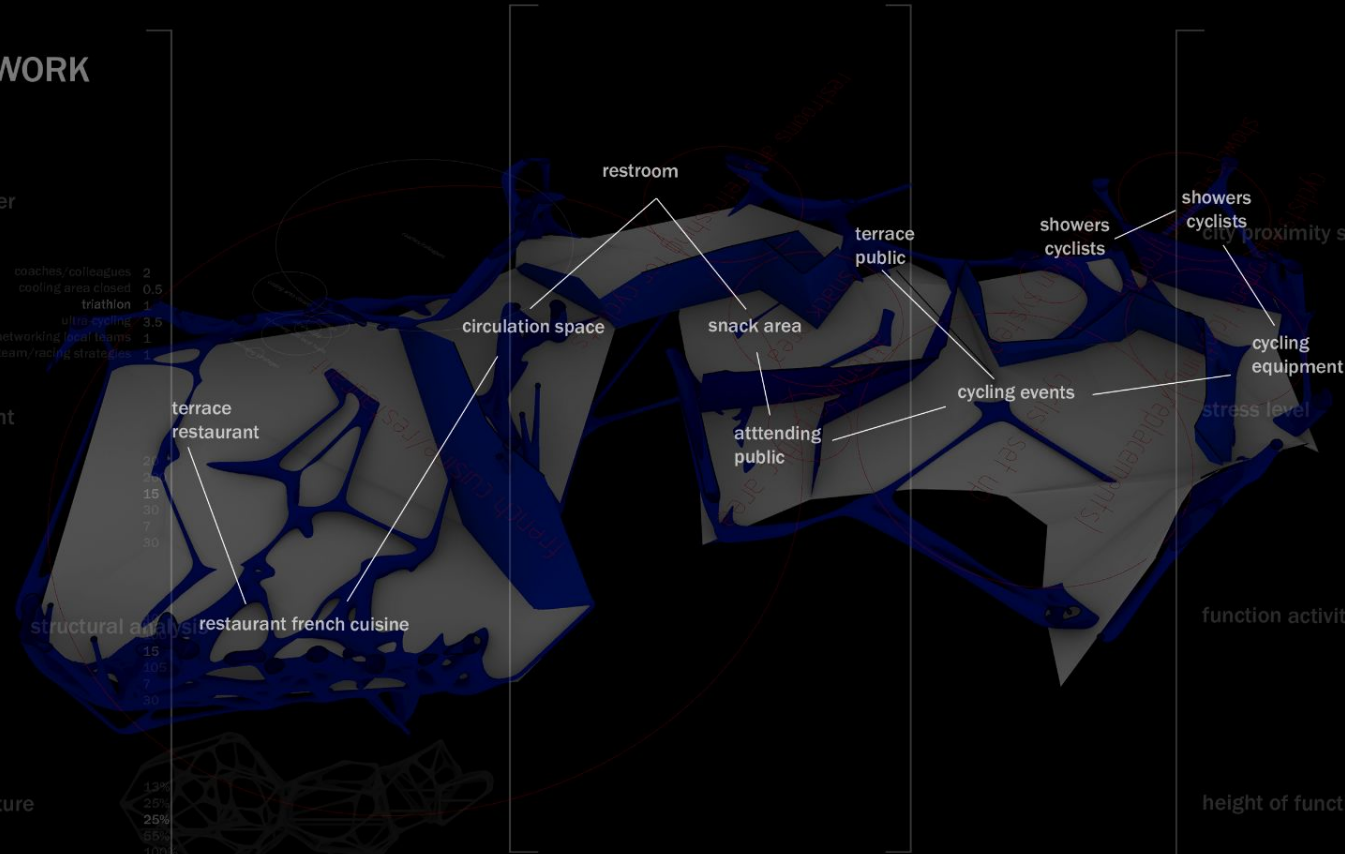
25
15
0
7
30

structural analysis

15
100
7
30

voronoi support structure

13%
25%
25%
65%
100%
80%



Not relevant
Waterfront
Waterfront
Waterfront
Rua de Sotir/ino
Rua de Sotir/ino

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

1.17
2.25
2.25
4.95
9
7.2



coaches/colleagues 0.5  
 triathlon 1  
 ultra-cycling 3.5  
 networking local teams 1  
 team/racing strategies 1

analysis slope gradient

20  
 200  
 15  
 30  
 7  
 30

structural analysis

40  
 100  
 15  
 105

1.5m

stress level

function activity

coaches/colleagues  
 cooling area closed  
 triathlon  
 ultra-cycling  
 networking local teams  
 team/racing strategies

# FLOORPLAN

height of function

1.17  
 2.25  
 2.25  
 4.95  
 9  
 7.2



coaching/colleagues 0.5  
triathlon 1  
ultra-cycling 3.5  
networking local teams 2  
team/racing strategies 1

analysis slope gradient

20  
250  
15  
30  
7  
30

structural analysis

40  
100  
15  
105



4.5m

stress level

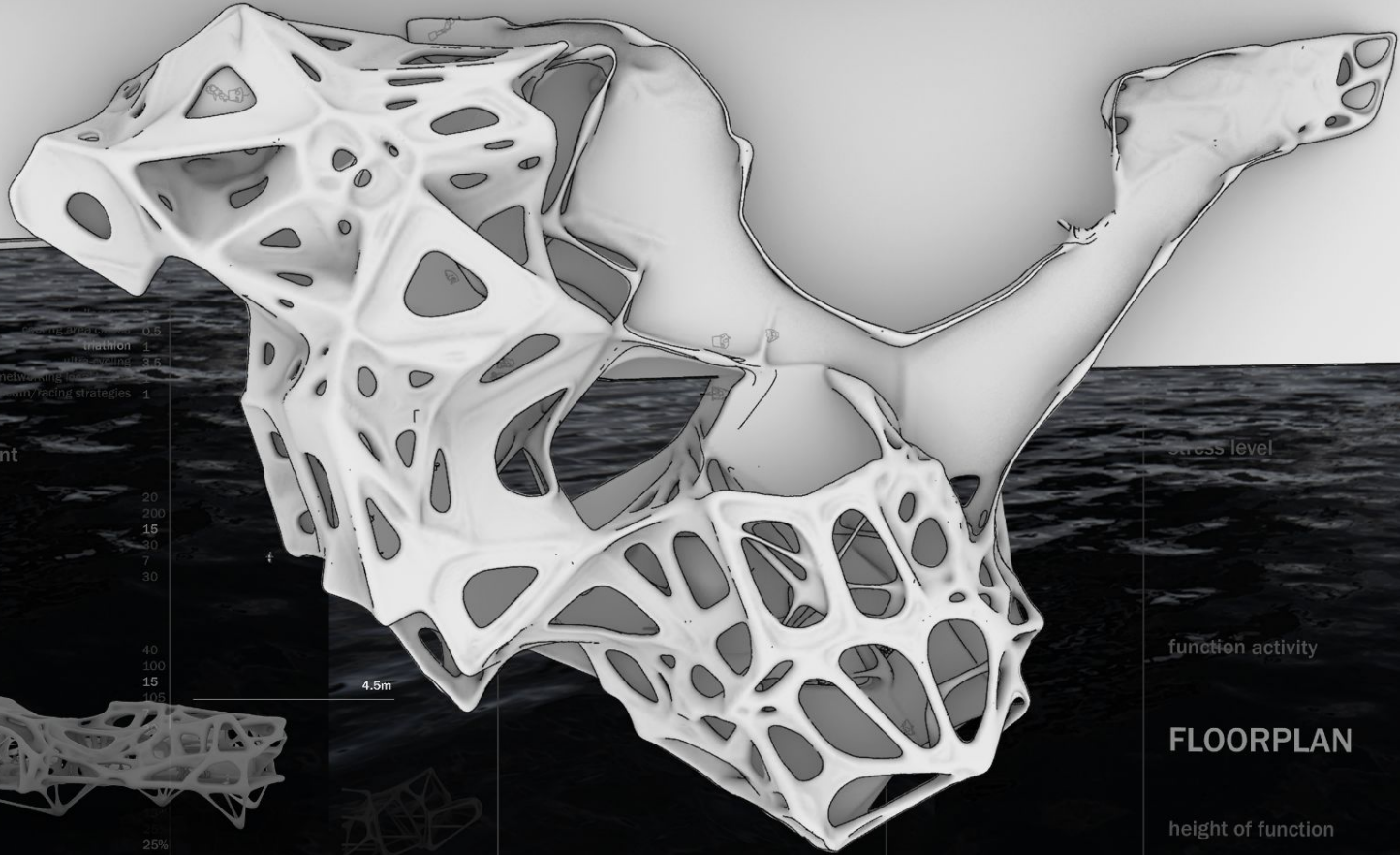
function activity

coaches/colleagues  
cooling area closed  
**triathlon**  
ultra-cycling  
networking local teams  
team/racing strategies

**FLOORPLAN**

height of function

1.17  
2.25  
**2.25**  
4.95  
9  
7.2



0.5  
1  
3.5  
1  
1

analysis slope gradient

20  
200  
15  
30  
7  
30

structural analysis

40  
100  
15  
105

4.5m

stress level

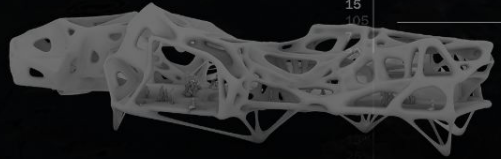
function activity

coaches/colleagues  
cooling area closed  
**triathlon**  
ultra-cycling  
networking local teams  
team/racing strategies

**FLOORPLAN**

height of function

1.17  
2.25  
**2.25**  
4.95  
9  
7.2



25%  
50%  
100%  
200%



TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m<sup>2</sup>

# CIRCULATION

surface per user

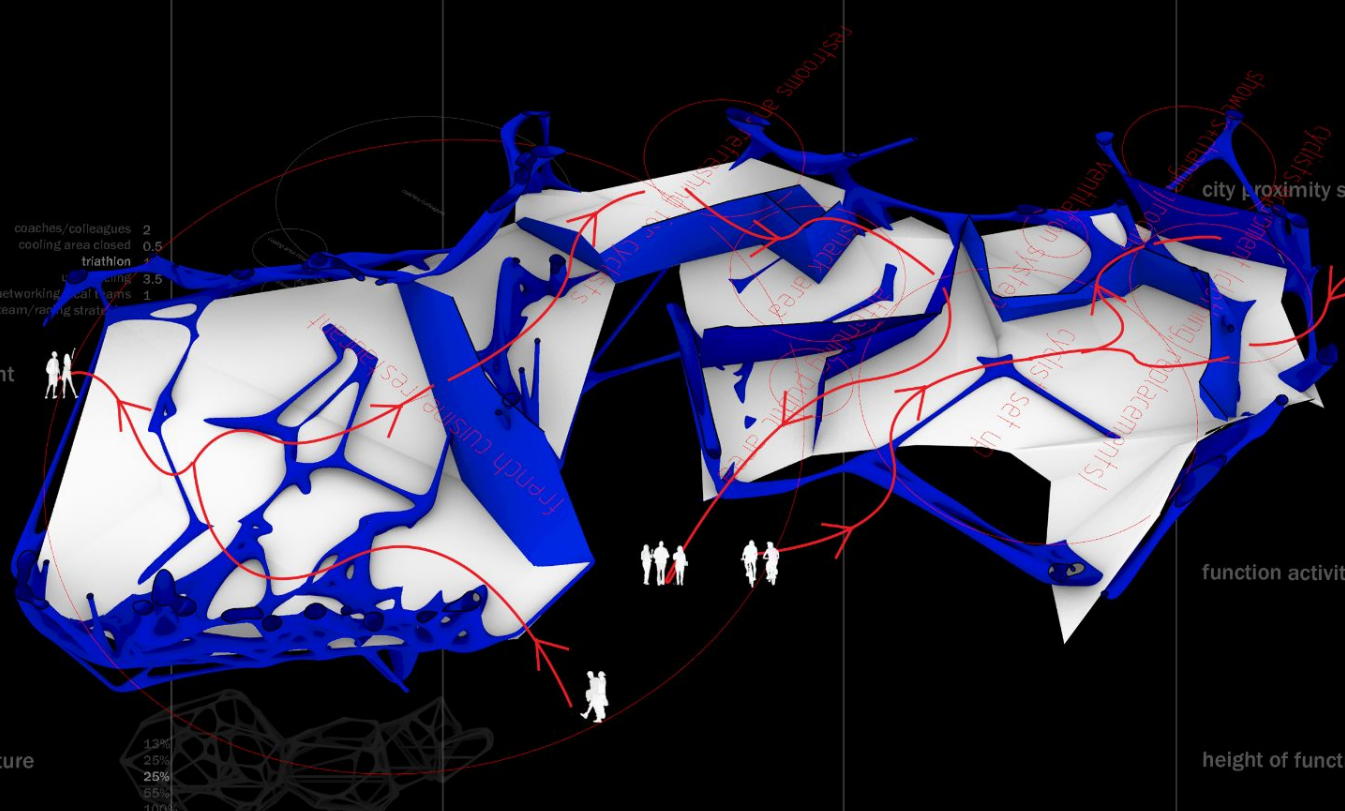
coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient



voronoi support structure

13%
25%
<b>25%</b>
55%
100%
80%



city proximity spots



function activity

Not relevant  
Waterfront  
Waterfront  
Rue de Solferino  
Rue de Solferino

height of function

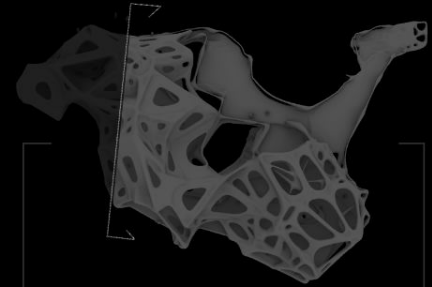
1.17
2.25
<b>2.25</b>
4.95
9
7.2

coaches/colleagues  
cooling area closed  
triathlon  
ultra-cycling  
networking local teams  
team/racing strategies

