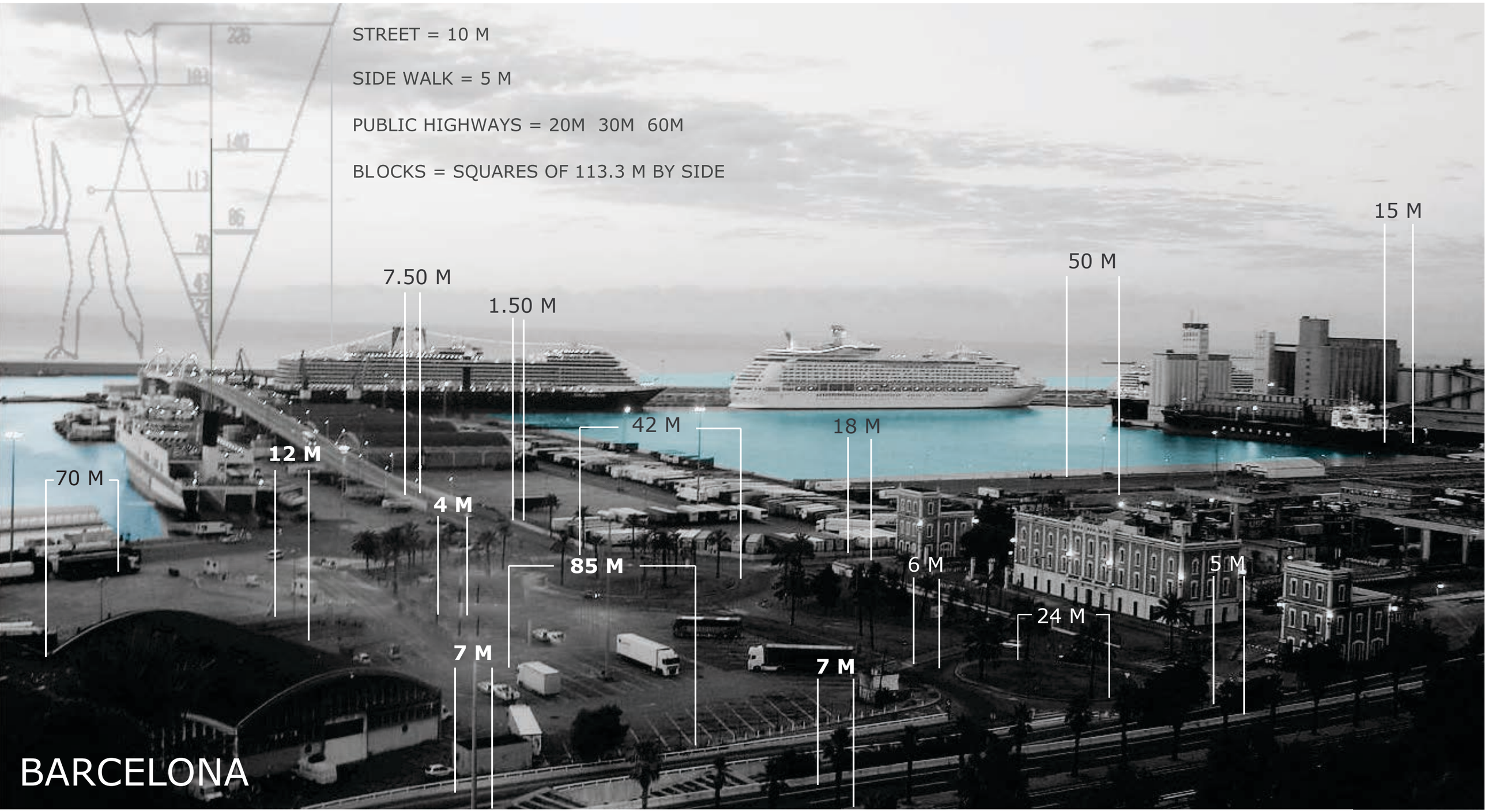
Hyperbordered Port

DS1 EMERGENT TERRITORIES
Faculty: Willy Müller, Maite Bravo
Group 2: **Alejandro Nuñez**, **Jesus Sapien**, **Diana Leon**



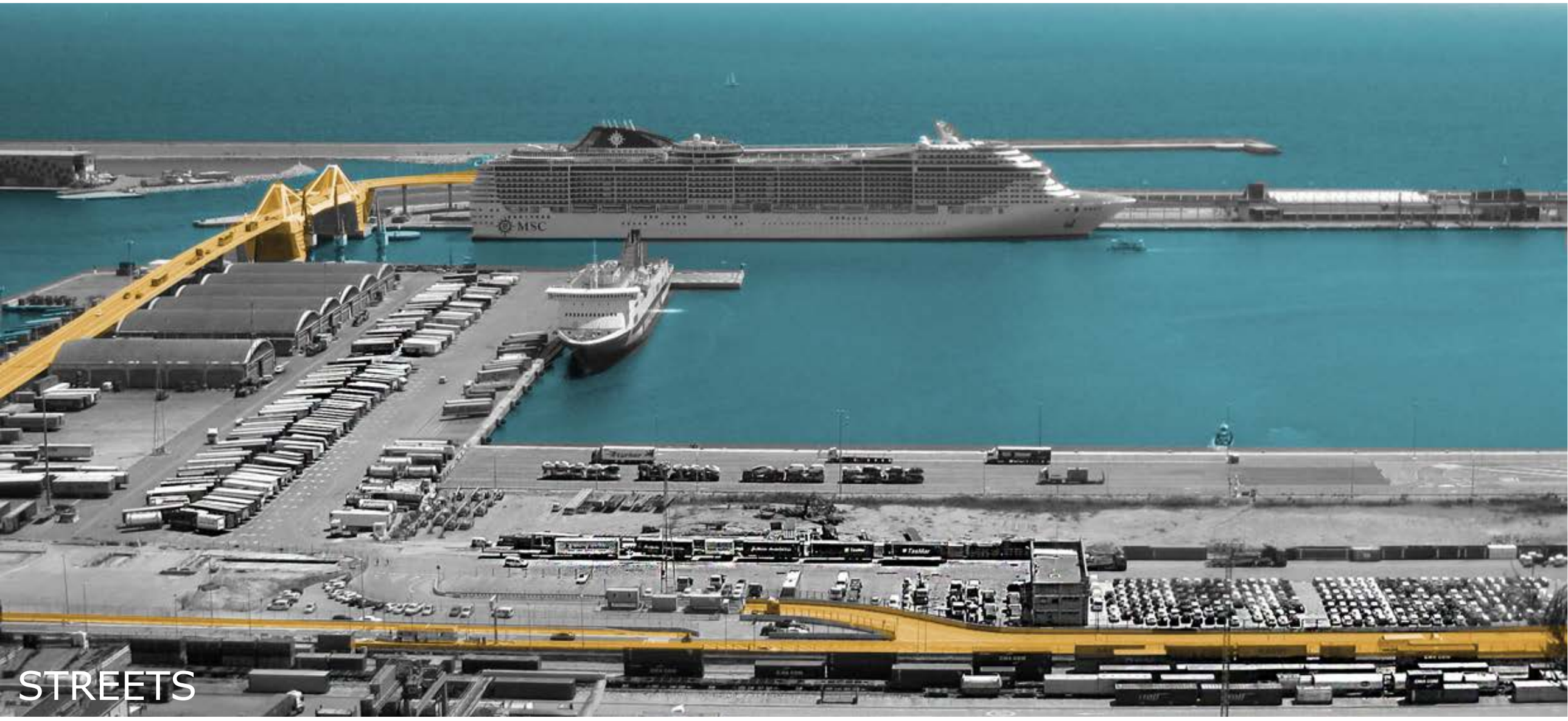
Cities as Barcelona were built based on general data sources. However the new design agenda requires to take into account the wider context of organization, systems, people, time, and even legal and political contexts. The integration of sensing an d actuation technologies in the urban settings will change the way people replay to the public spaces.

BARCELONA PORT

The borders in the port defines the physical infrastructure required for the activities in the site.

WATERFRONT

In the port, the dock line is a designated zone exclusively for ships, cruisers and ferries.



STREETS

Roads determine and restric the pedestrian and vehicular accesibility to the site.

STORAGE ZONES

The storage zone is occupied only containers, vehicles and trucks.

Could the borders in the port be configured by real time data generated by the city?

Concept

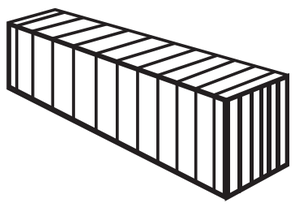
Inputs & Outputs

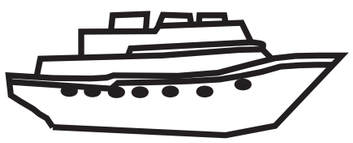
BASICS

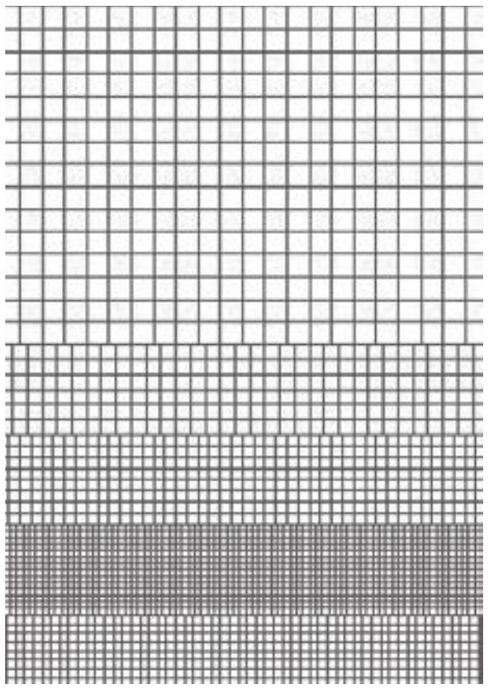
SHIPS

CONTAINERS

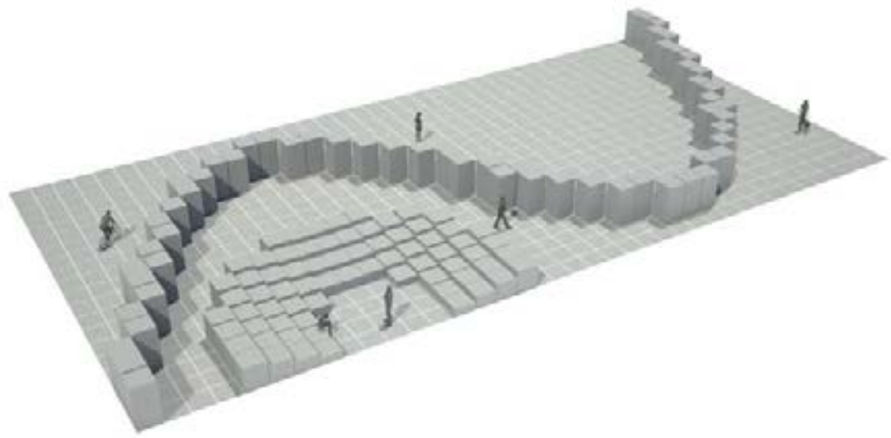
DATA COLLECTION



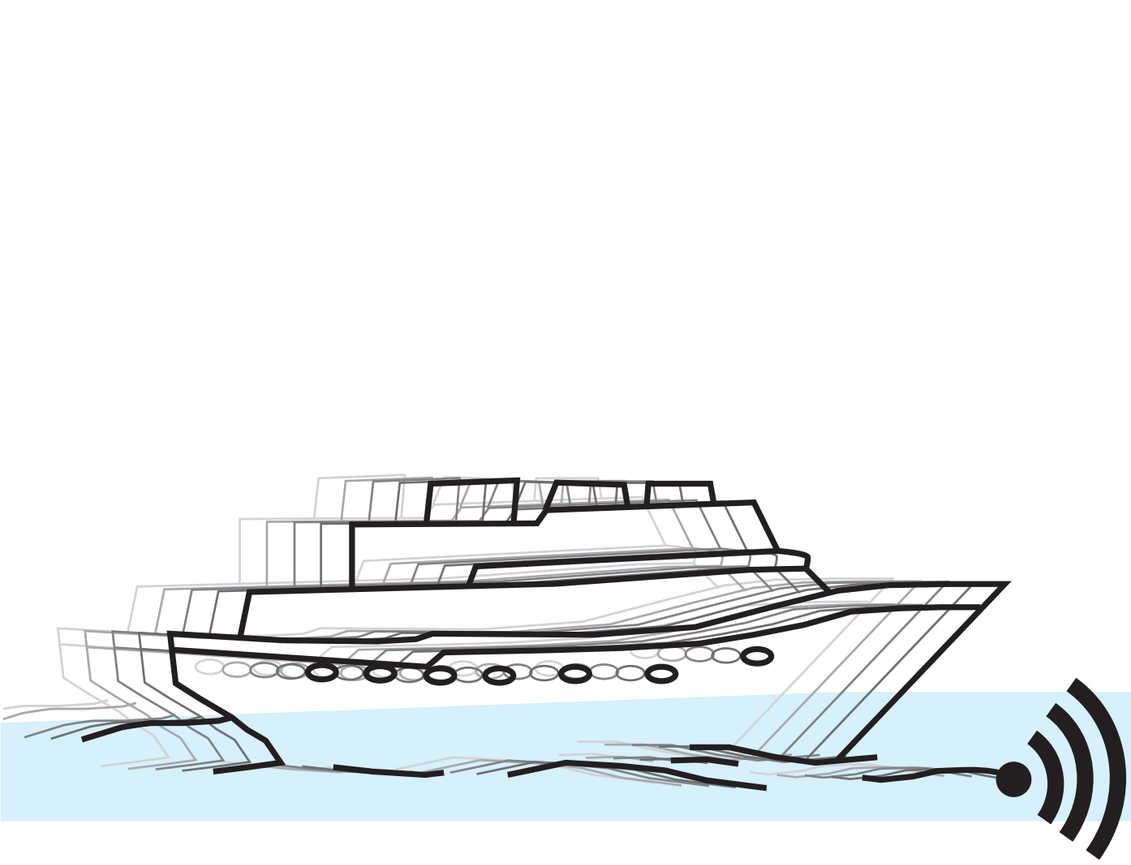




smart pavement



responsive borders configurations



position
(coordinates)

starting point

d

d = velocity x time

depends on
the ship

INPUT: SHIP POSITION

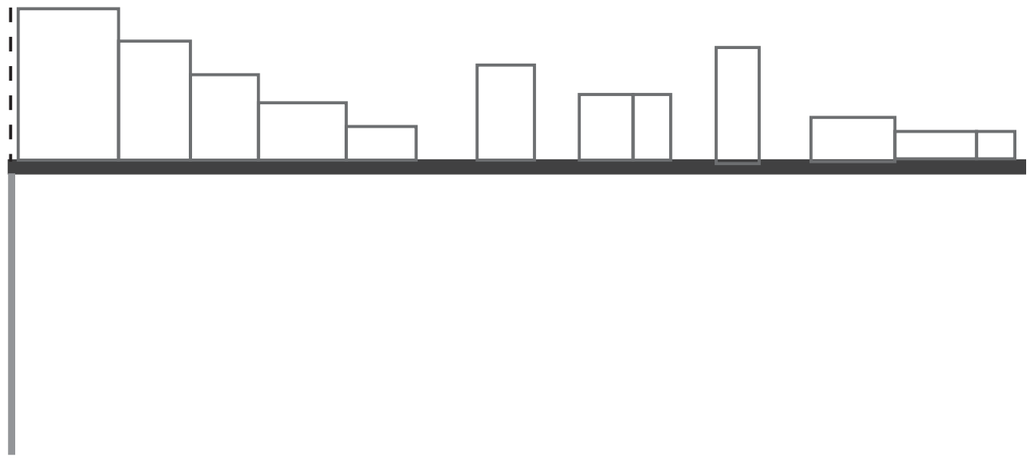
organization of the information

urban scenarios

weight (kg)

data for energy generation

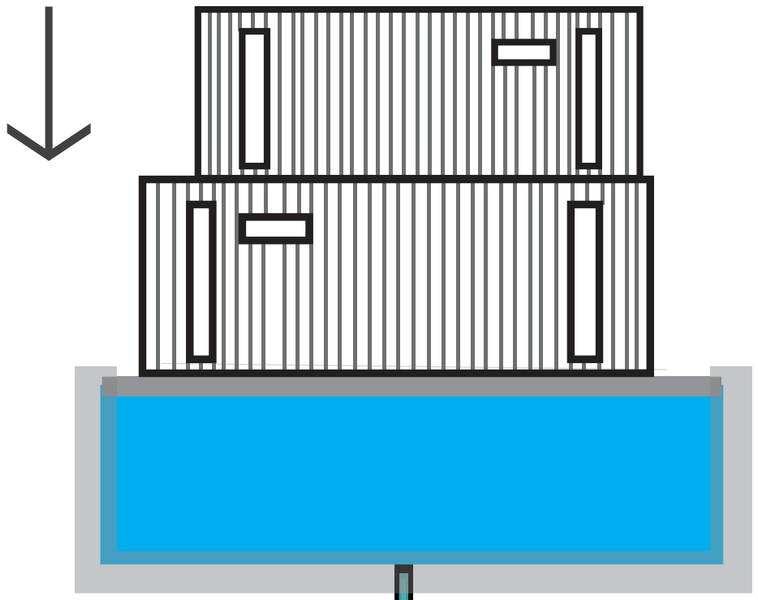
m2 occupied



site area - containers area = public space

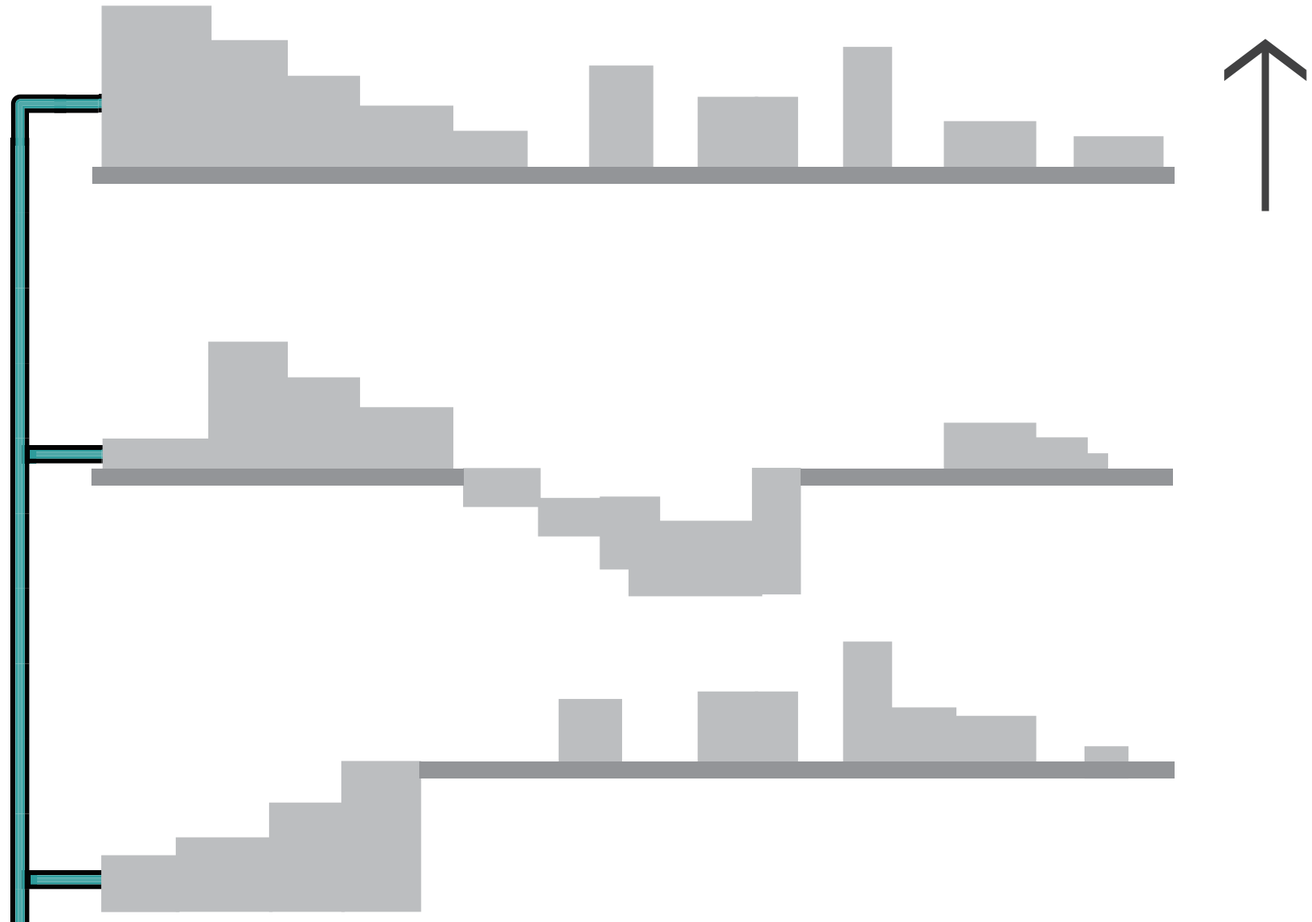
INPUT: CONTAINERS / STORAGE WEIGHT

CONTAINERS’ WEIGHT (kg)



Containers weight is the force that push the water to the storage system.

FORCE TO CONFIGURE THE SMART PAVEMENT



WATER STORAGE (m3) POTENCIAL ENERGY

Water Distribution

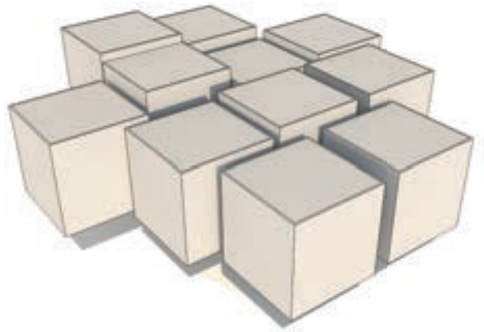
ENERGY GENERATION CONCEPT

Applied forces = Responsive forces

1500 kg

f=$\frac{14700}{9.80}$

f=1500 kg

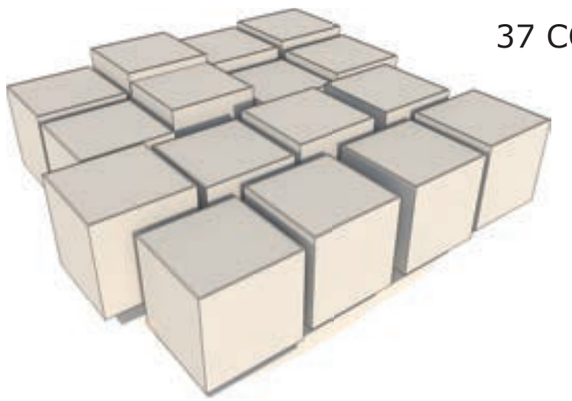


15 CO.

3000 kg

f=$\frac{36260}{9.80}$

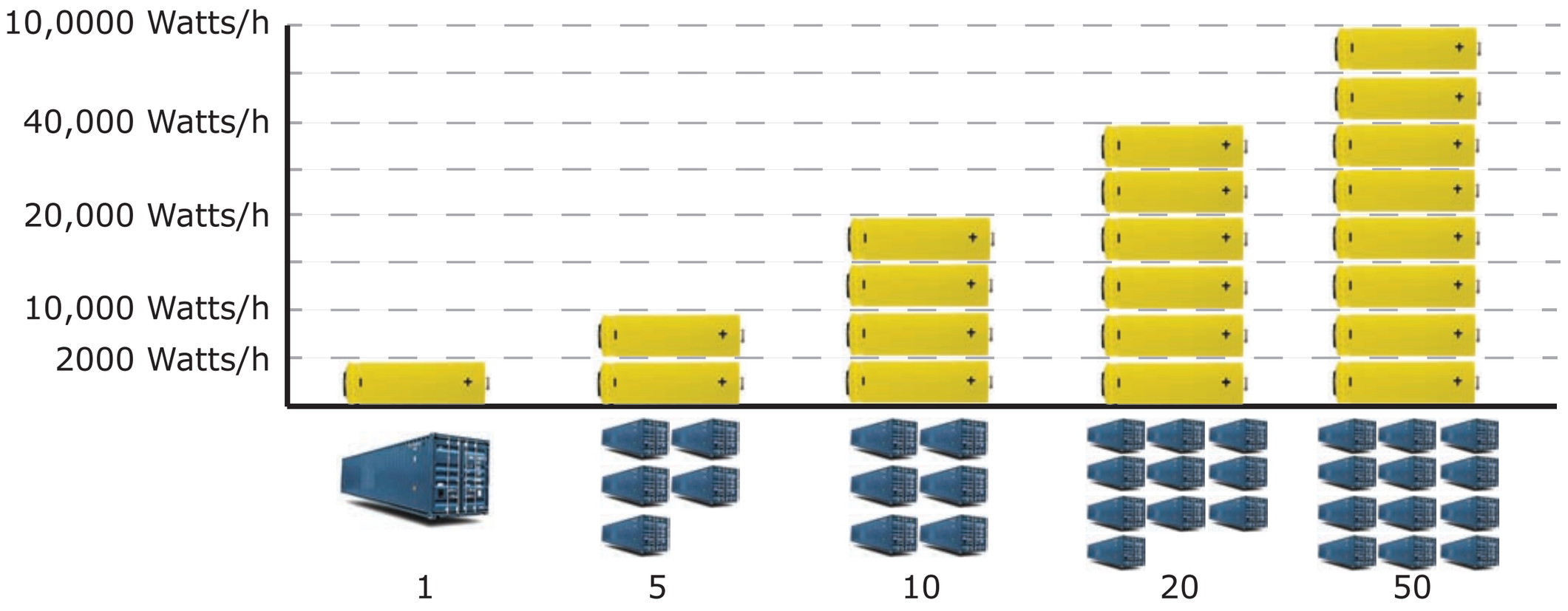
f=3700 kg



37 CO.

Energy generator

Energy storage

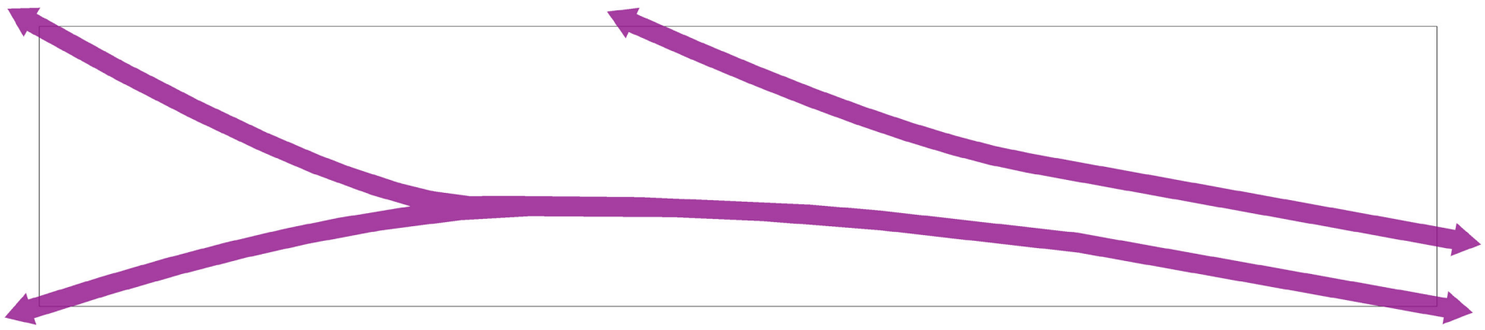


ENERGY GENERATION SYSTEM

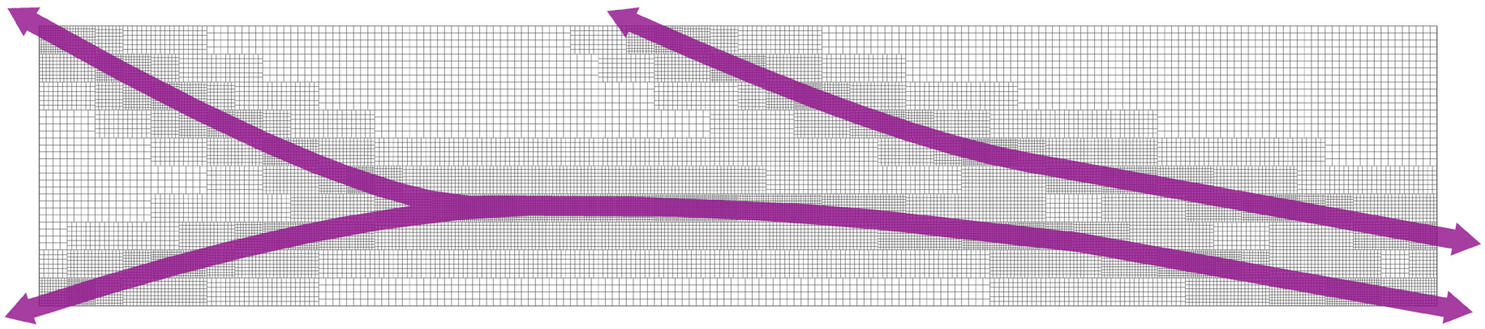
Intervention Process

Grid Development and Optimization

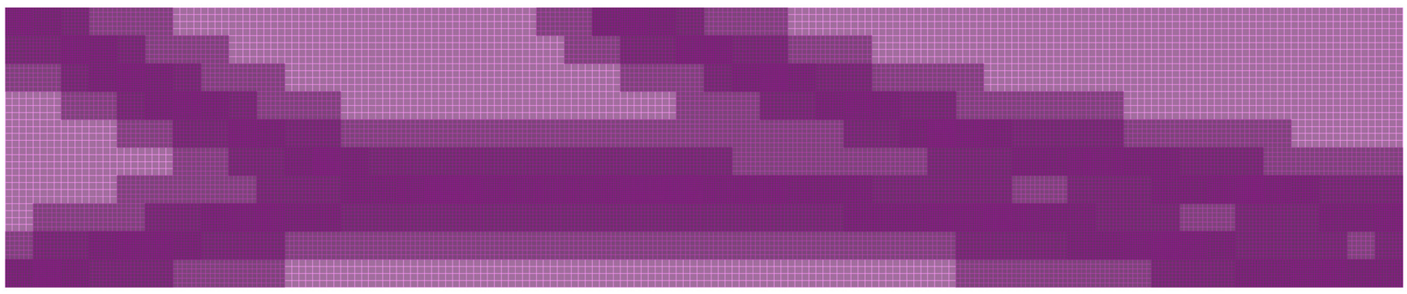
Definition of the application area.