TIME 8 10 12 14 16 18 20 22 24

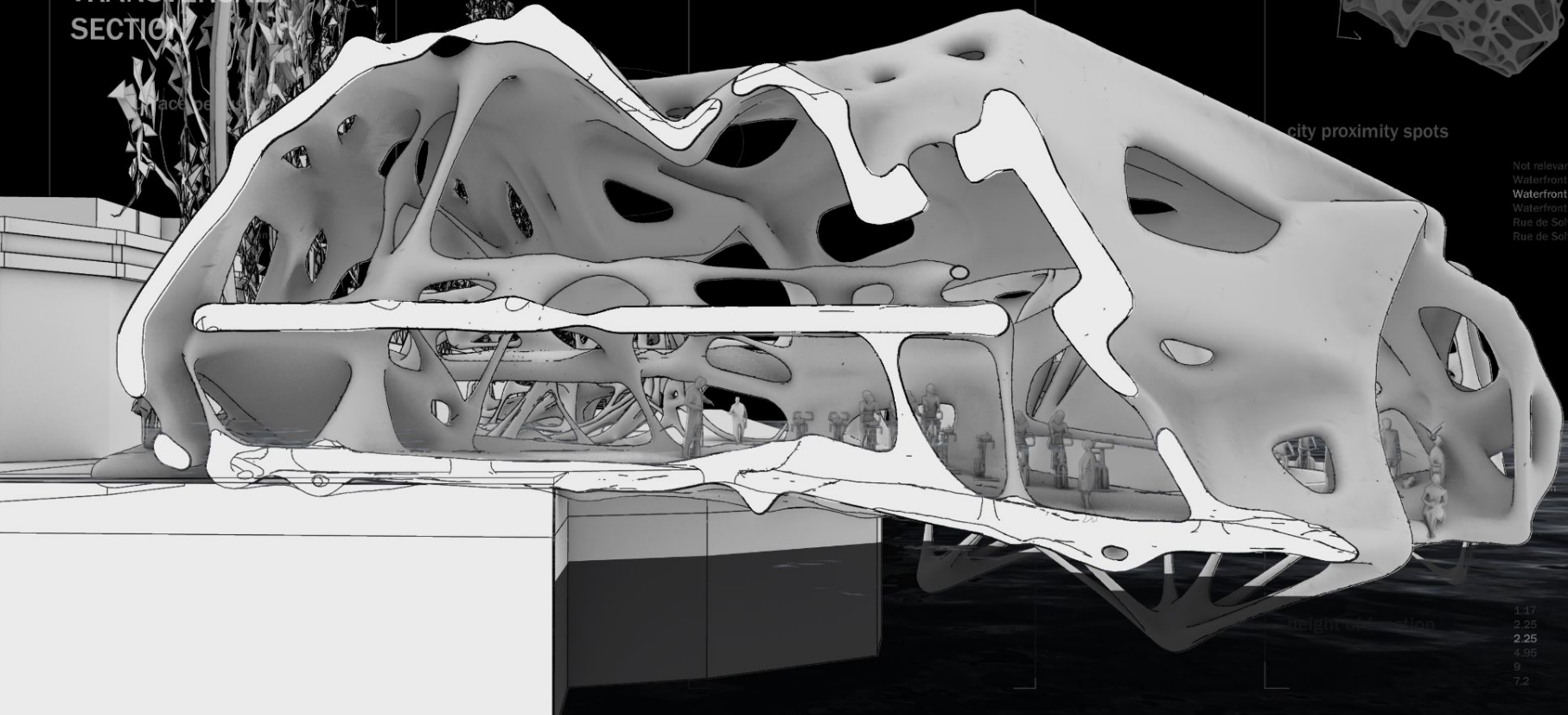
SURFACE AREA IN m<sup>2</sup>

# TRANSVERSAL SECTION



city proximity spots

- Not relevant
- Waterfront
- Waterfront**
- Waterfront
- Rue de Solferino
- Rue de Solferino



height of section

- 1.17
- 2.25
- 2.25**
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

city proximity spots

Not relevant  
Waterfront  
Waterfront  
Waterfront  
Rue de Solferino  
Rue de Solferino

ELEVATION S-E



TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m<sup>2</sup>

# TRANSVERSAL SECTION

sun / air user

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- local teams 1
- strategies 1

and

0.80m

8.15m

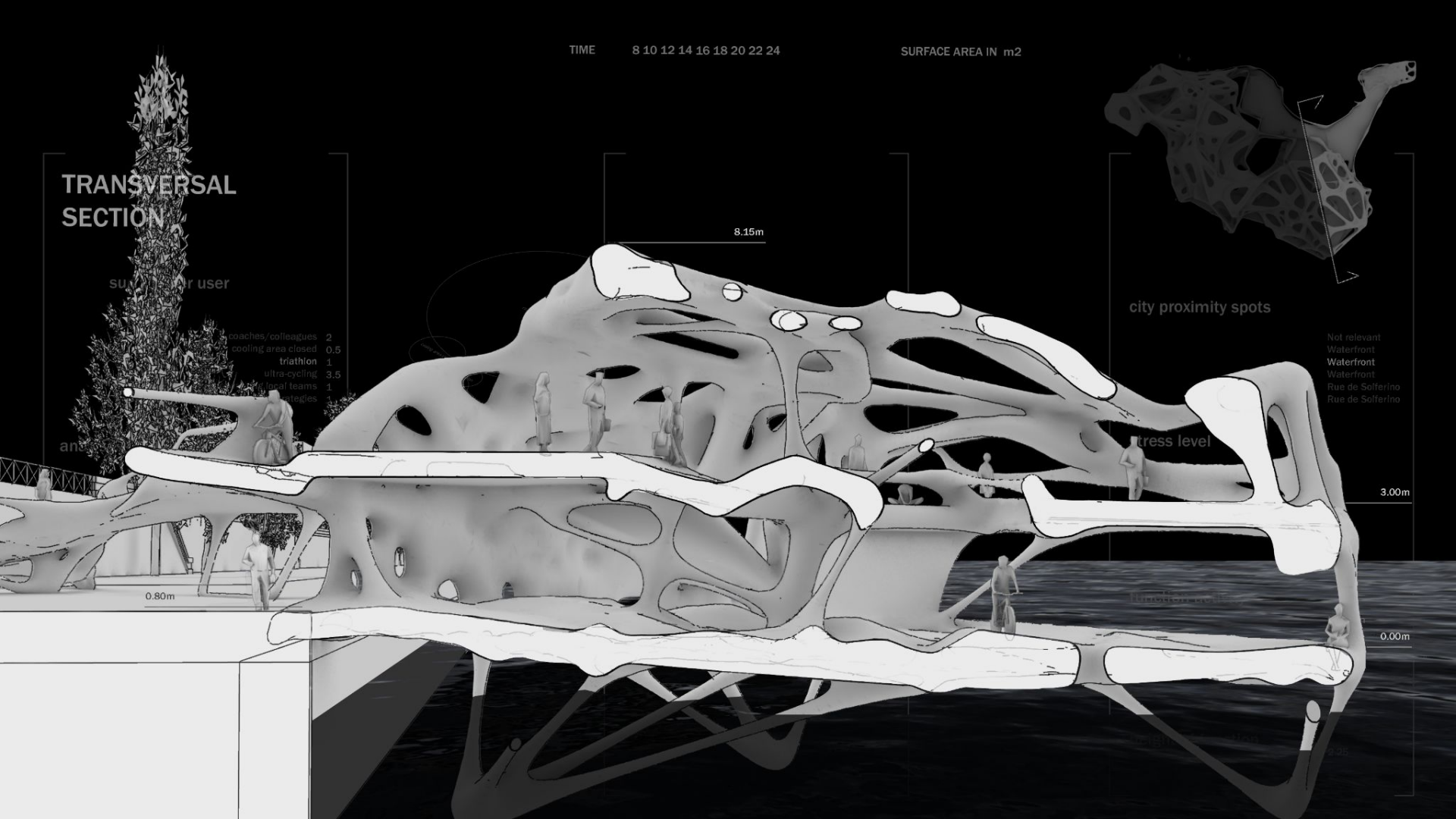
city proximity spots

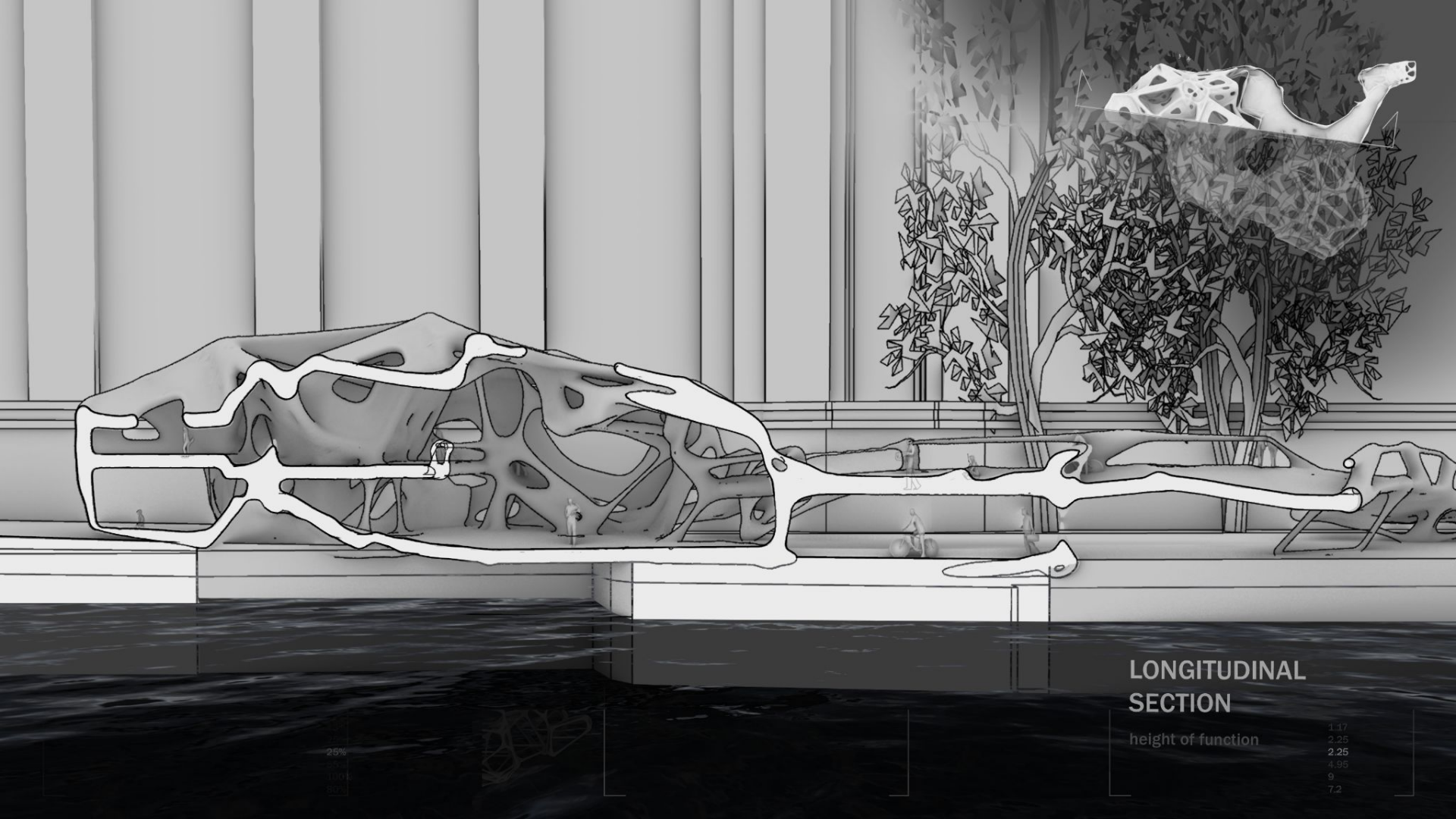
- Not relevant
- Waterfront
- Waterfront
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