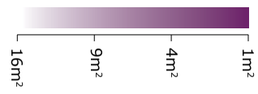
Definition of the high resolution zones.

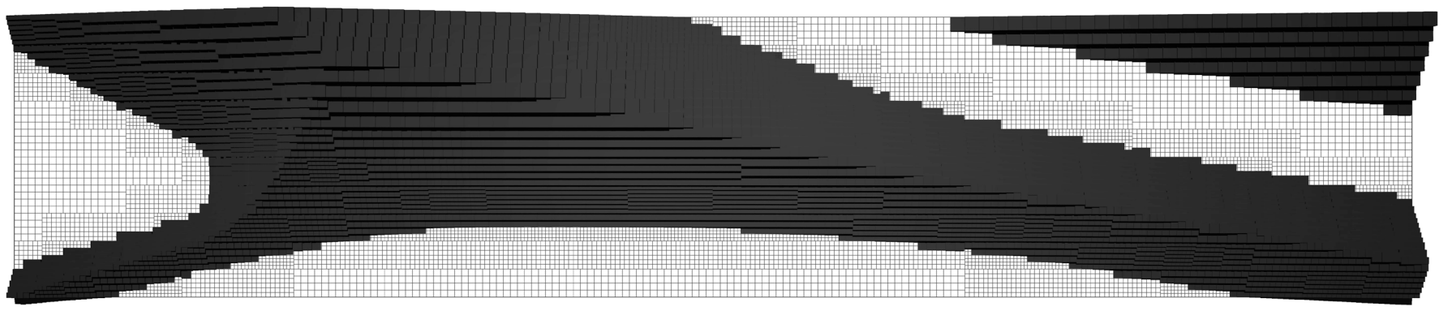


Definition of the high resolution zones parameters.

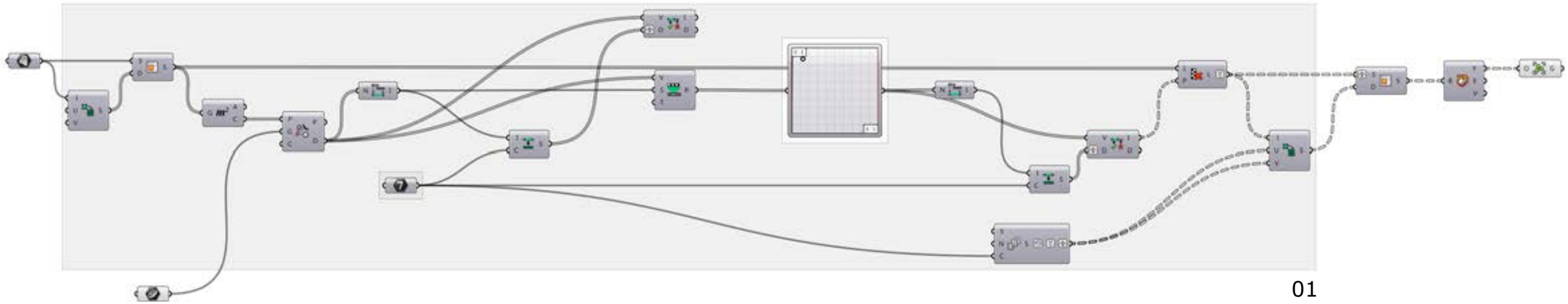


Spatial analysis.

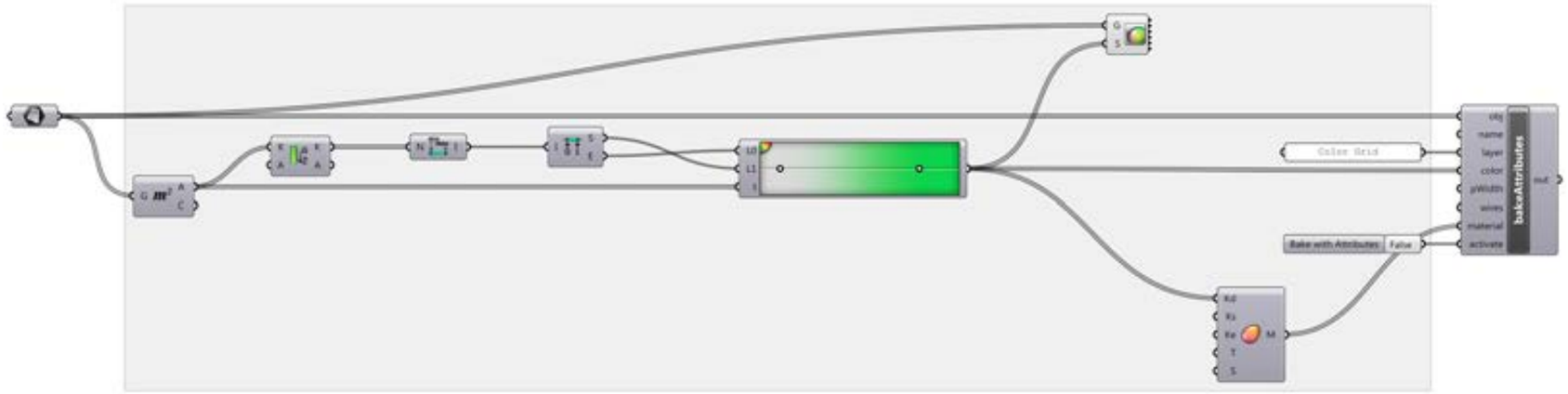




Generation of topographic and spatial configurations.



01

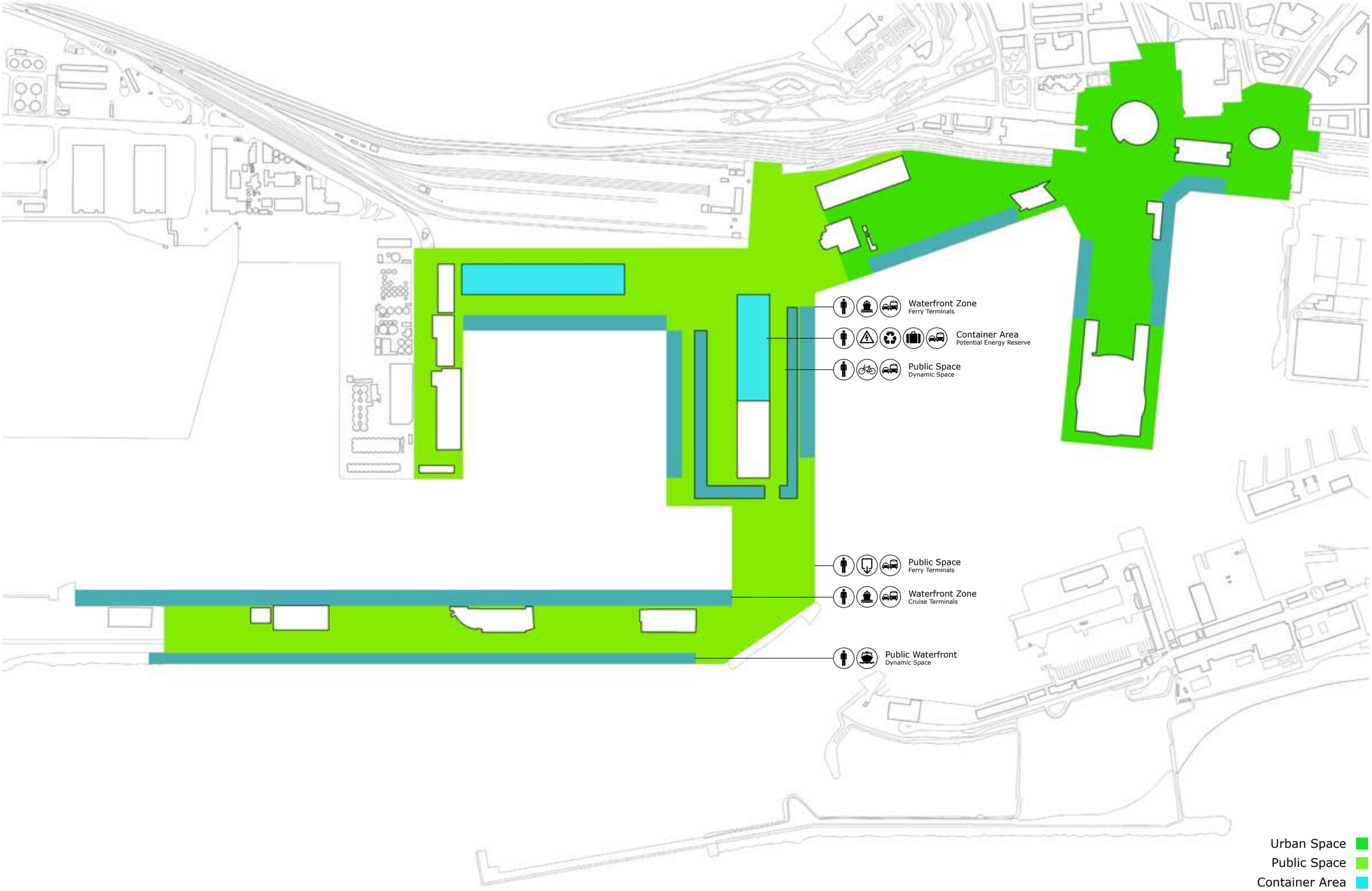


02

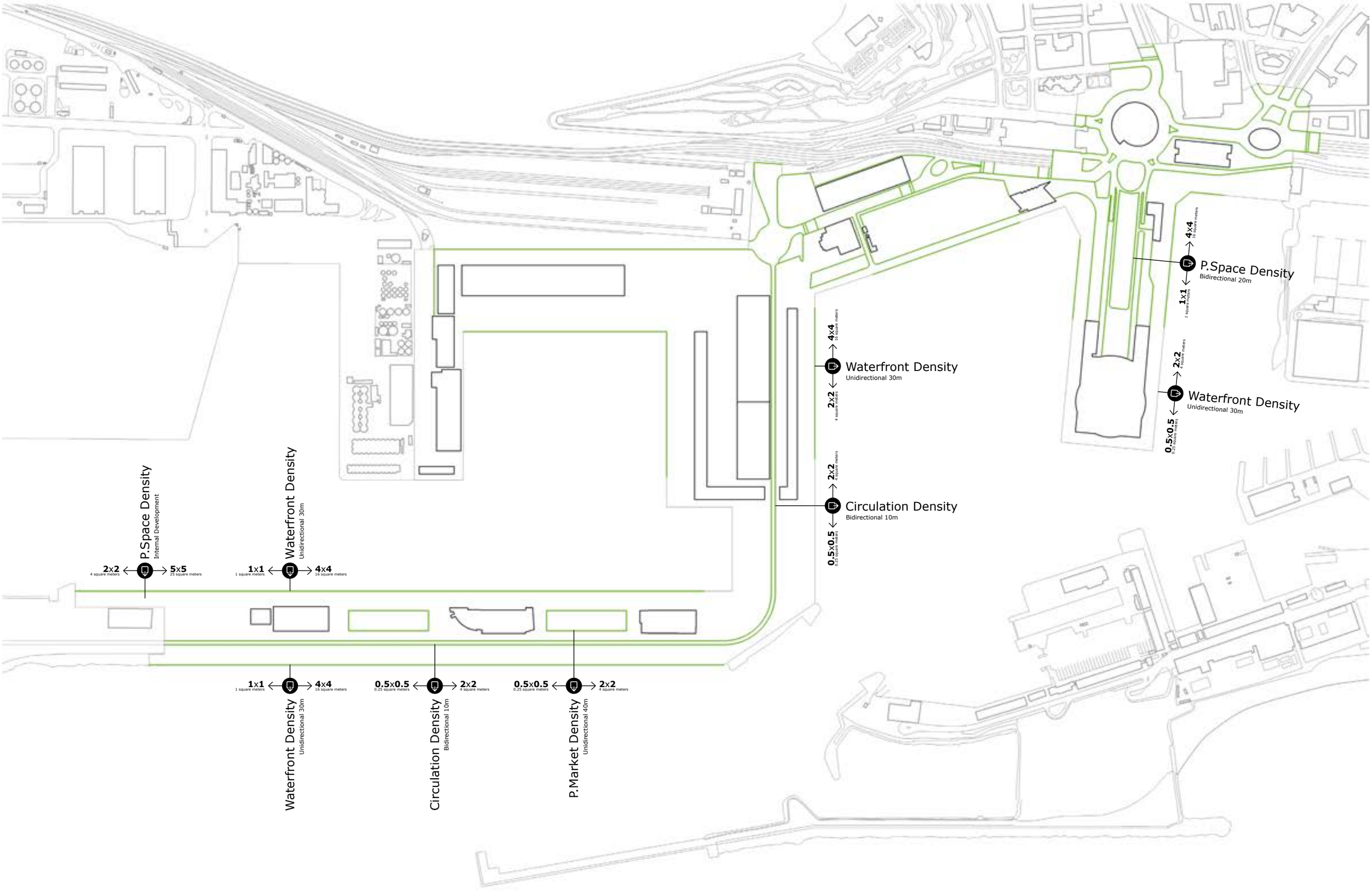
GRID GENERATION PROCESS

Site Plan

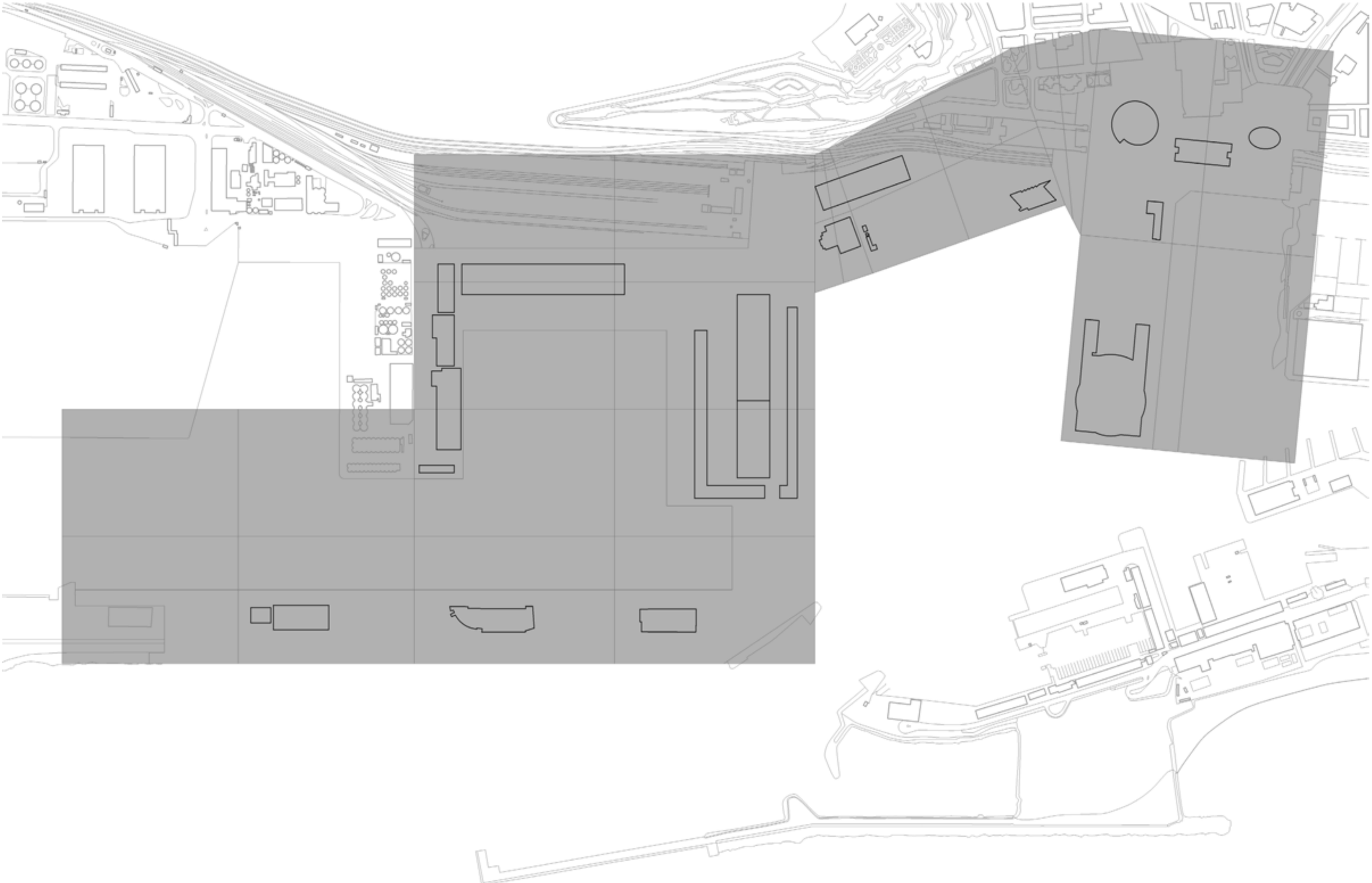
Master Grid Development



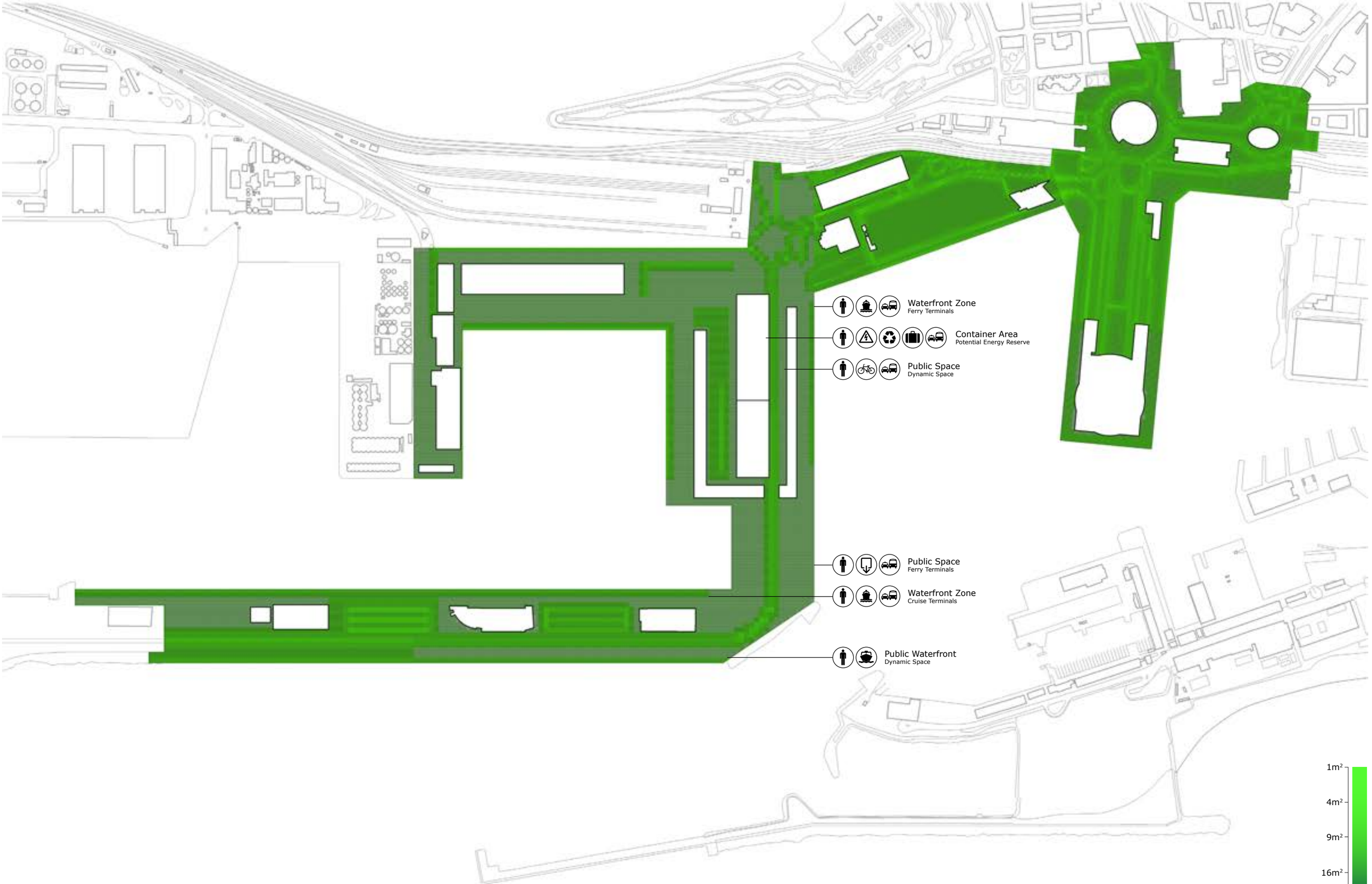
ACTIVITIES AND PROGRAM DISTRIBUTION



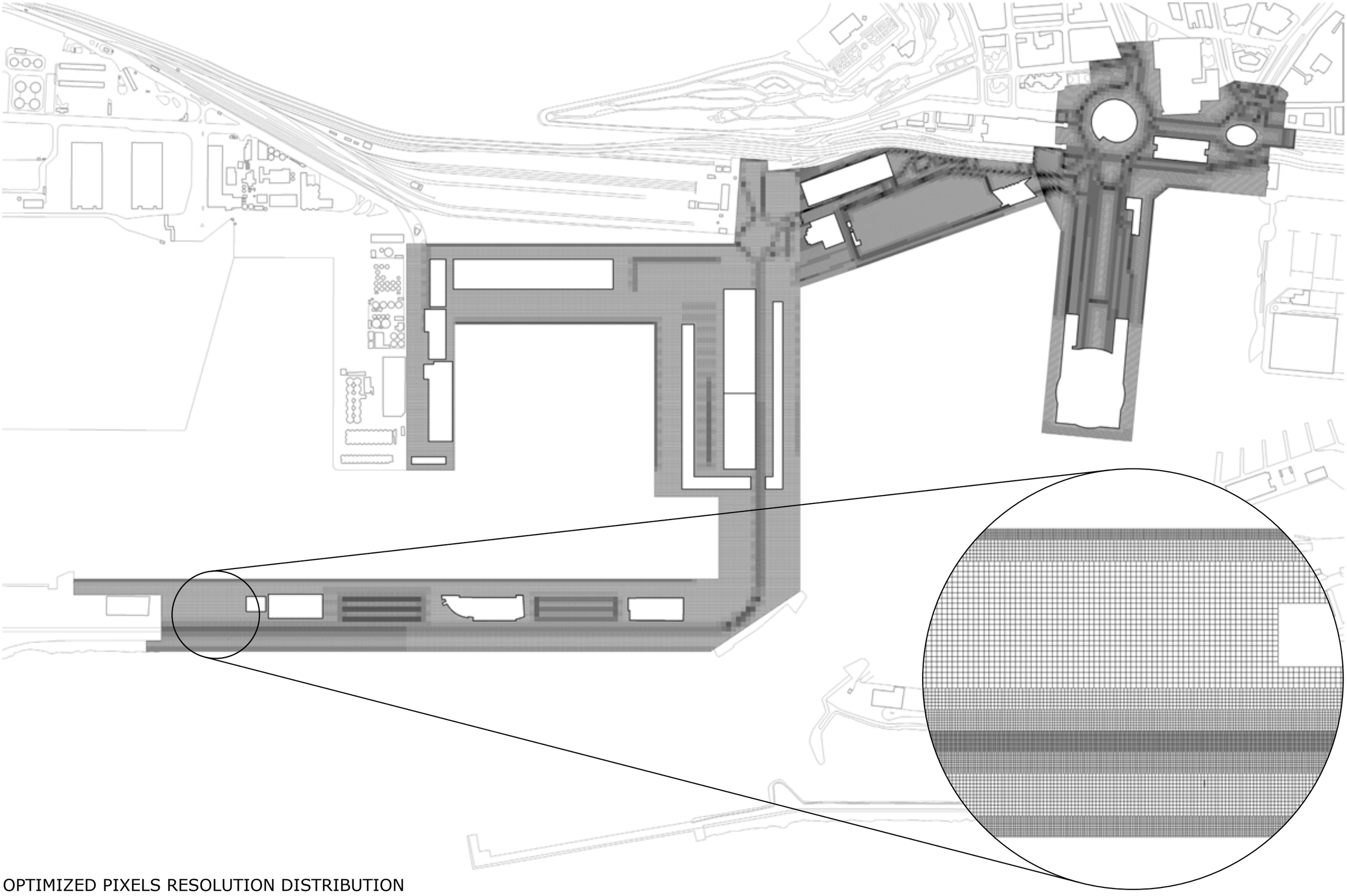
SPATIAL OPTIMIZATION LINES



PORT GEOMETRIC ADAPTATIONS



GRID GENERATION



OPTIMIZED PIXELS RESOLUTION DISTRIBUTION

Plan Detail

Barcelona Port

Waterfront Zone
Ferry Terminals

Container
Energy Reserve

Public Space
Dynamic Space

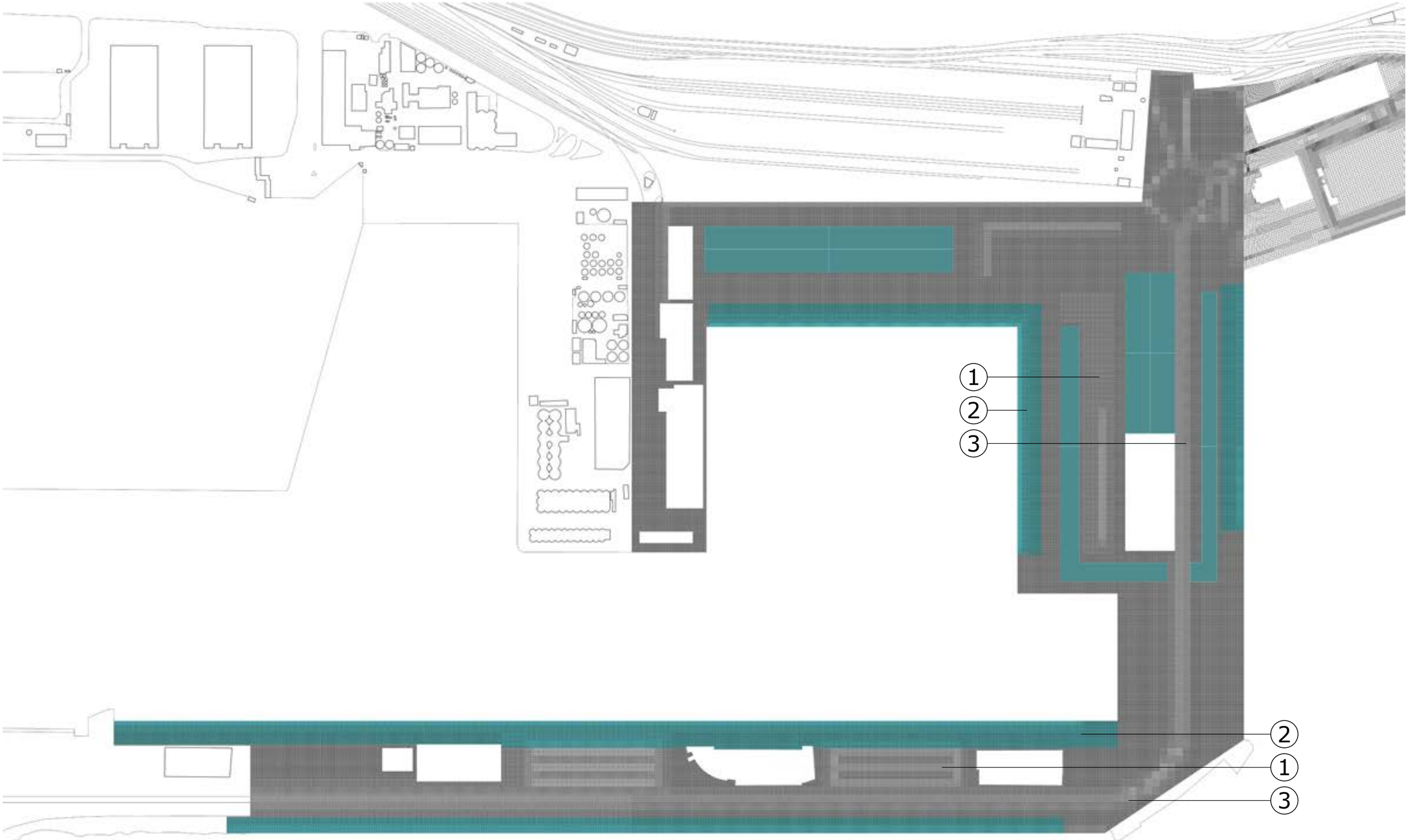
Public Space
Ferry Terminals

Waterfront Zone
Cruise Terminals

Public Waterfront
Dynamic Space

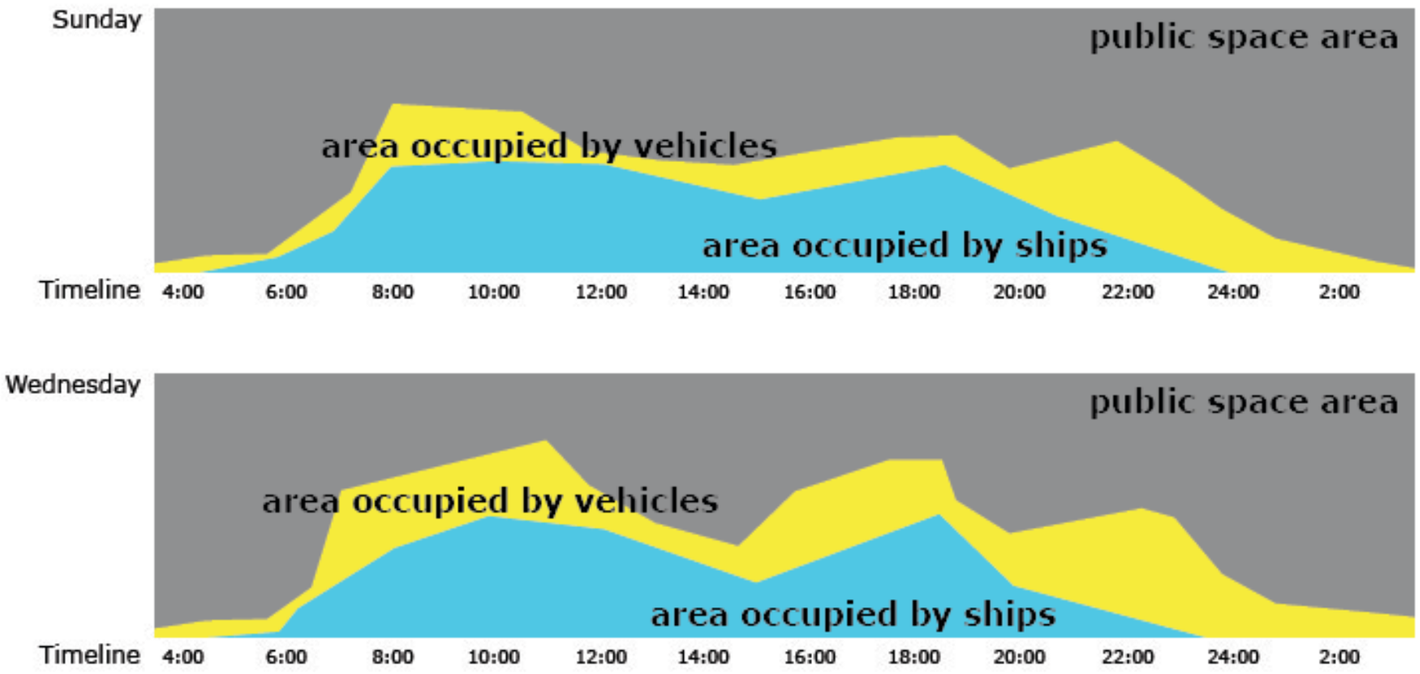
1m²
4m²
9m²
16m²
25m²

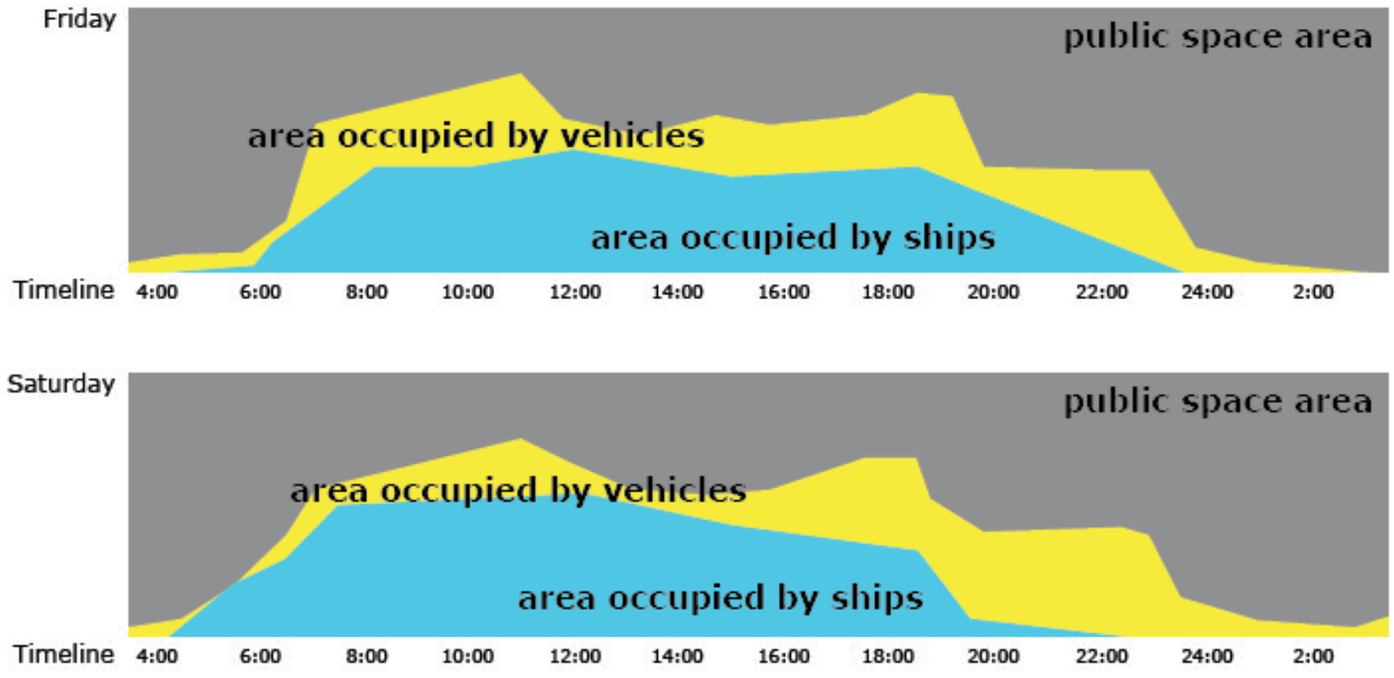
GRID DETAILS



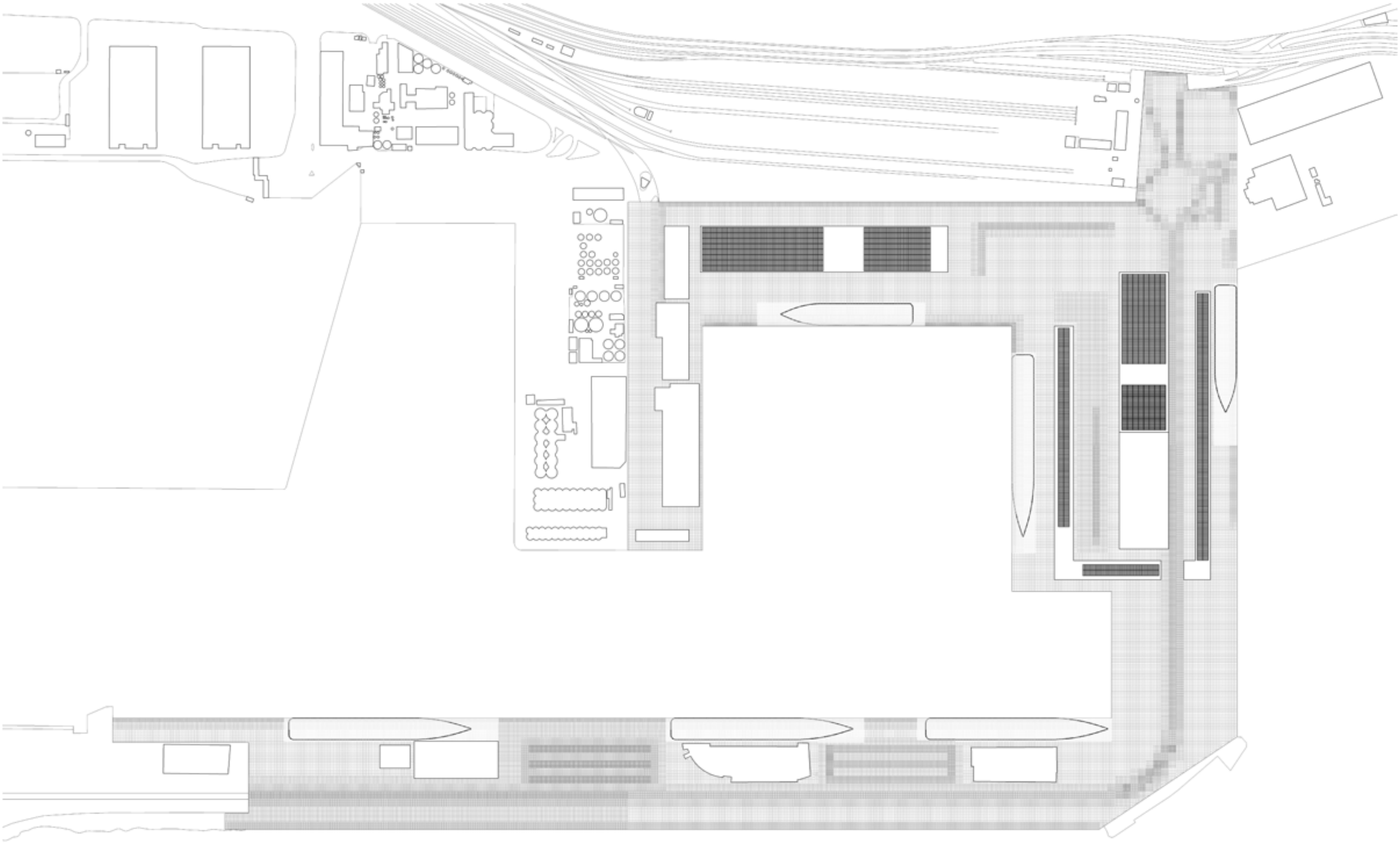
GRID BEHAVIORS DISTRIBUTION

Public Space Pixels **1**
Waterfront Pixels **2**
Circulation Pixels **3**

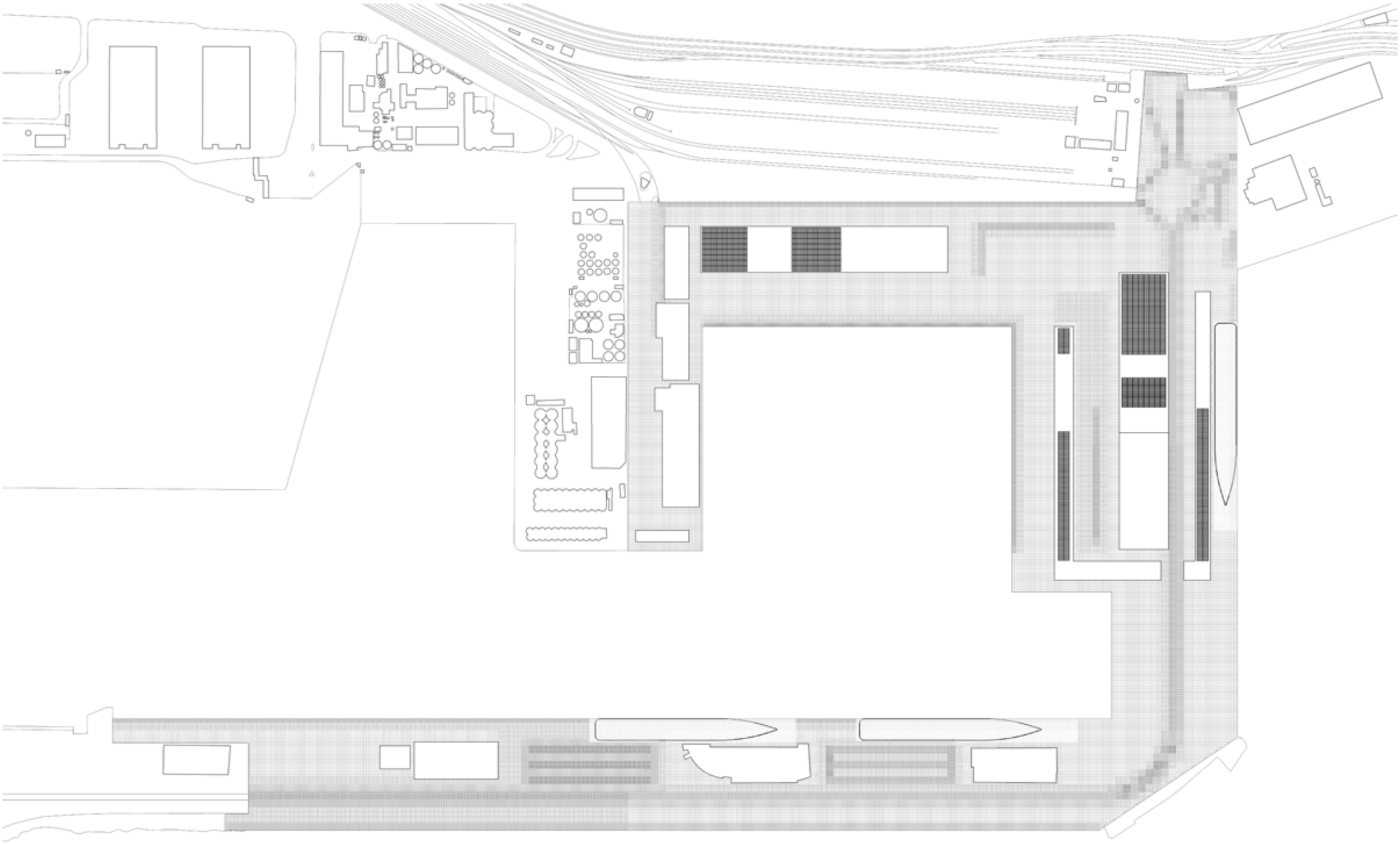




SPATIAL USE FLUCTUATIONS

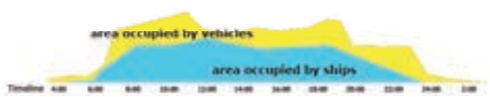


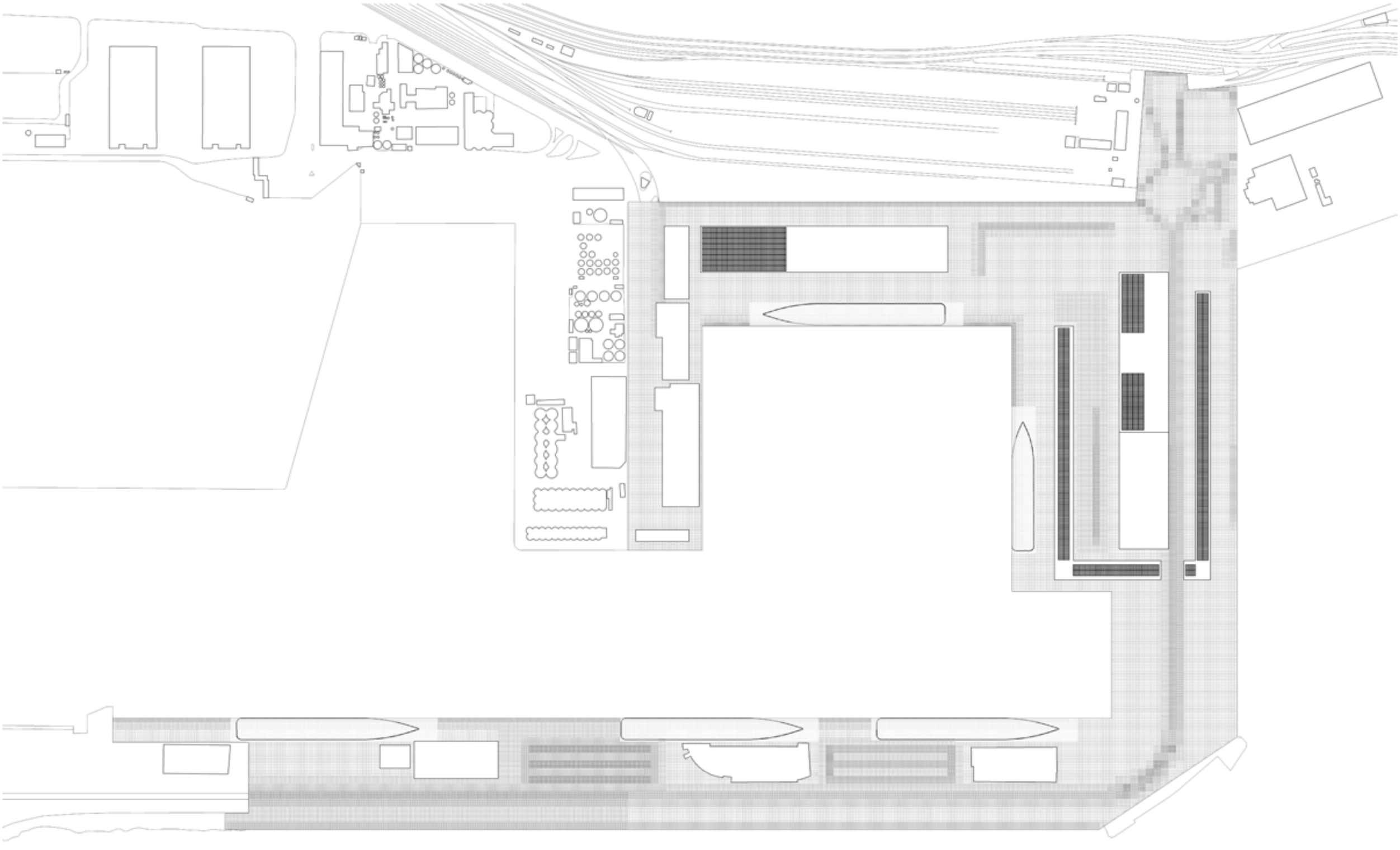
GRID BASIC REACTIONS / **SUNDAY**



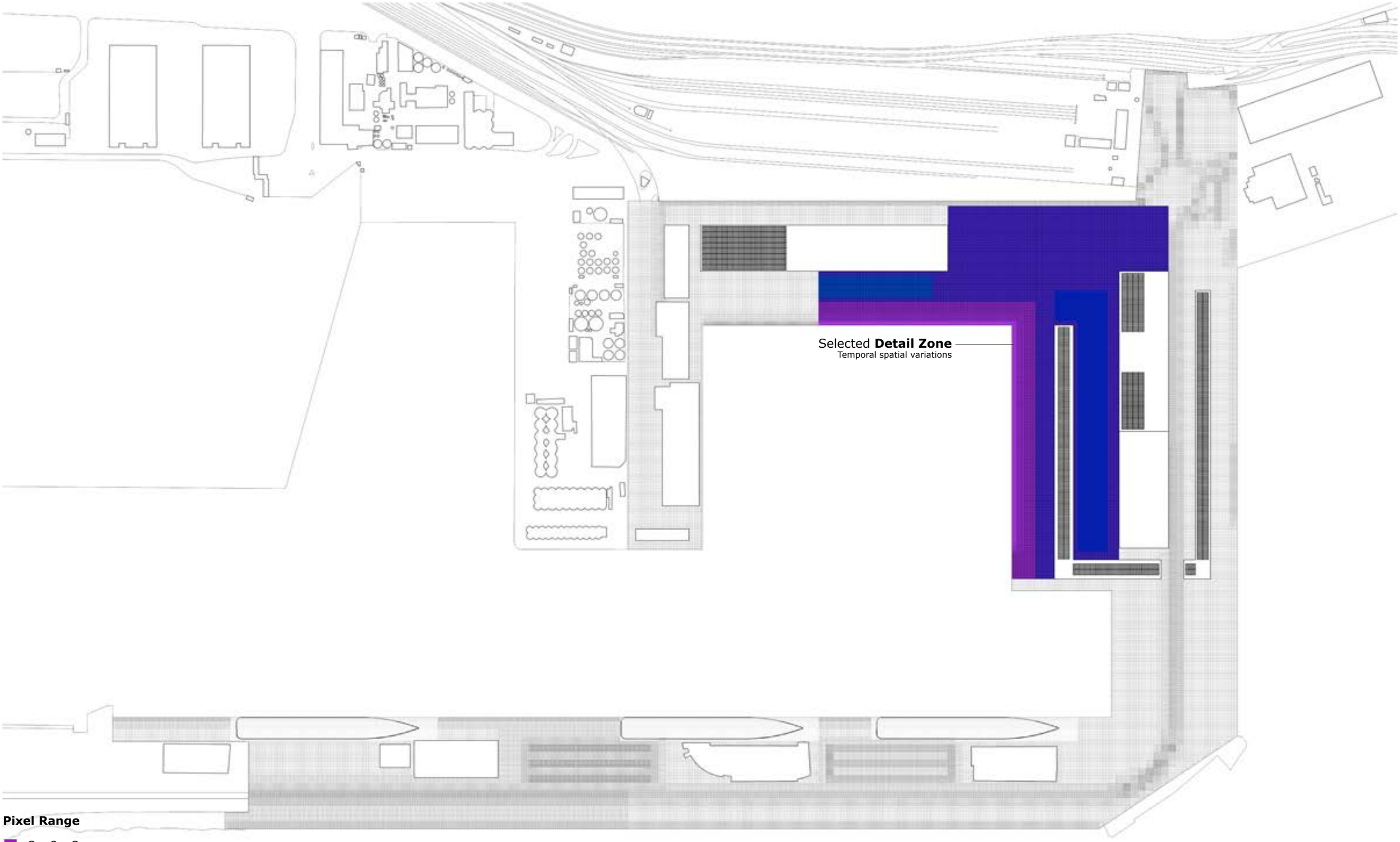