3.00m

0.00m





LONGITUDINAL  
SECTION

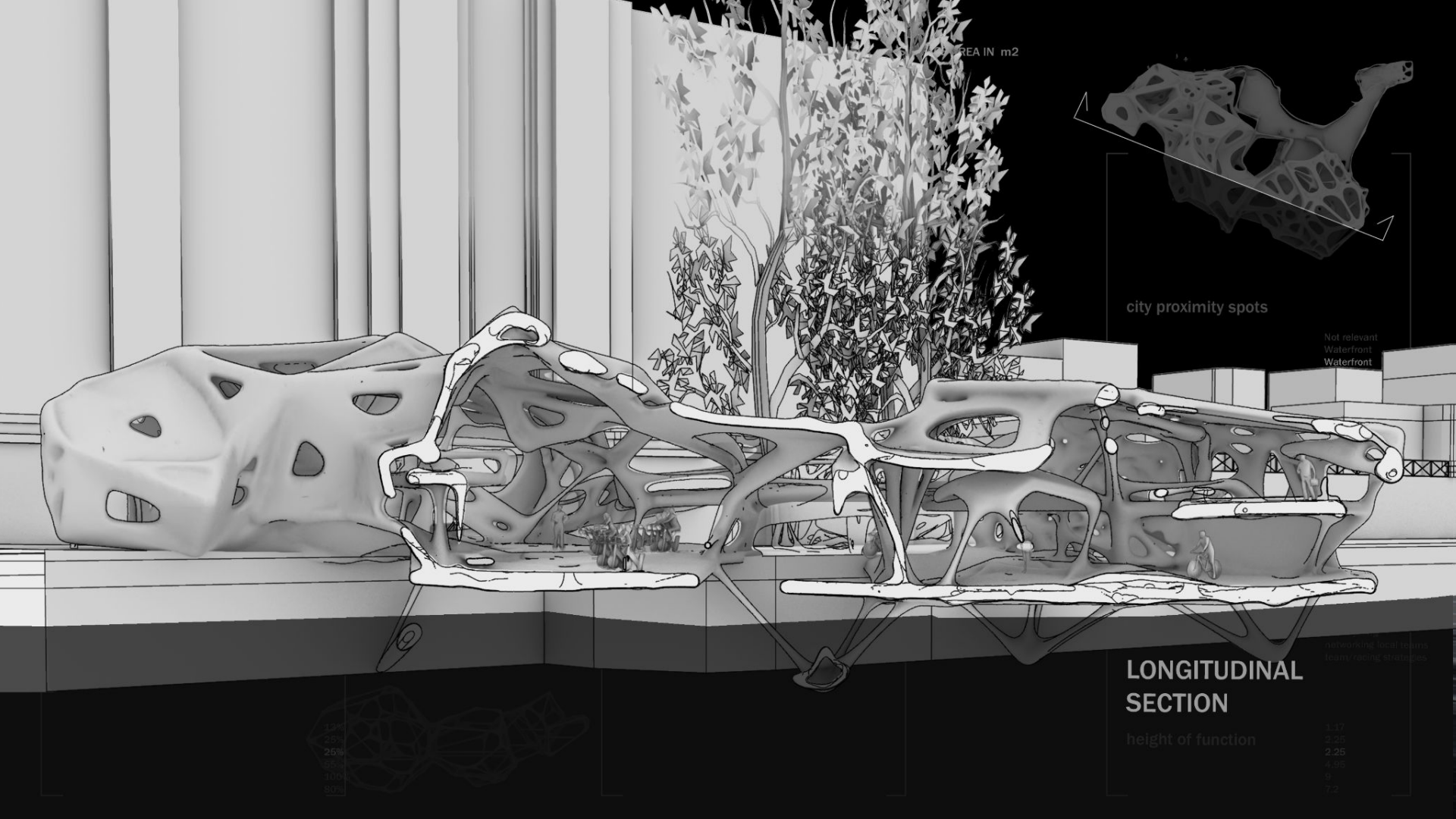
height of function

1.17  
2.25  
2.25  
4.95  
9  
7.2

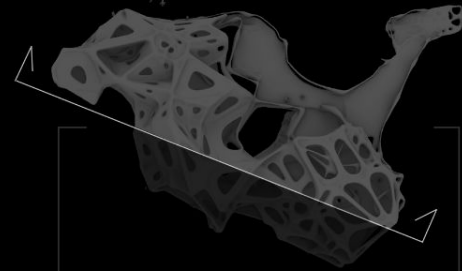
25%

10%

5%



AREA IN m2



city proximity spots

Not relevant  
Waterfront  
Waterfront

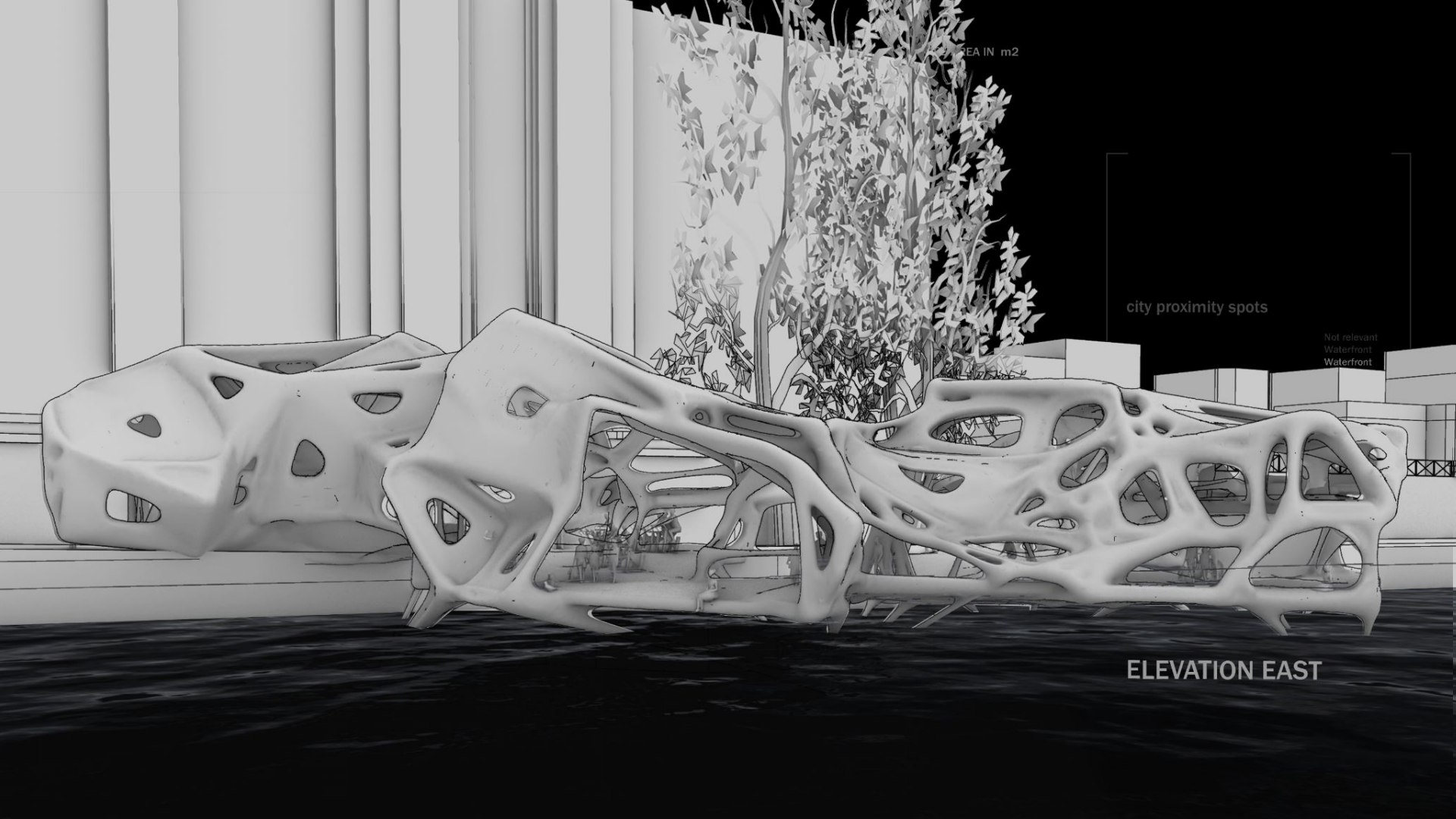
1.17  
2.25  
4.45  
8.90  
17.80

# LONGITUDINAL SECTION

height of function

subordinate local levels  
from rising structure

1.17  
2.25  
2.25  
4.45  
8.90  
17.80



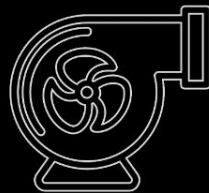
EA IN m2

city proximity spots

Not relevant  
Waterfront  
Waterfront

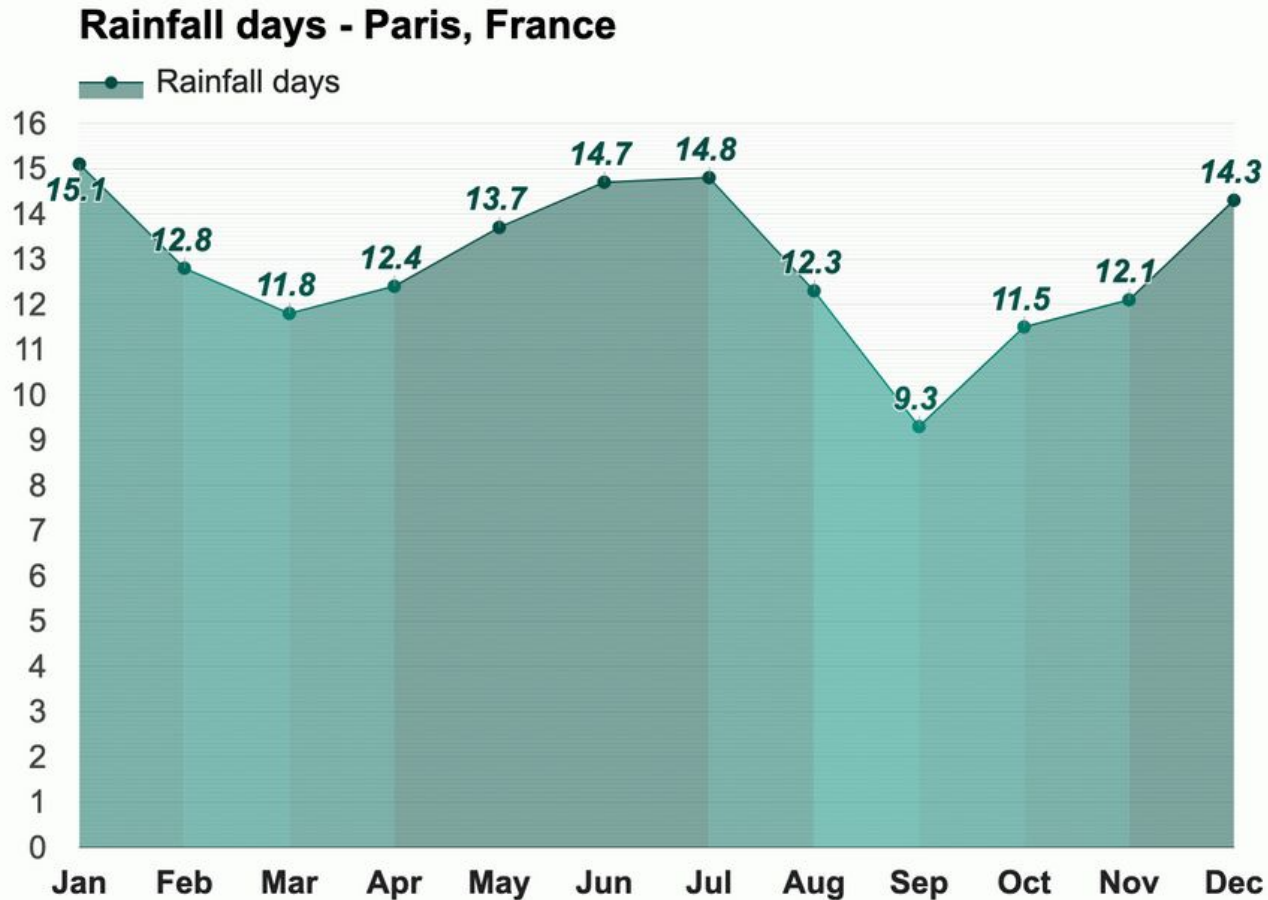
ELEVATION EAST

**CLIMATE**



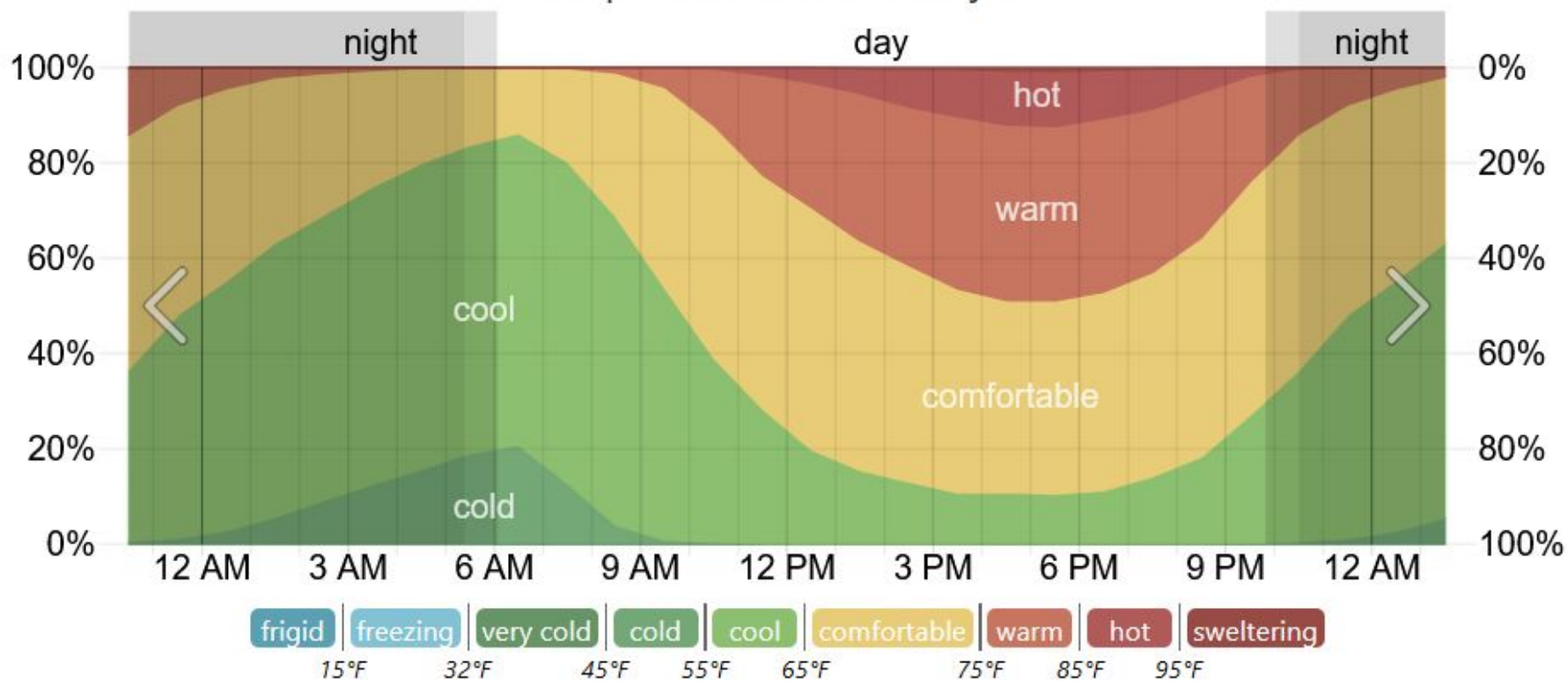


## Average rainfall days in July Paris, France



Average rainfall days in July: **14.8 days**

# Temperature Bands on July 15



The percentage of time spent in various temperature bands. Civil twilight and night are indicated by shaded overlays.

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# LOCAL THERMAL COMFORT REQUIREMENTS

beam

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

- 25
- 250
- 15
- 20
- 5
- 30

structural analysis

- 40
- 100
- 15
- 105
- 7
- 30

24 °C

15 °C

21 °C

city proximity spots

- Not relevant
- Waterfront
- Waterfront**
- Waterfront
- Rue de Solferino
- Rue de Solferino

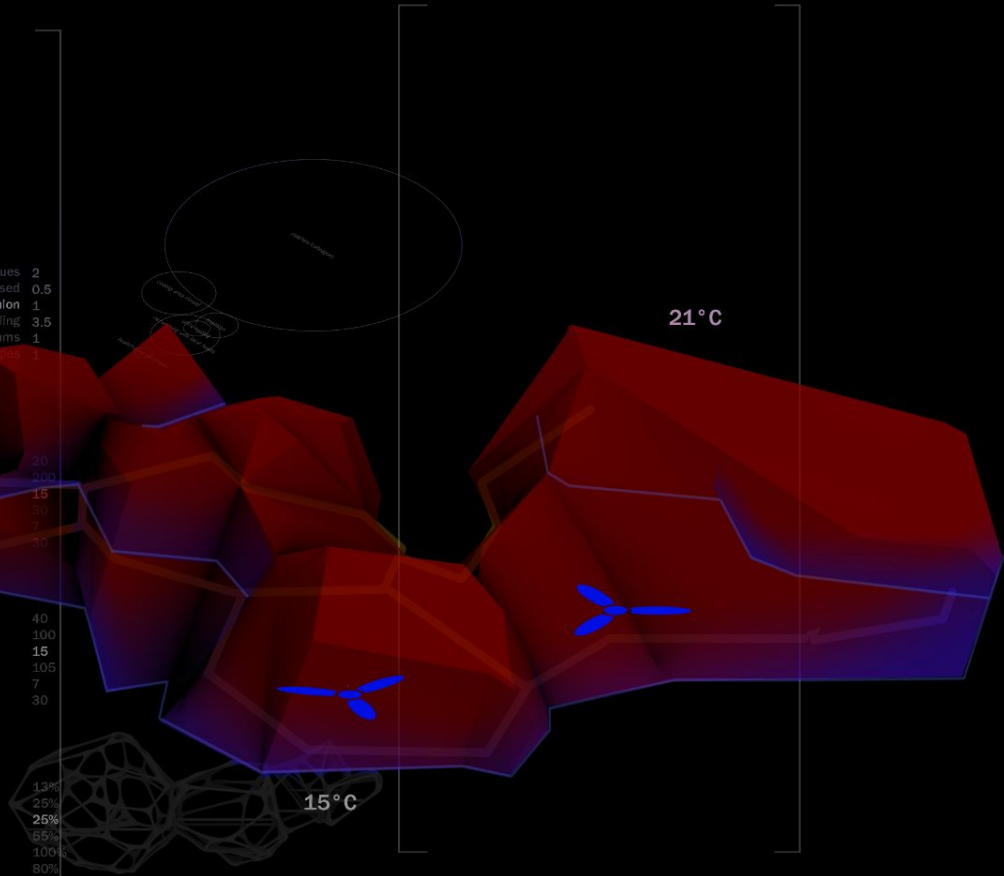
stress level

function activity

- coaches/colleagues
- cooling area closed
- triathlon**
- ultra-cycling
- networking local teams
- team/racing strategies

26 °C

- 1.17
- 2.25
- 2.25**
- 4.95
- 9
- 7.2





TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# VENTILATION CHILLED WATER SYSTEM

beam

coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient

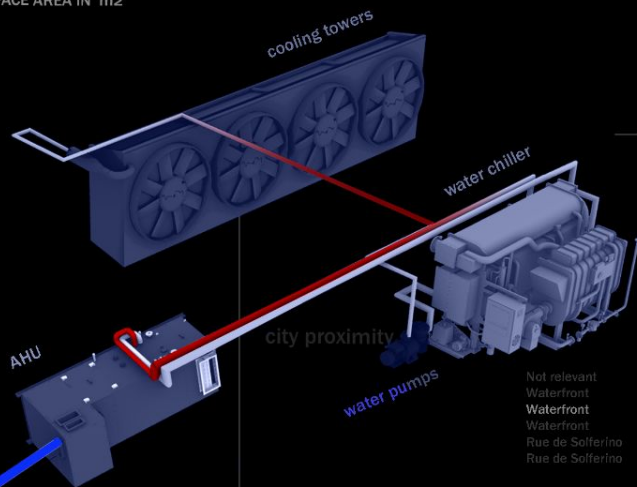
25
250
15
20
5
30

structural analysis

40
15
105
7
30

NODE

13%
25%
25%
65%
100%
80%



city proximity

stress level

function activity

Not relevant  
Waterfront  
Waterfront  
Rue de Solferino  
Rue de Solferino

coaches/colleagues  
cooling area closed  
triathlon  
ultra-cycling  
networking local teams  
team/racing strategies

BEAM

1.17
2.25
2.25
4.95
9
7.2

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m<sup>2</sup>

# ENERGY PRODUCTION

integrated solar cells

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

- 20
- 250
- 15
- 20
- 5
- 30

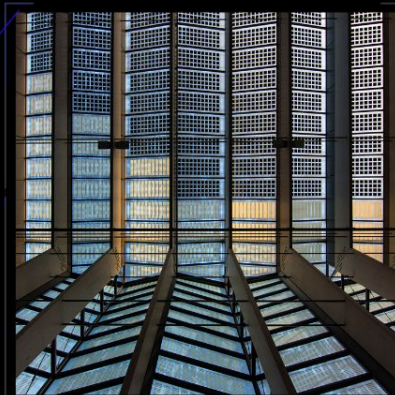
structural analysis

- 40
- 100
- 15
- 105
- 7
- 30

24°C

15°C

21°C



10.00m<sup>2</sup> solar cells = 350MWh

- 1.17
- 2.25
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	
ultra-cycling	
networking local teams	
team/racing strategies	

analysis slope gradient

structural analysis

100
15
105
7
30
13%
25%
25%
65%
100%
80%



proximity spots

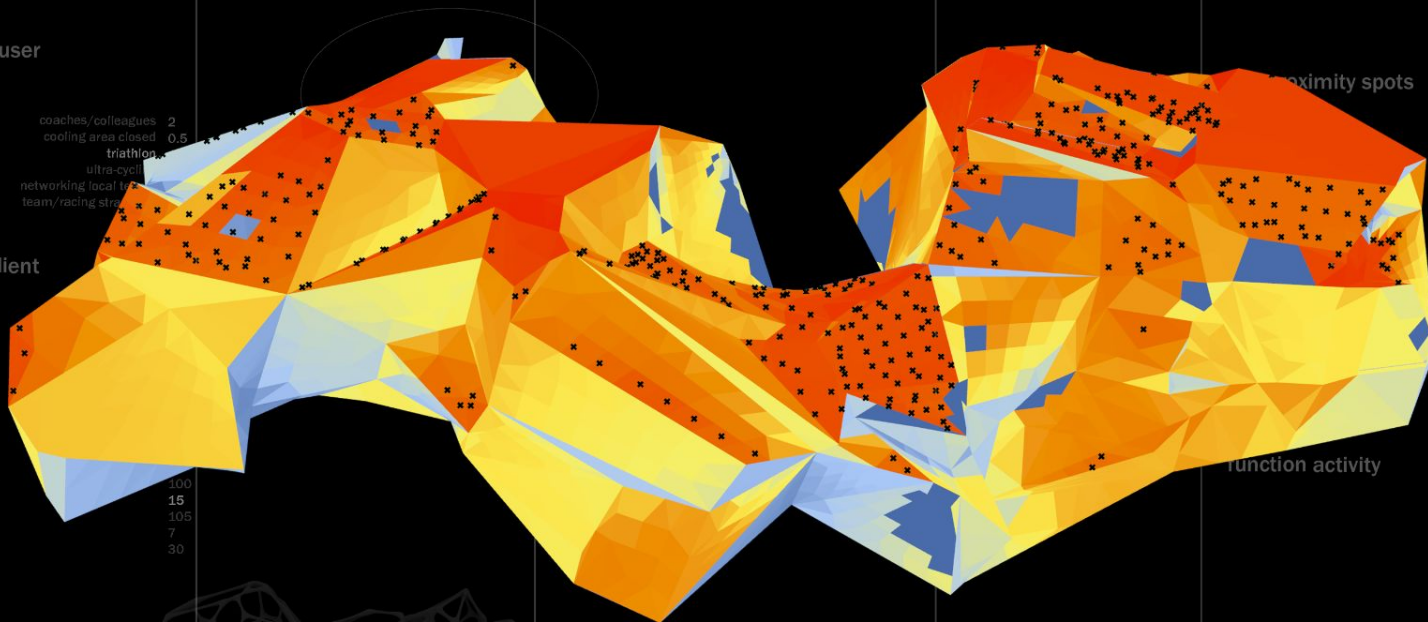
Not relevant
Waterfront
<b>Waterfront</b>
Waterfront
Rue de Solferino
Rue de Solferino

function activity

coaches/colleagues
cooling area closed
<b>triathlon</b>
ultra-cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
<b>2.25</b>
4.95
9
7.2



TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	
ultra-cycling	
networking local teams	
team/racing strategies	

analysis slope gradient

structural analysis

100
15
105
7
30



13%
25%
25%
65%
100%
80%

proximity spots

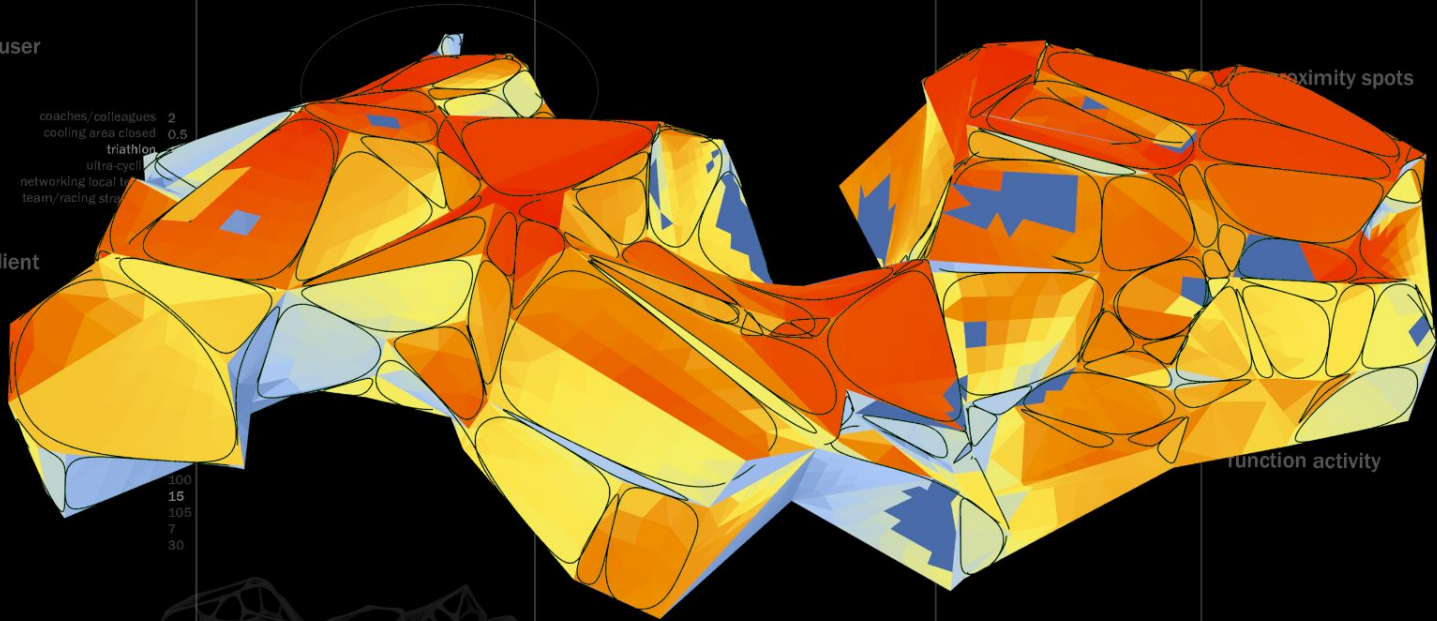
Not relevant
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
2.25
4.95
9
7.2





TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m<sup>2</sup>

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	
ultra-cycling	
networking local teams	
team/racing strategies	

analysis slope gradient

structural analysis

100
15
105
7
30
13%
25%
<b>25%</b>
65%
100%
80%



proximity spots

Not relevant
Waterfront
<b>Waterfront</b>
Waterfront
Rue de Solferino
Rue de Solferino