GRID BASIC REACTIONS / **WEDNESDAY**

GRID BASIC REACTIONS / **FRIDAY**





GRID BASIC REACTIONS / **SATURDAY**



GRID BASIC REACTIONS / **SATURDAY** / **SELECTED DETAIL**

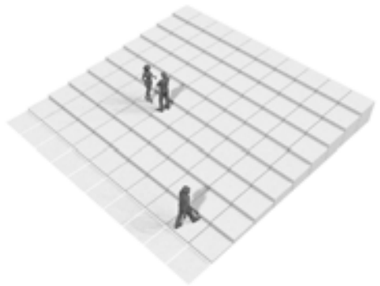
Grid Behavior Detail

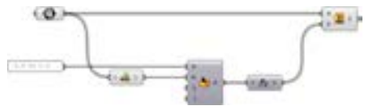
Day Detail: **Saturday**

A-01
Waterfront

Functions:

Beach simulation
Spatial use enhancer
Scenarios and seating configurations
Multifunctional topography generation



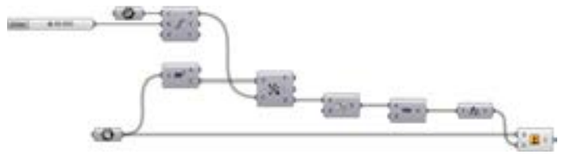


Script A-01: Beach Basic

A-02
Waterfront

Functions:

Spatial control
Random topography generation

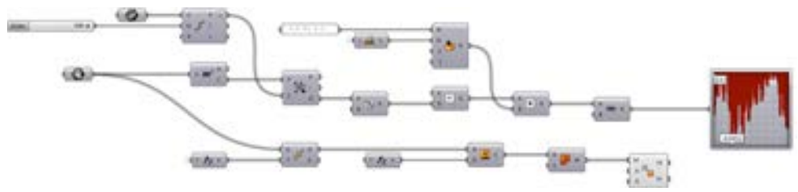


Script A-02: Beach Random

B-01
Public Space

Functions:

Spatial control and subdivision
Multiple public pools generation
Semi-random and behavior

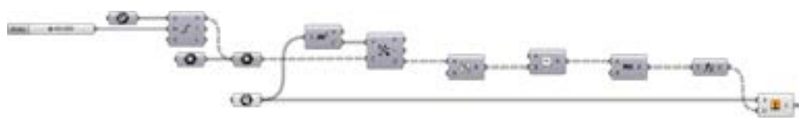


Script B-01: Public Random Pools

B-02
Public Space

Functions:

Spatial control and subdivision
Pedestrian and vehicular path definitions
Scenarios and seating configurations
Multifunctional topography generation

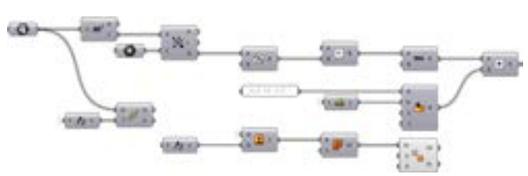


Script B-02: Public Point Cloud

B-03
Public Space

Functions:

Spatial control and definition