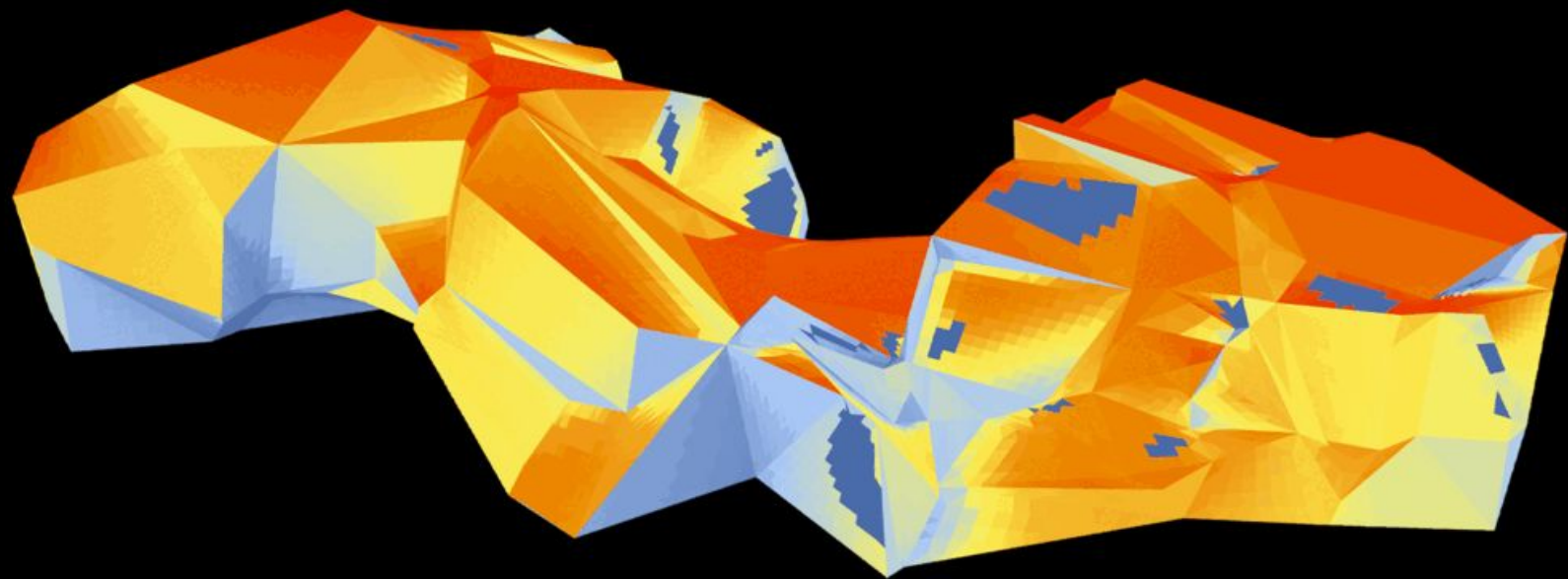
function activity

coaches/colleagues
cooling area closed
<b>triathlon</b>
ultra-cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
<b>2.25</b>
4.95
9
7.2





TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

## FRAGMENT PANELIZATION

surface per user

waterfront 2  
city center 0.5  
triatlon 1  
urban cycling 2.5  
networking local business 1  
family housing structure 1

analysis slope gradient

30  
20  
15  
10  
5  
0

structural analysis

30  
15  
0  
-15  
-30

voronoi support structure

100%  
20%  
50%  
30%  
90%

city proximity spots

port waterfront  
Waterfront  
waterfront  
Rue de Suffrin  
Rue de Suffrin

stress level

function activity

waterfront waterfront  
cycling area closed  
triatlon  
urban cycling  
networking local business  
family housing structure

height of function

1.17  
2.25  
2.25  
4.00  
6  
7.2

wood is collected from local  
commercial and manufacturing  
industries

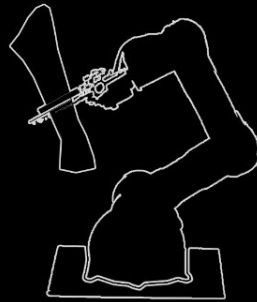
wooden beams milled in industrial  
depot setting East of Paris  
Vaire sur Marne

milled pieces and construction  
components shipped via Marne/Seine  
river to site

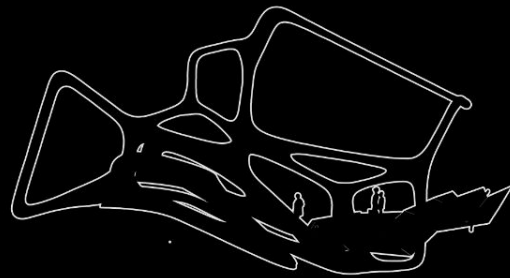
scaffolding for extending the reach of the  
robotic arms

on-site assembly with use of robotic arms

## LOGISTICS



## ASSEMBLY





TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# FRAGMENT PANELIZATION

surface per user

- coaches/colleagues 2
- cooling area closed 0.5
- triatlon 1
- ultra cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

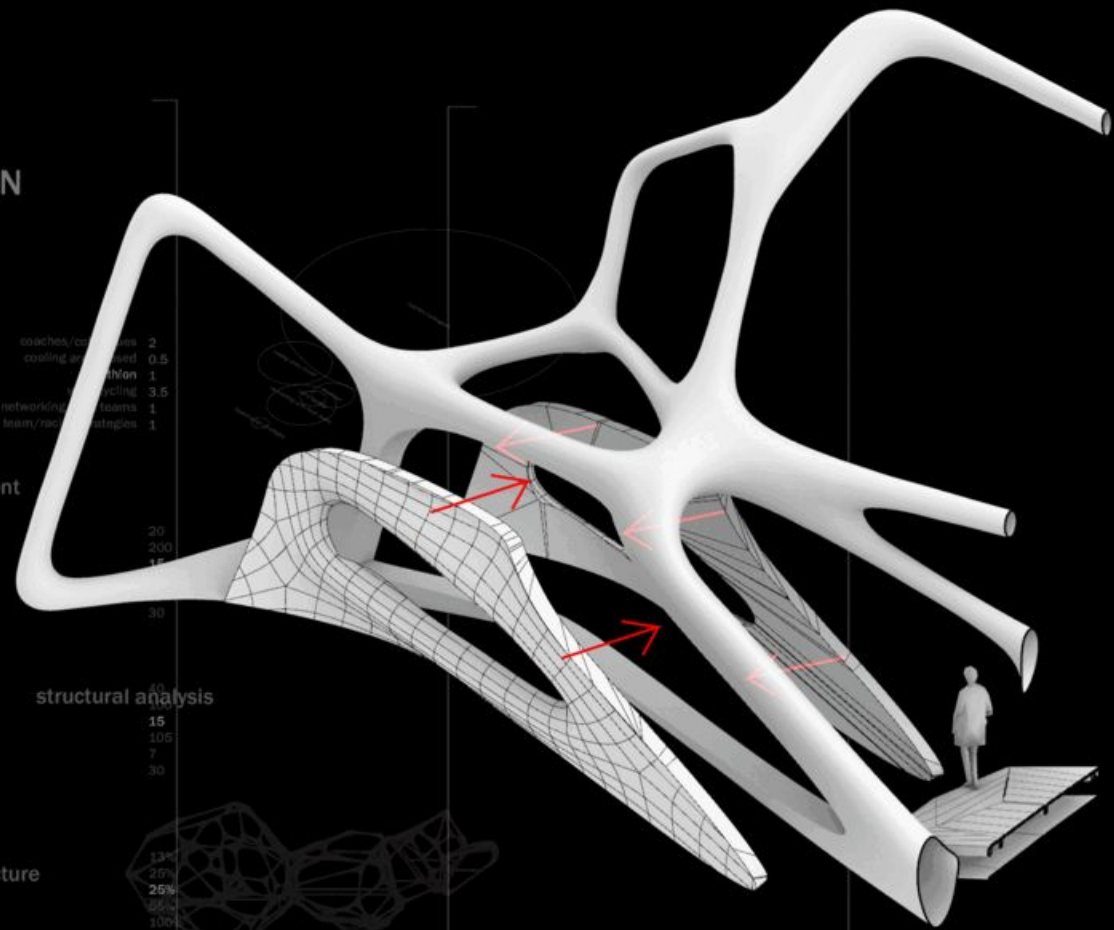
- 20
- 300
- 15
- 30

structural analysis

- 40
- 15
- 105
- 7
- 30

voronoi support structure

- 13%
- 26%
- 25%**
- 55%
- 100%
- 80%



city proximity spots

- Not relevant
- Waterfront
- Waterfront**
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

function activity

- coaches/colleagues
- cooling area closed
- triatlon**
- ultra cycling
- networking local teams
- team/racing strategies

height of function

- 1.17
- 2.25
- 2.25**
- 4.95
- 9
- 7.2



Wooden Beams Spatial Structure Node



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# DETAIL NODE HORIZONTAL SECTION

- 1. Double glazing
- 2. Wooden panels
- 3. Wood joint bolt
- 4. Rubber gasket
- 5. Wooden joint with metal plate

surface per user

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

- 20
- 200
- 15
- 30
- 7
- 30

structural analysis

- 40
- 100
- 15
- 105
- 7
- 30

scale 1:10

0.5m

1m

city proximity spots

- Not relevant
- Waterfront
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

function activity

- coaches/colleagues
- cooling area closed
- triathlon
- ultra-cycling
- networking local teams
- team/racing strategies

height of function

- 1.17
- 2.25
- 2.25
- 4.95
- 9
- 7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

# DETAIL PANEL HORIZONTAL SECTION

surface per user

analysis slope gradient

structural analysis

scale 1:10

0.5m

1m

4.

1.

3.

2.

city proximity spots

stress level

function activity

height of function

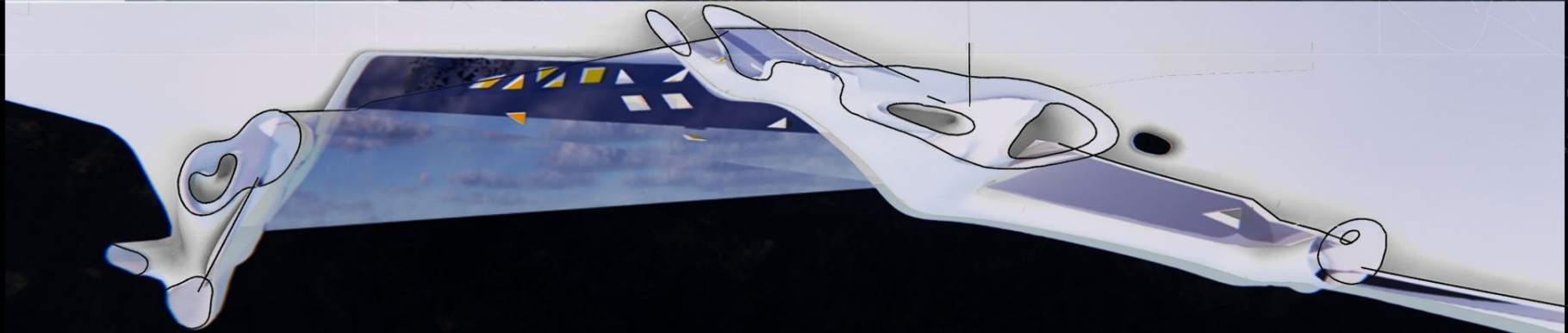
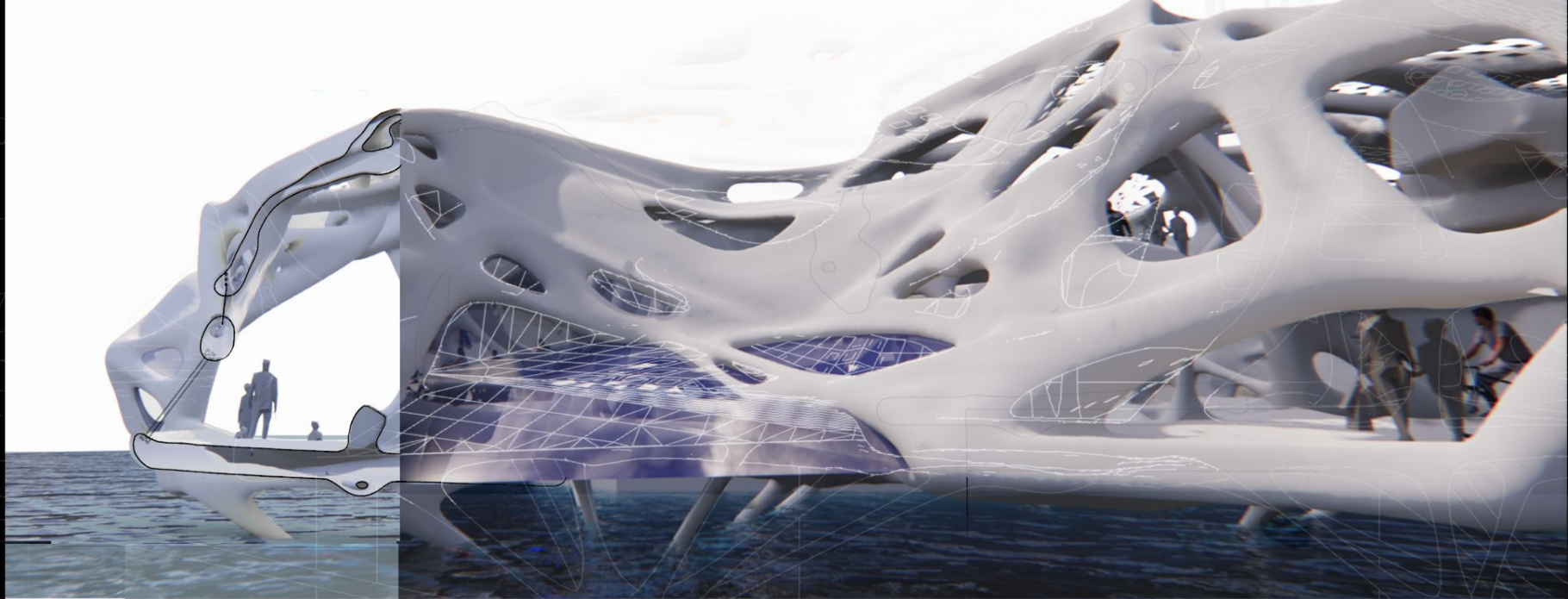
Not relevant  
Waterfront  
Waterfront  
Waterfront  
Rue de Solferino  
Rue de Solferino

coaches/colleagues  
cooling area  
triathlon  
networking  
team/ra

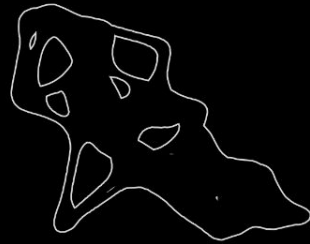
1.1  
2.26  
2.25  
4.50  
6.75  
7.2

- 1. Double glazing
- 2. Structure/panel joint
- 3. Wood joint bolt
- 4. Rubber gasket
- 5. Wooden joint with metal plate





# INTERIOR DESIGN









I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

**IV. MATERIALIZATION**

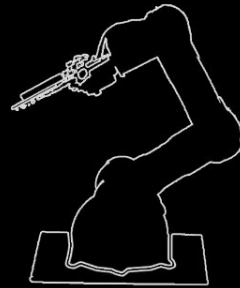
V. STRUCTURAL STABILITY

VI. REFLECTION



robotic manufacturing  
computation  
optimization

## **WORKSHOP**





Amsterdam Velodrome



Stacked wood prepared for milling



Robotic Arm



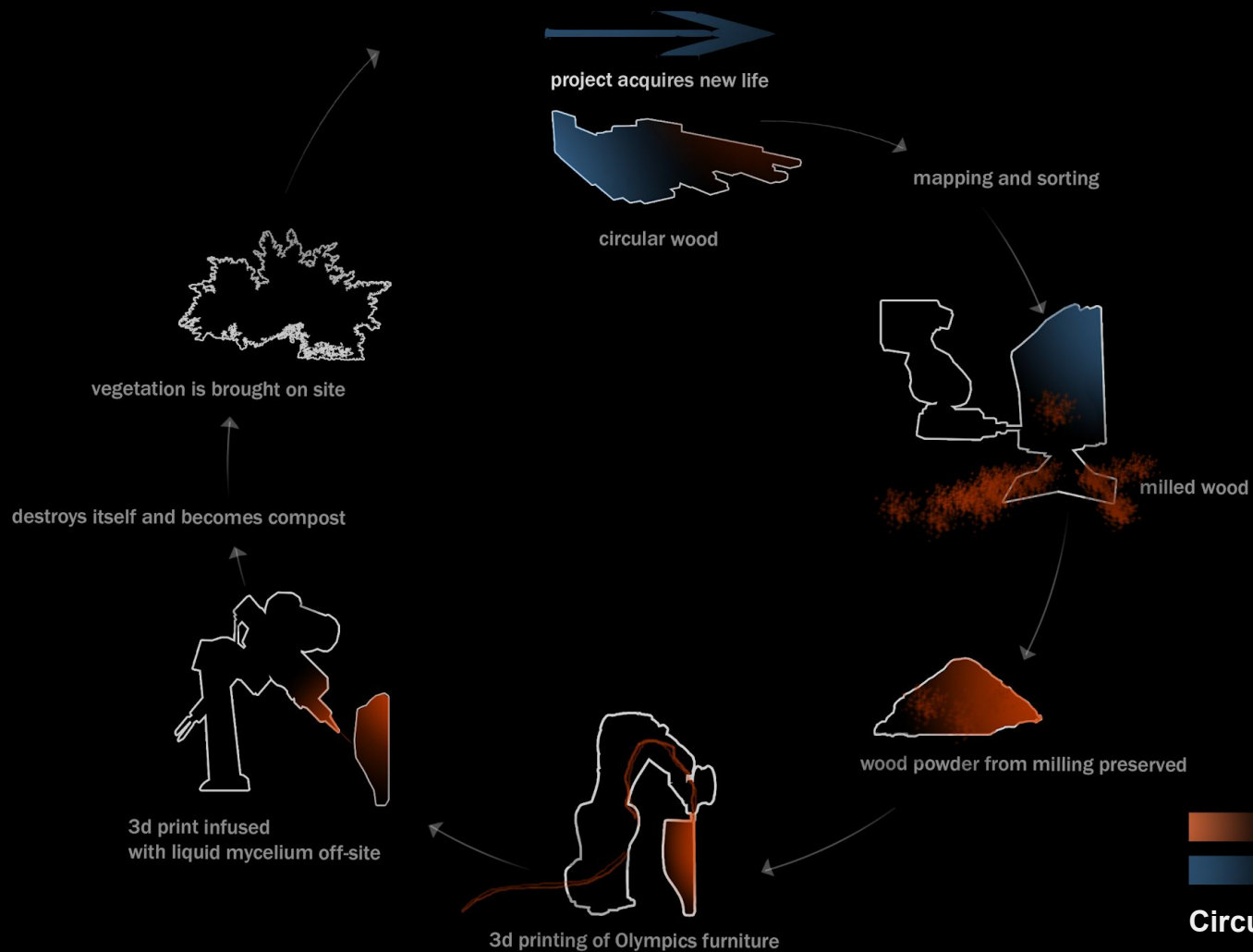
Milled wood



Wood powder

**The Material components of Circular Milling**





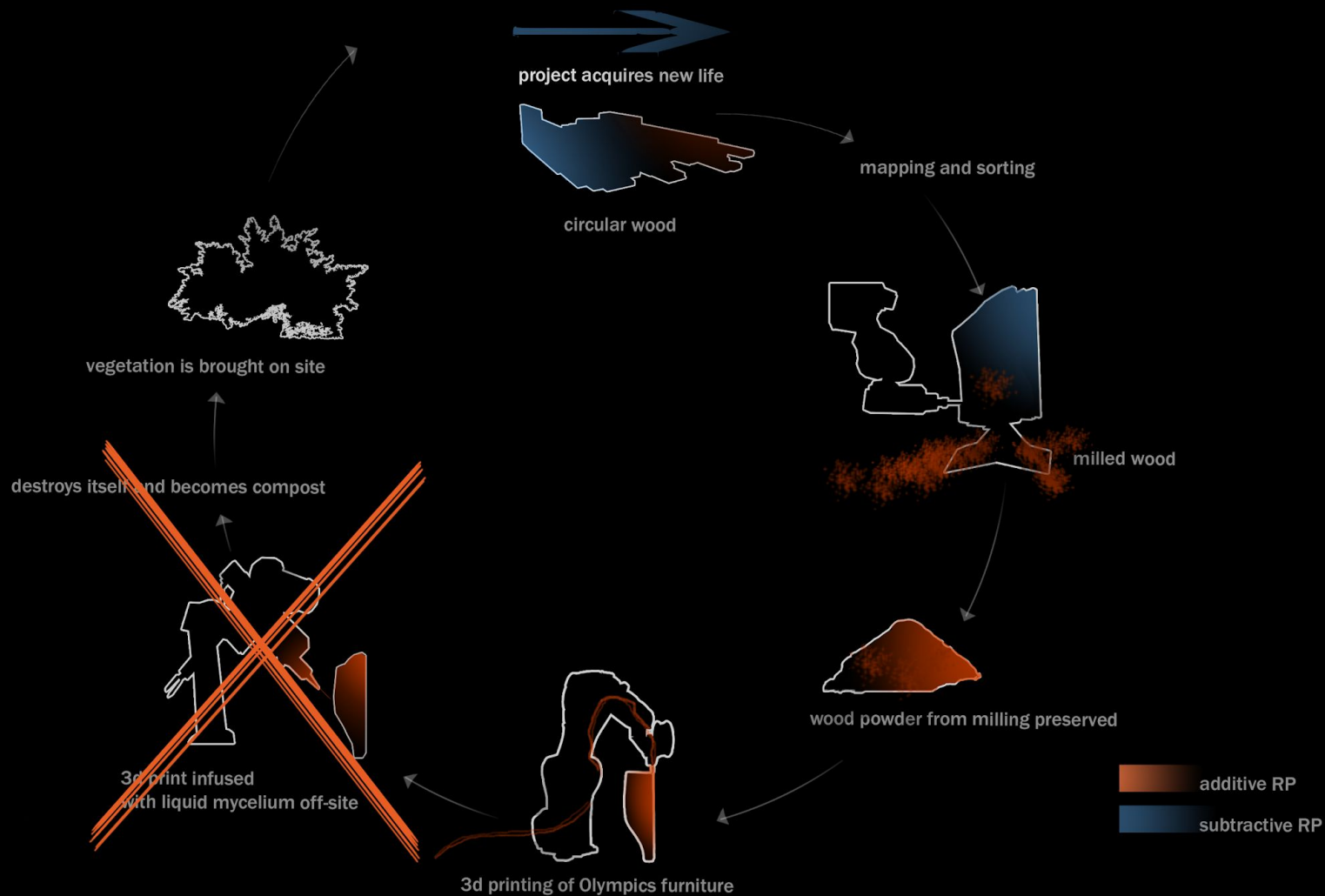
**Circularity scheme**



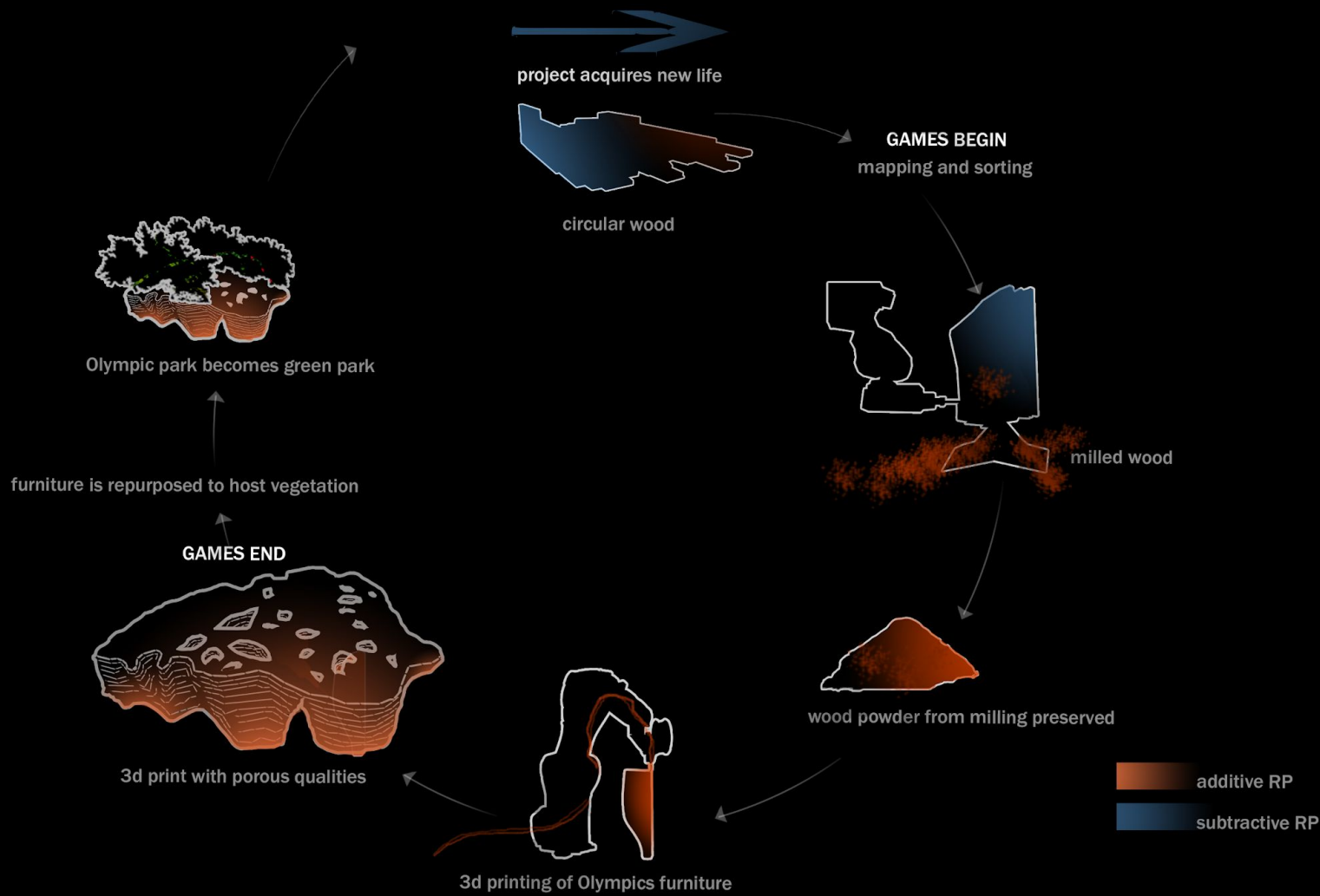
Heterogeneous structure 3d printed with the wood filament



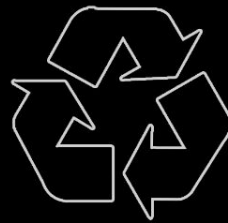
Mycellium is inserted into the form according to previous analysis.







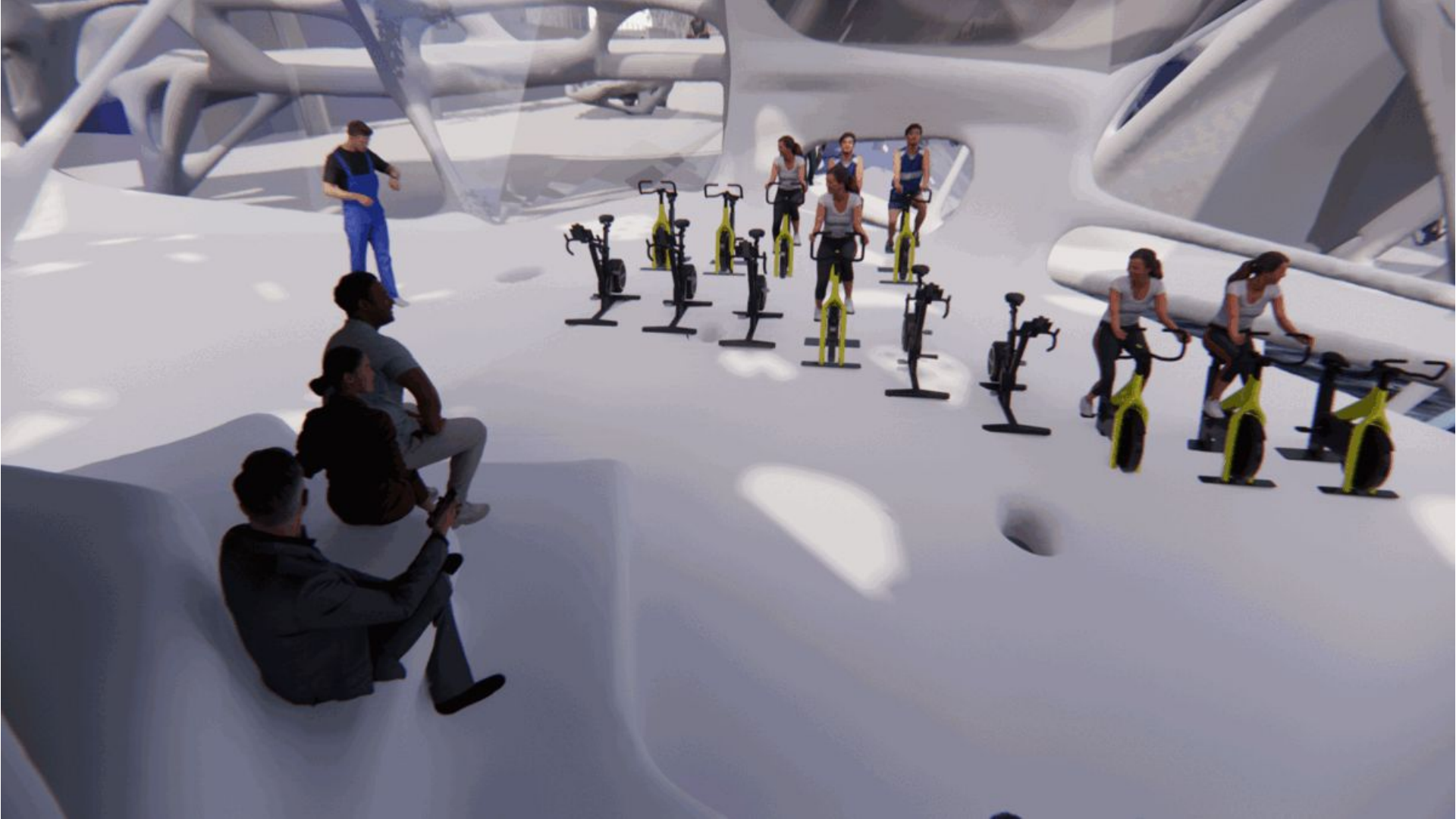
## **POST-OLYMPICS**











I. CONTEXT

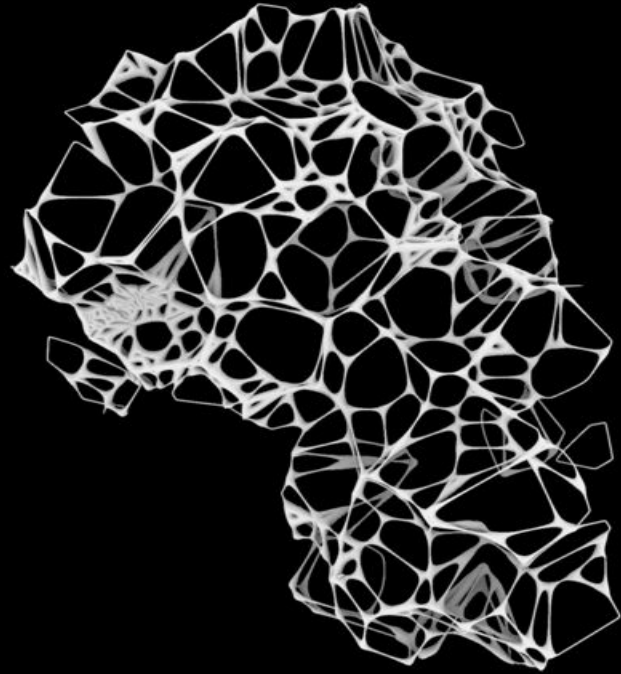
II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

IV. MATERIALIZATION

**V. STRUCTURAL STABILITY**

VI. REFLECTION





I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

IV. MATERIALIZATION

V. STRUCTURAL STABILITY

**VI. REFLECTION**



Stacked wood prepared for milling



Robotic Arm

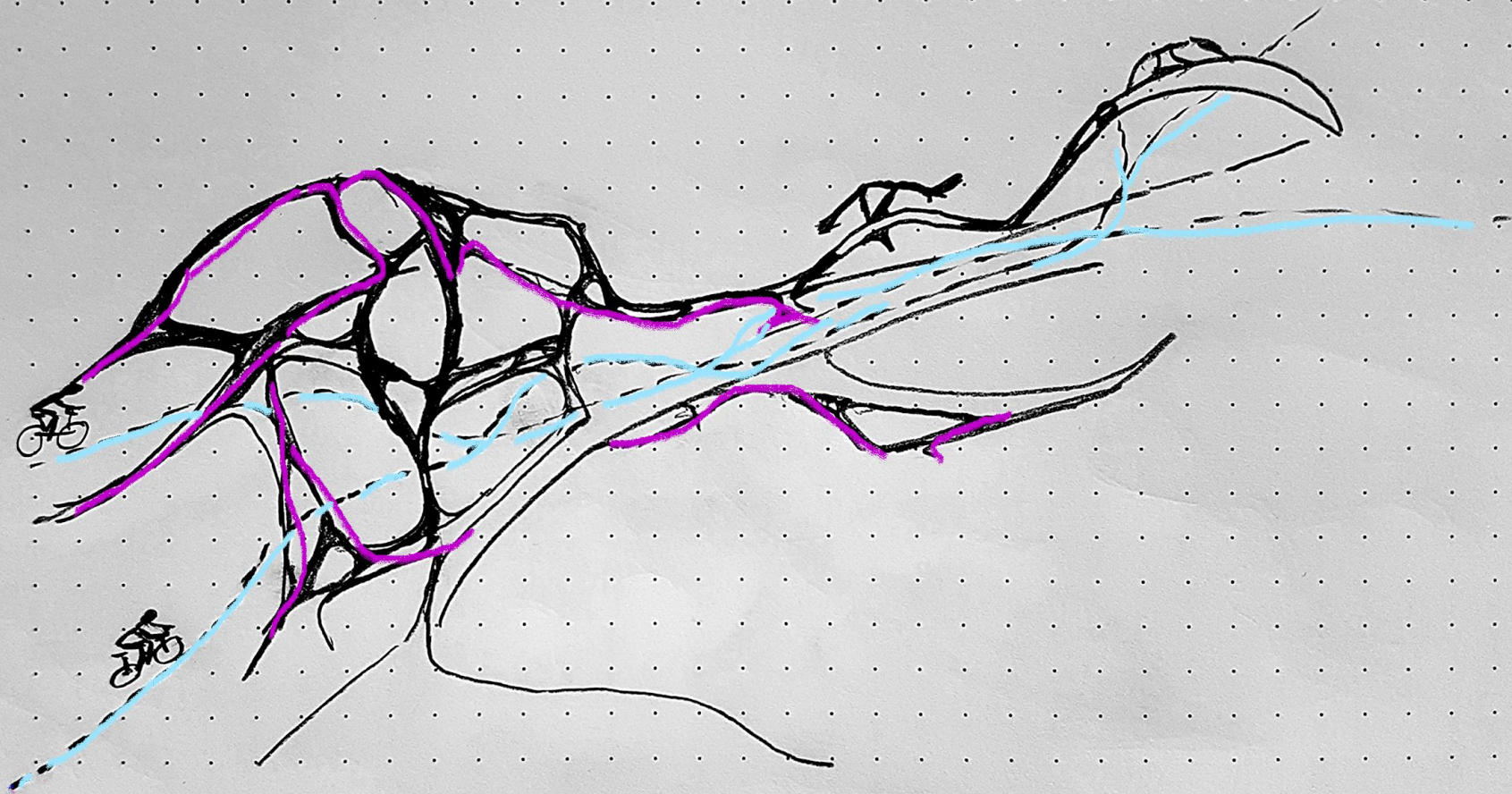


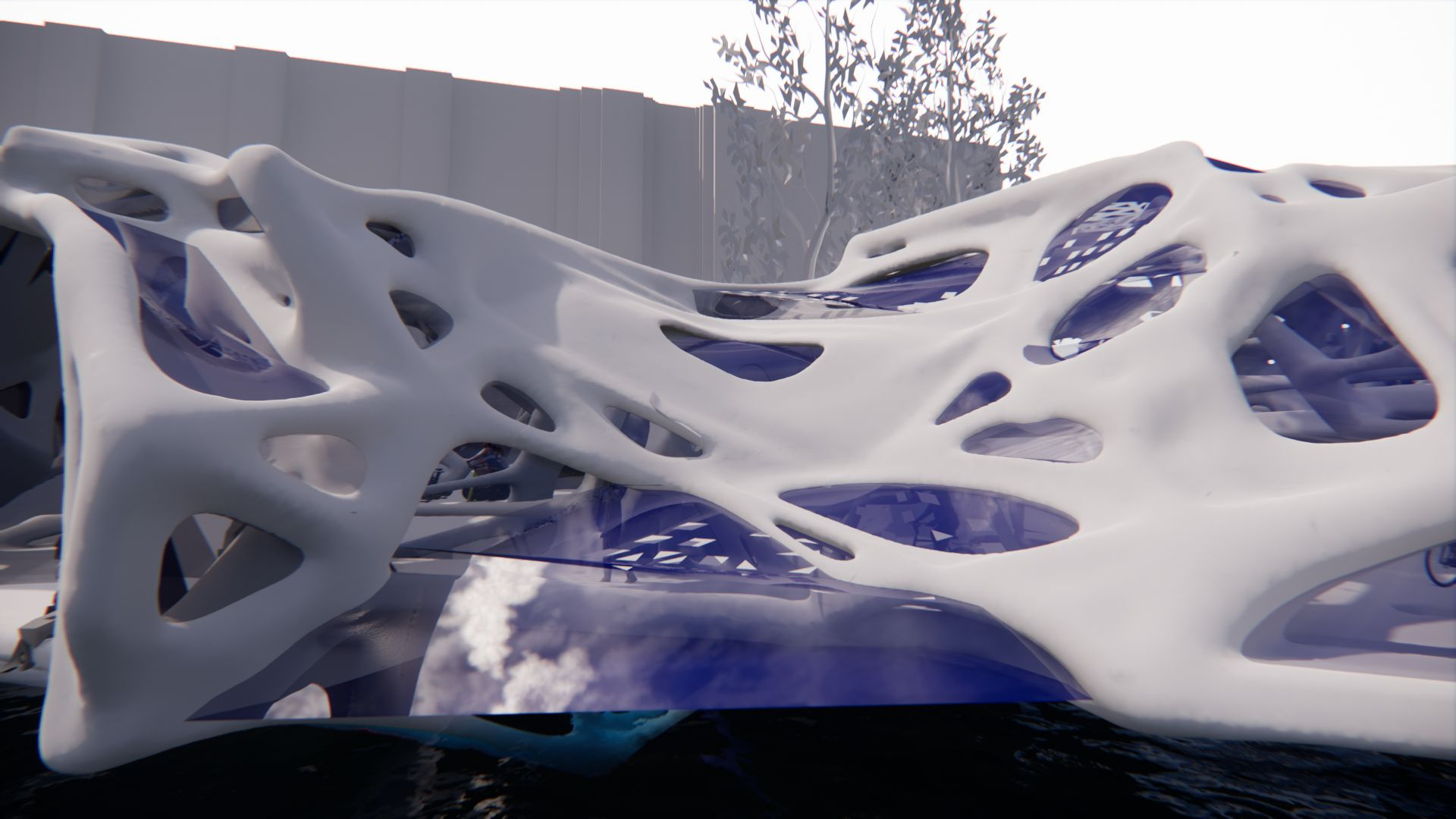
Milled wood



Wood powder

The Material components of Circular Milling



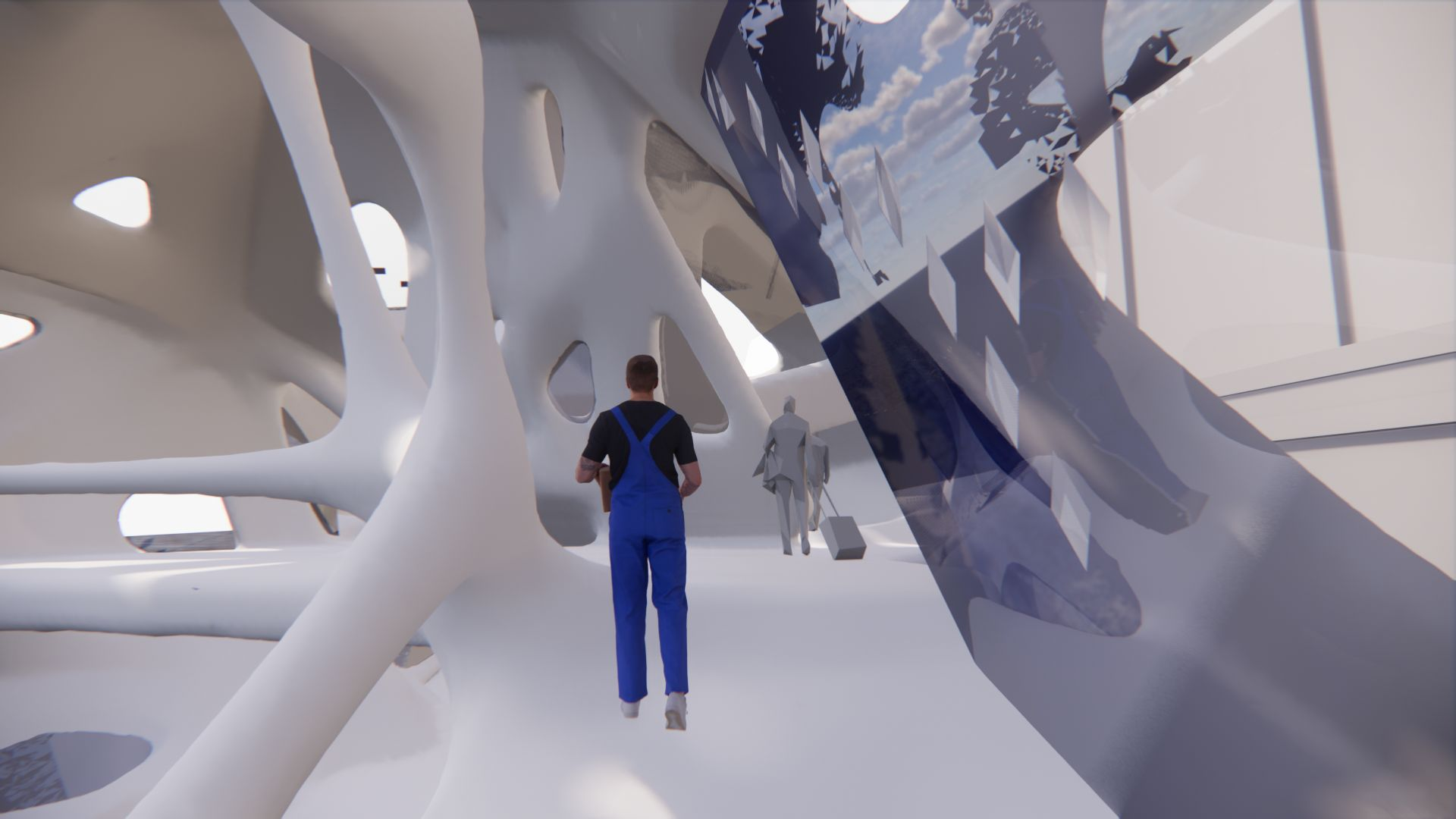


## RENDERS

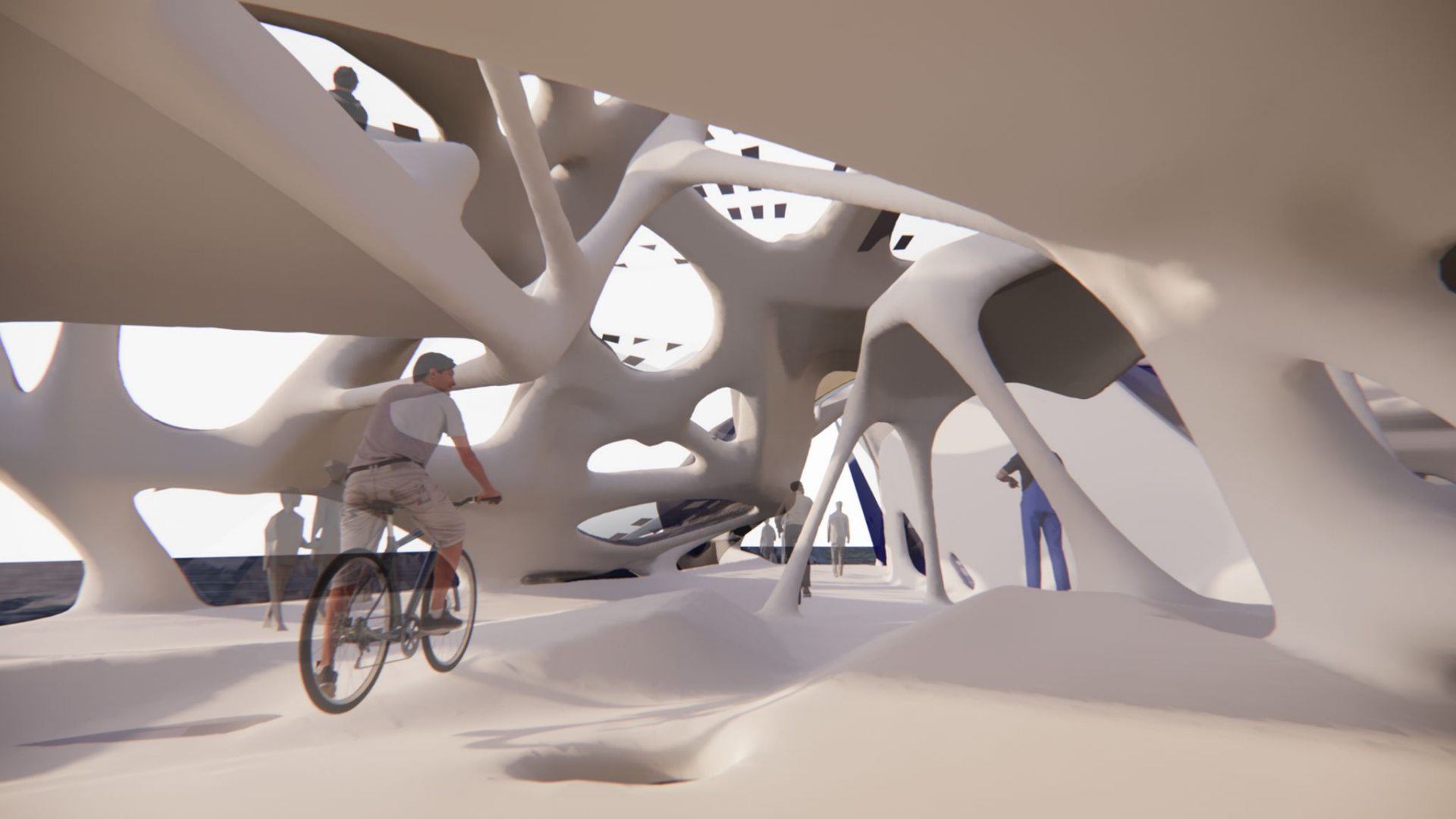


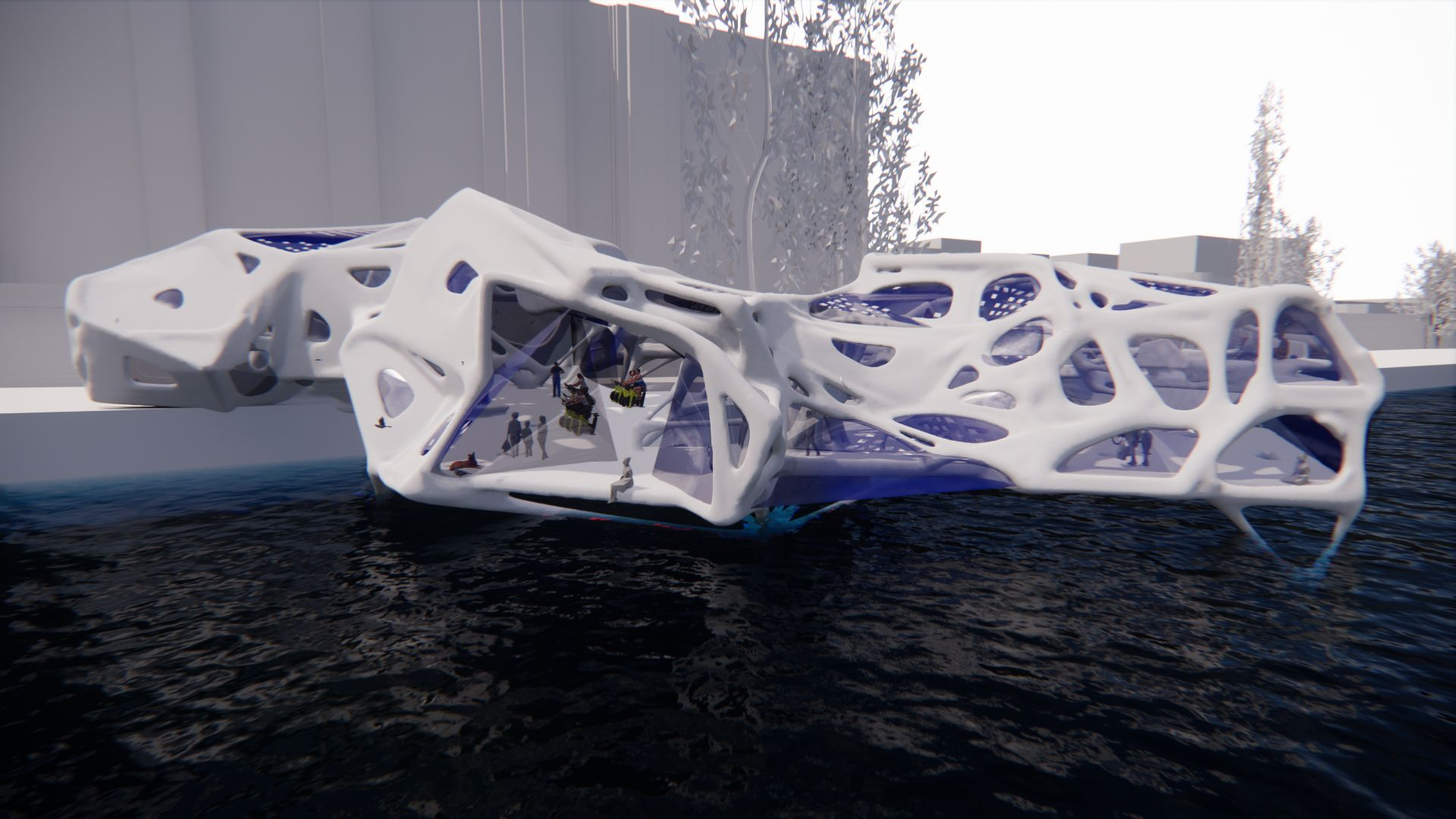


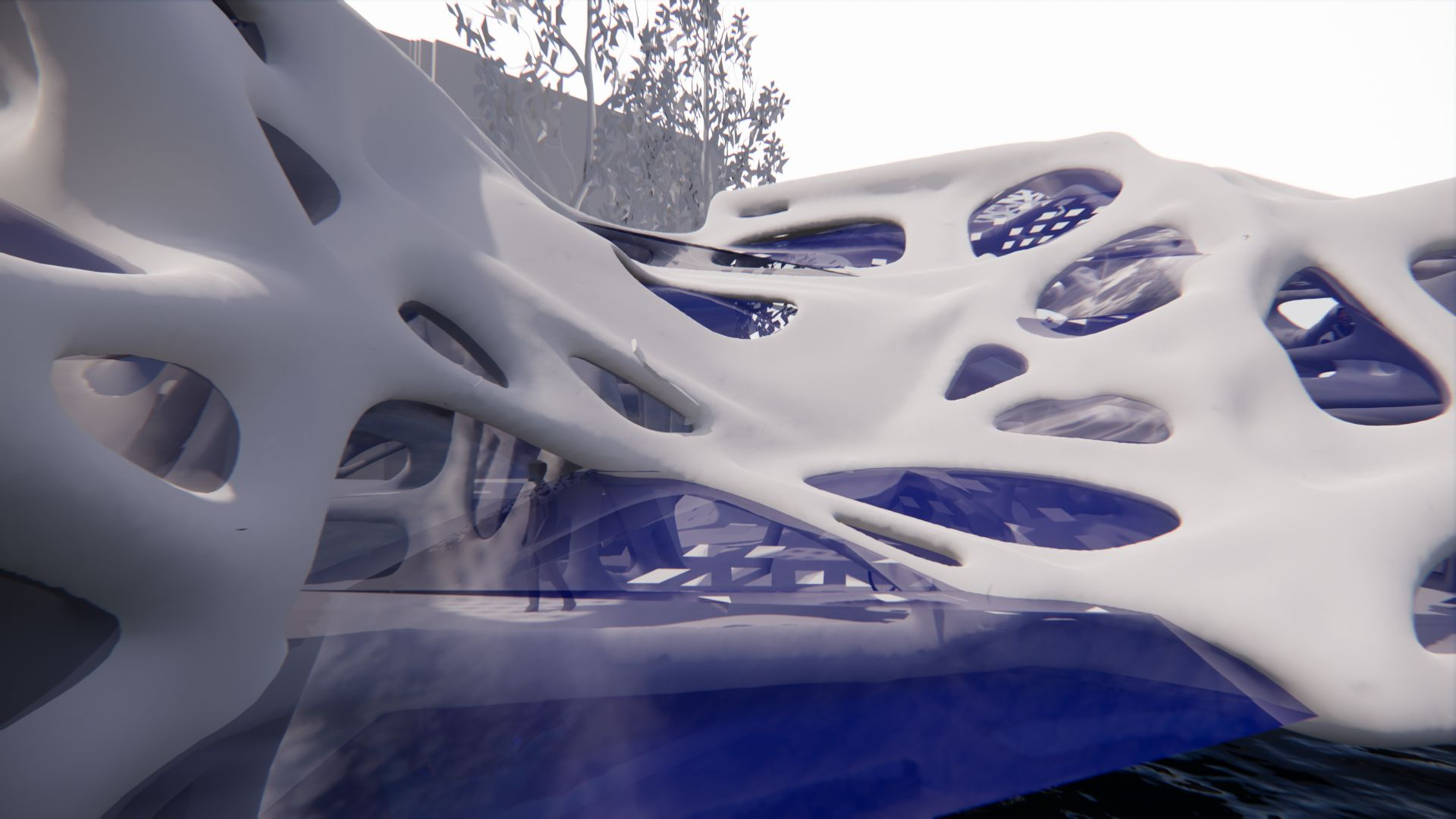














**Bike is ready for the Olympics!**

**Thank you!**