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations



Script B-03: Public Random Space

Time
06:00

Container (Empty)

Ship (x0)

Imput

Time
10:00

Container (Medium)

Ship (x2)

Imput

Time
14:00

Container (Full)

Ship (x2)

Imput

Time
18:00

Container (Full)

Ship (x1)

Imput

Time
22:00

Container (Medium)

Ship (x0)

Imput

Response
(Behaviors)

A-01
Waterfront

B-01
Public Space

B-03
Public Space

Response
(Behaviors)

B-01
Public Space

B-03
Public Space

Response
(Behaviors)

B-03
Public Space

Response
(Behaviors)

A-01
Waterfront

B-02
Public Space

Response
(Behaviors)

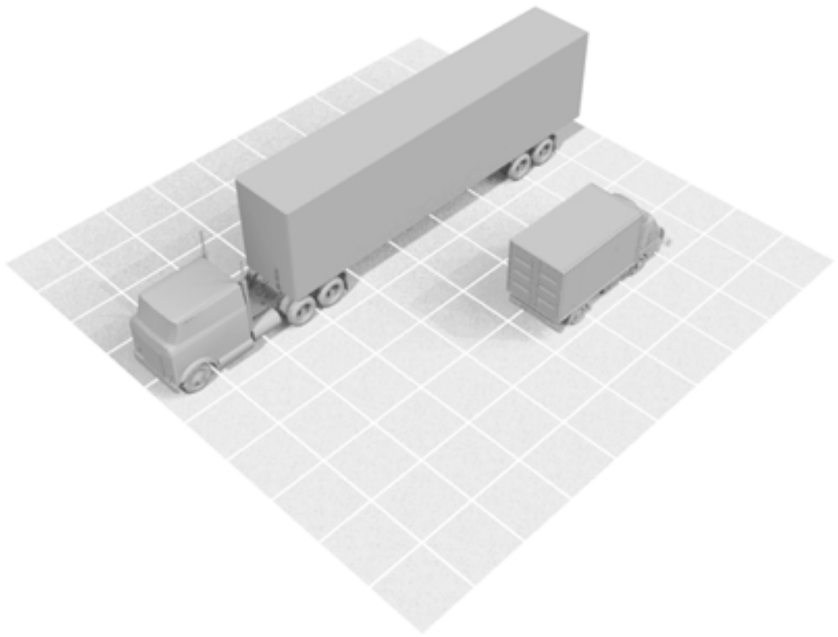
A-01
Waterfront

A-02
Waterfront

B-02
Public Space

B-03
Public Space

GRID BEHAVIOR DETAIL / **SATURDAY**



Starting Point (Grid at 0)

When the grid is at 0 (resting mode, without any specific imput defining public space or any other special behaviors) space will remain flat, providing a surface that facilitates the overall traffic, specially the transit of containers to and from the storage area.

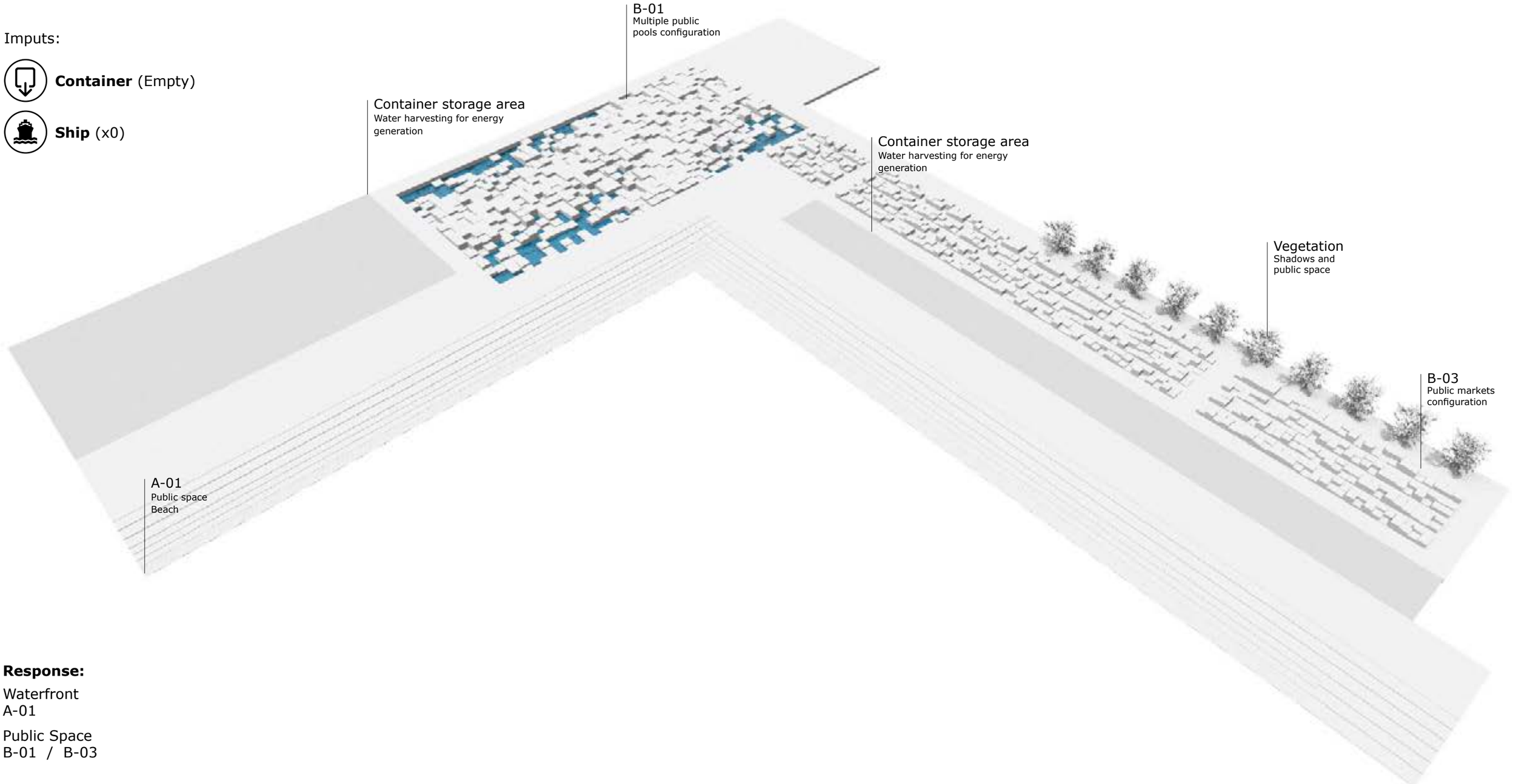
Time:

06:00

Imputs:

Container (Empty)

Ship (x0)



Response:

Waterfront
A-01

Public Space
B-01 / B-03

Events:

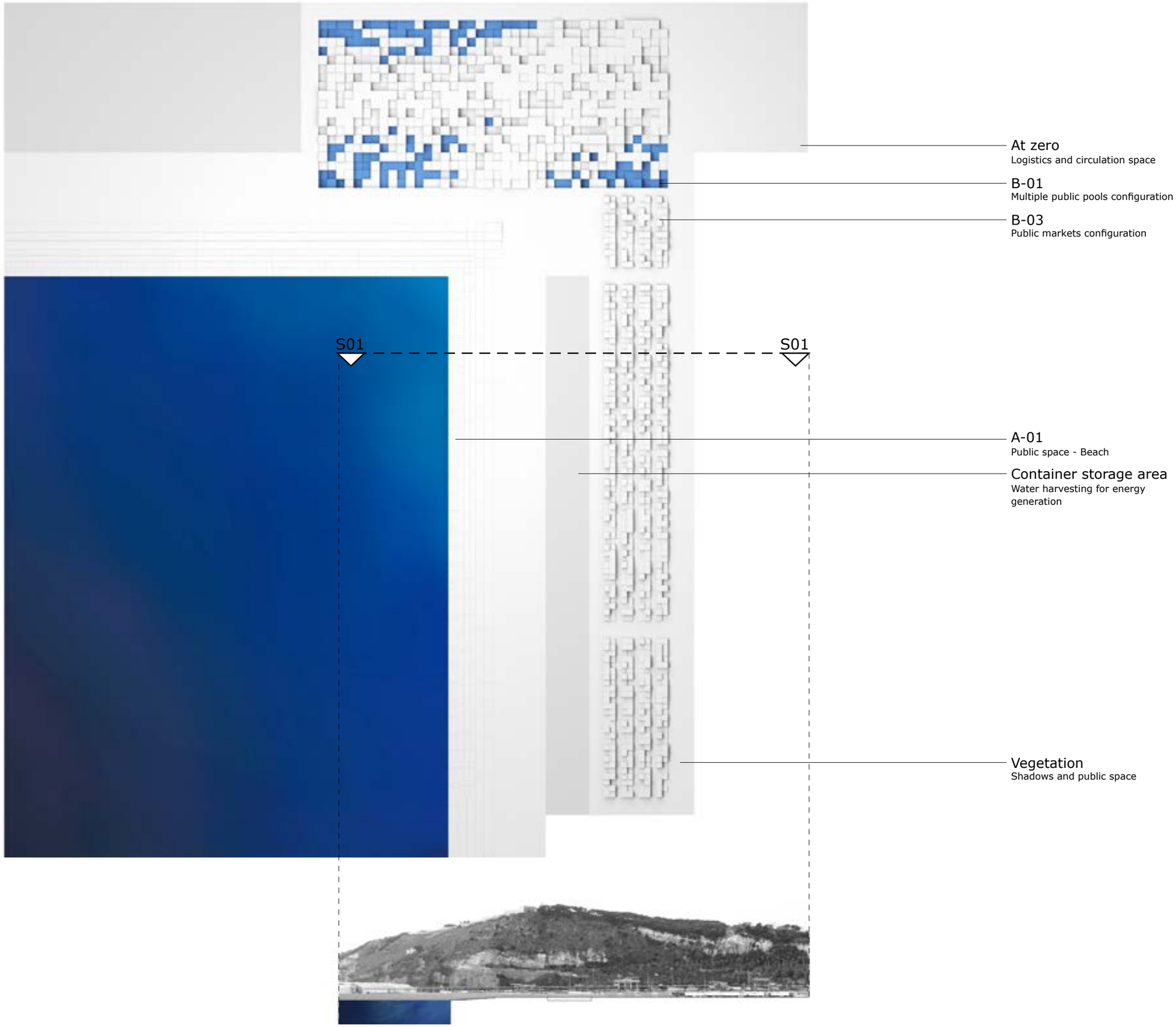
Beach simulation
Spatial use enhancer
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations
Multiple public pools generation

Time:
06:00

Imputs:

Container (Empty)

Ship (x0)



Response:

Waterfront
A-01

Public Space
B-01 / B-03

Events:

Beach simulation
Spatial use enhancer
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations
Multiple public pools generation

Time:
06:00

Imputs:

Container (Empty)

Ship (x0)

B-01
Public Space

B-01
Waterfront

B-03
Public Space

Events:

Beach simulation
Spatial use enhancer
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations
Multiple public pools generation

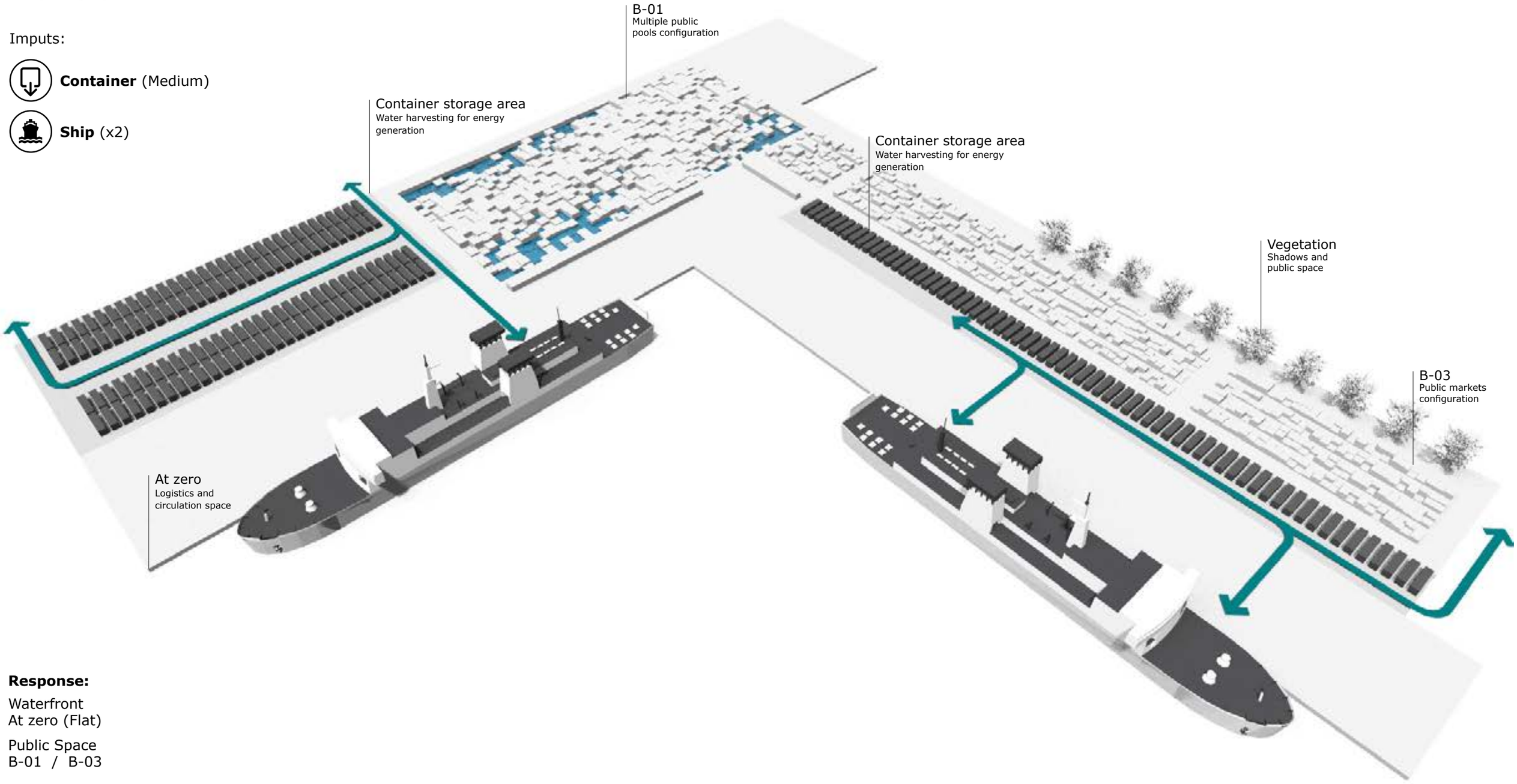
Time:

10:00

Imputs:

Container (Medium)

Ship (x2)



Response:

Waterfront
At zero (Flat)

Public Space
B-01 / B-03

Events:

Storage and transit
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations
Multiple public pools generation

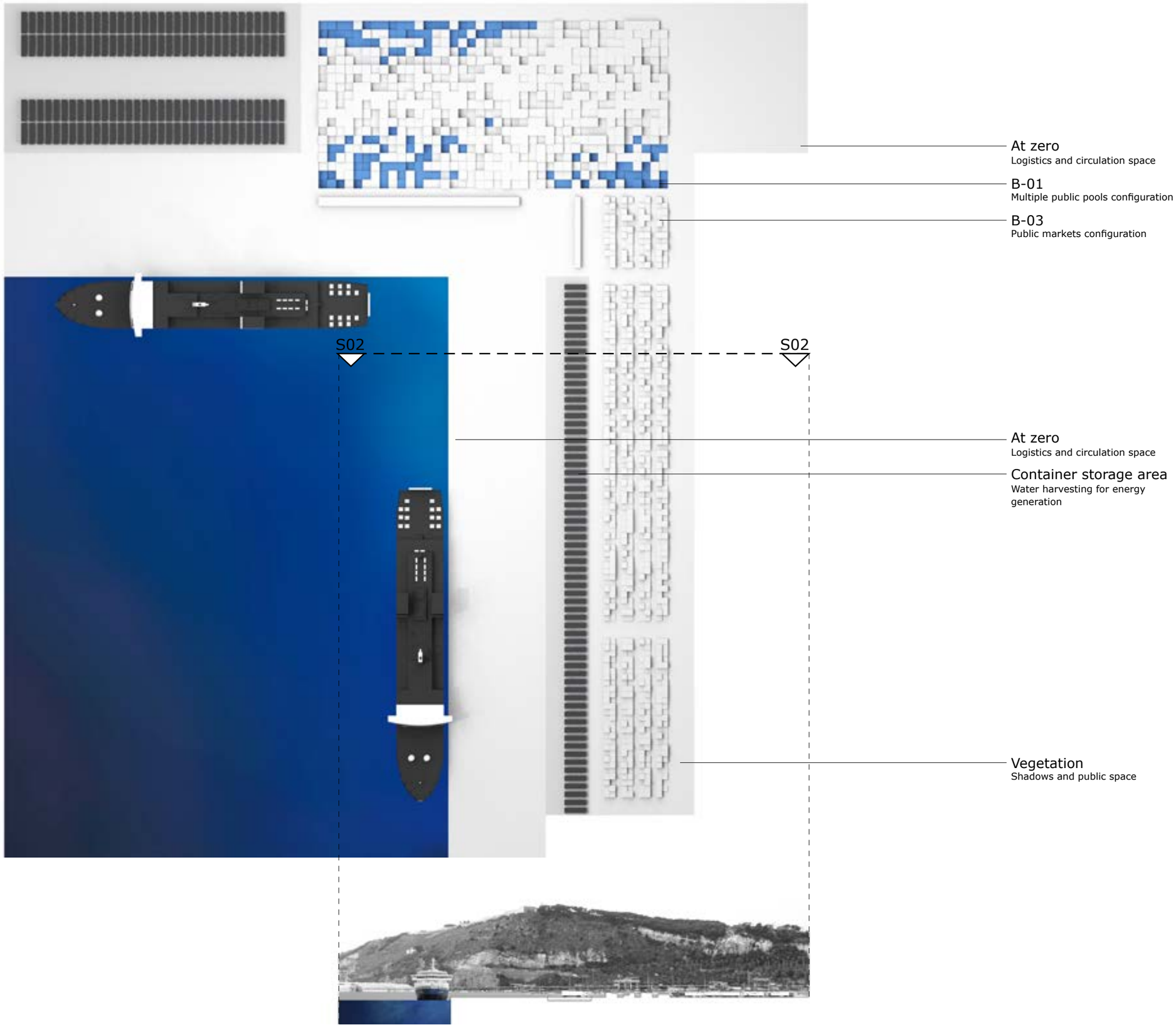
Time:

10:00

Imputs:

Container (Medium)

Ship (x2)



At zero
Logistics and circulation space

B-01
Multiple public pools configuration

B-03
Public markets configuration

At zero
Logistics and circulation space

Container storage area
Water harvesting for energy generation

Vegetation
Shadows and public space

Response:

Waterfront
At zero (Flat)

Public Space
B-01 / B-03

Events:

Storage and transit
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations
Multiple public pools generation

Time:
10:00

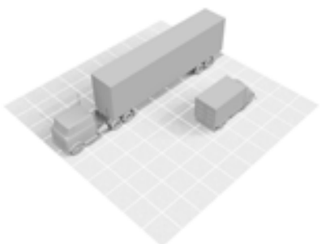
Imputs:

Container (Medium)

Ship (x2)

B-01
Public Space

At zero (Flat)
Waterfront



B-03
Public Space

Events:

Storage and transit
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations
Multiple public pools generation

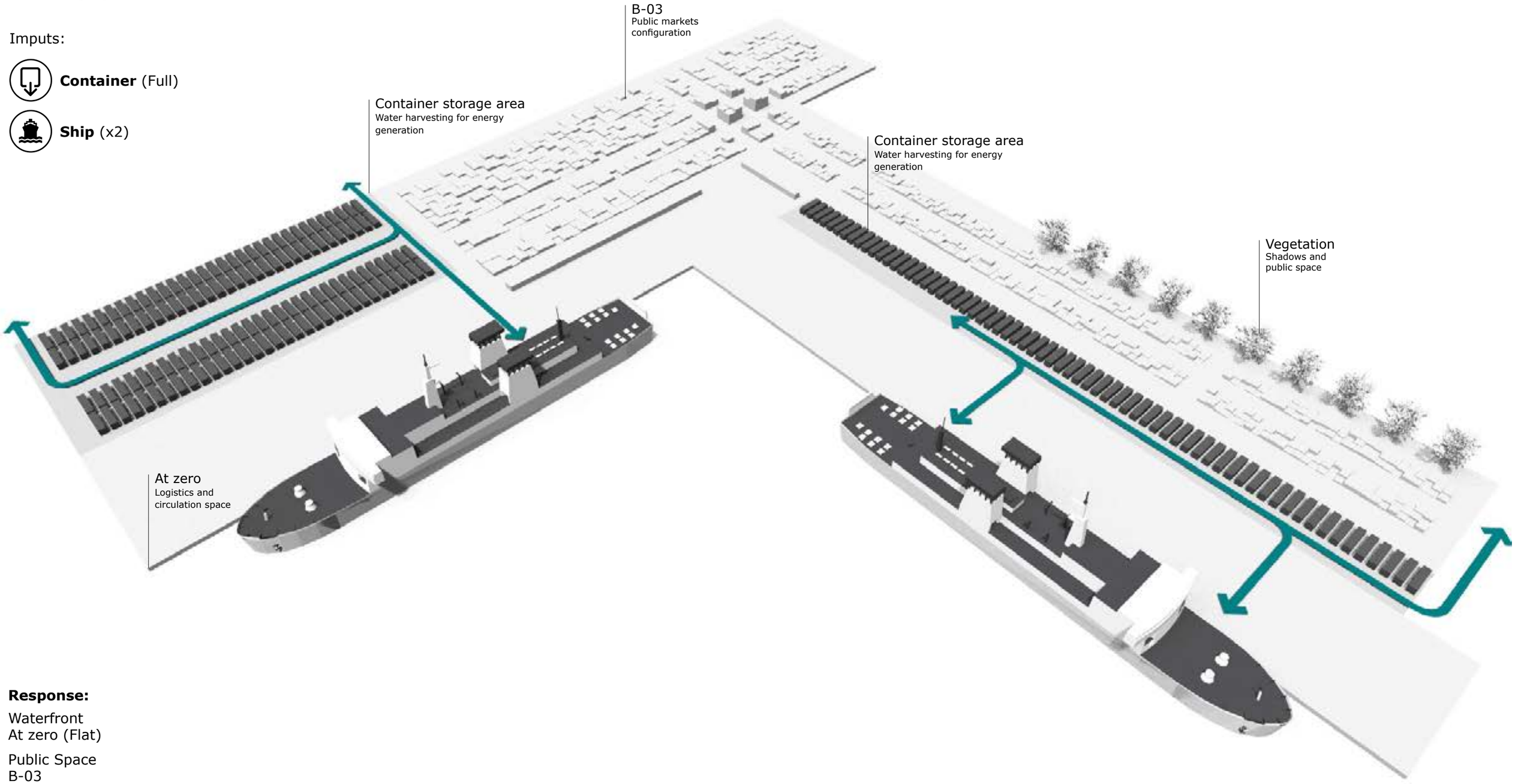
Time:

14:00

Imputs:

Container (Full)

Ship (x2)



Response:

Waterfront
At zero (Flat)

Public Space
B-03

Events:

Storage and transit
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations

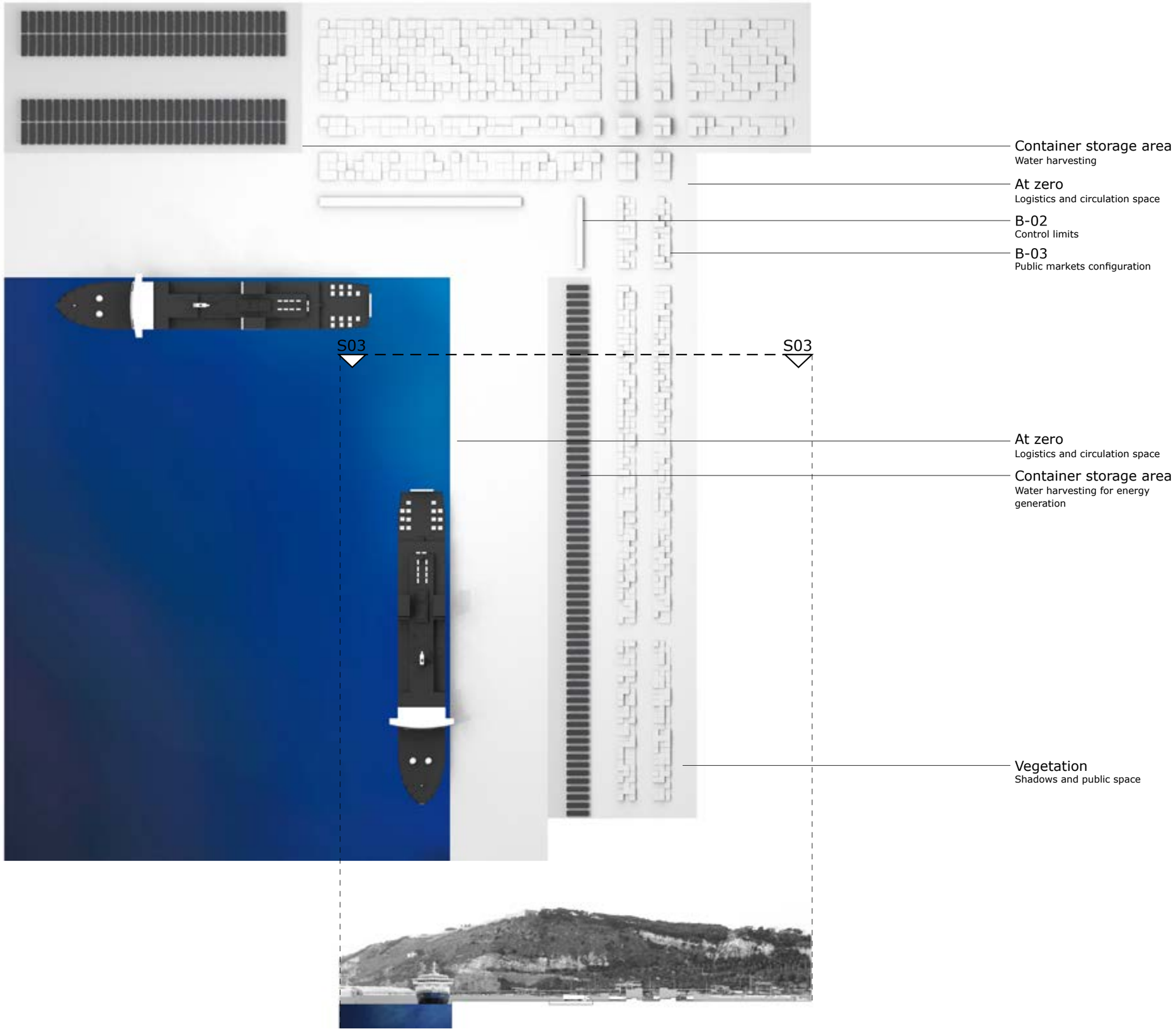
Time:

14:00

Imputs:

Container (Full)

Ship (x2)



Response:

Waterfront
At zero (Flat)

Public Space
B-03

Events:

Storage and transit
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations

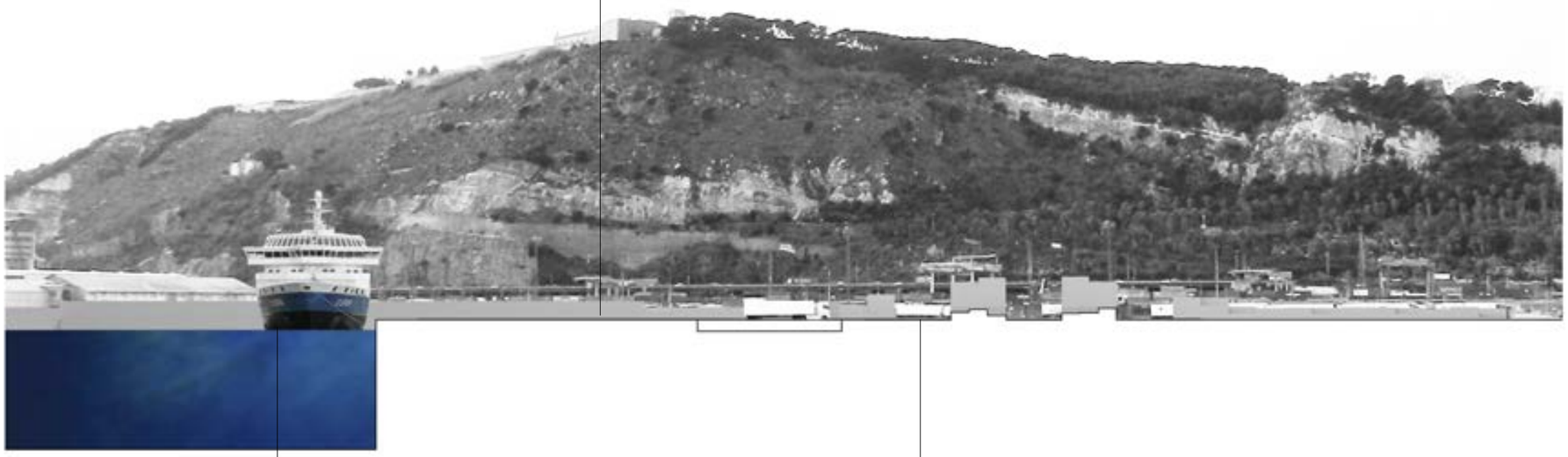
Time:
14:00

Imputs:

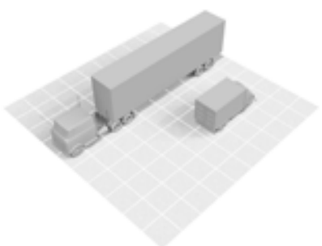
Container (Full)

Ship (x2)

A-02
Waterfront



At zero (Flat)
Waterfront



B-02
Public Space

Events:

Storage and transit
Scenarios and seating configurations
Multifunctional topography generation
Spatial control and subdivision
Pedestrian and vehicular path definitions
Random topography generation
Market space configurations

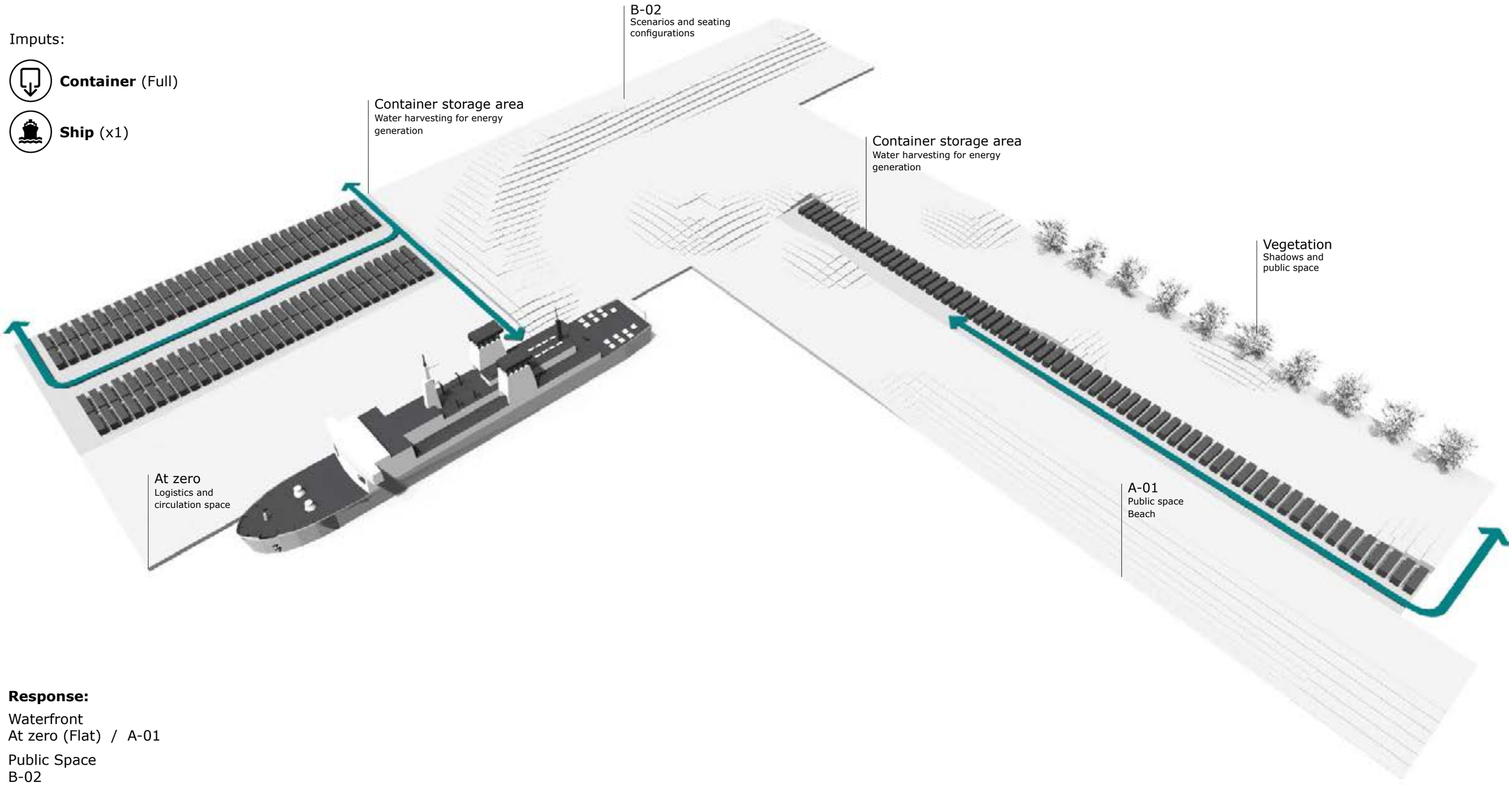
Time:

18:00

Imputs:

Container (Full)

Ship (x1)



Response:

Waterfront
At zero (Flat) / A-01

Public Space
B-02

Events:

Storage and transit
Beach simulation
Spatial use enhancer
Spatial control and subdivision
Pedestrian and vehicular path definitions
Scenarios and seating configurations
Multifunctional topography generation

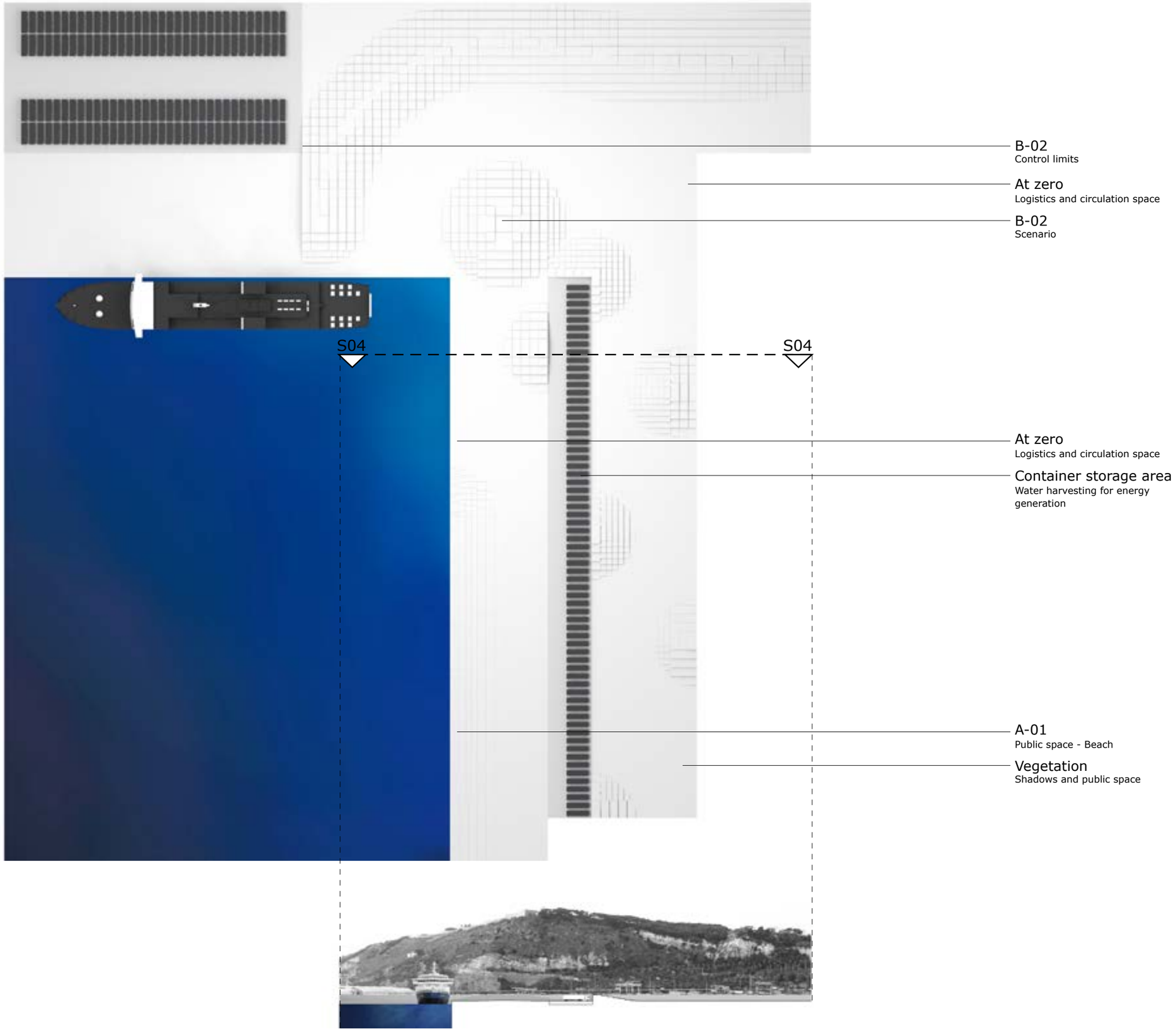
Time:

18:00

Imputs:

Container (Full)

Ship (x1)



Response:

Waterfront
At zero (Flat) / A-01

Public Space
B-02

Events:

Storage and transit
Beach simulation
Spatial use enhancer
Spatial control and subdivision
Pedestrian and vehicular path definitions
Scenarios and seating configurations
Multifunctional topography generation

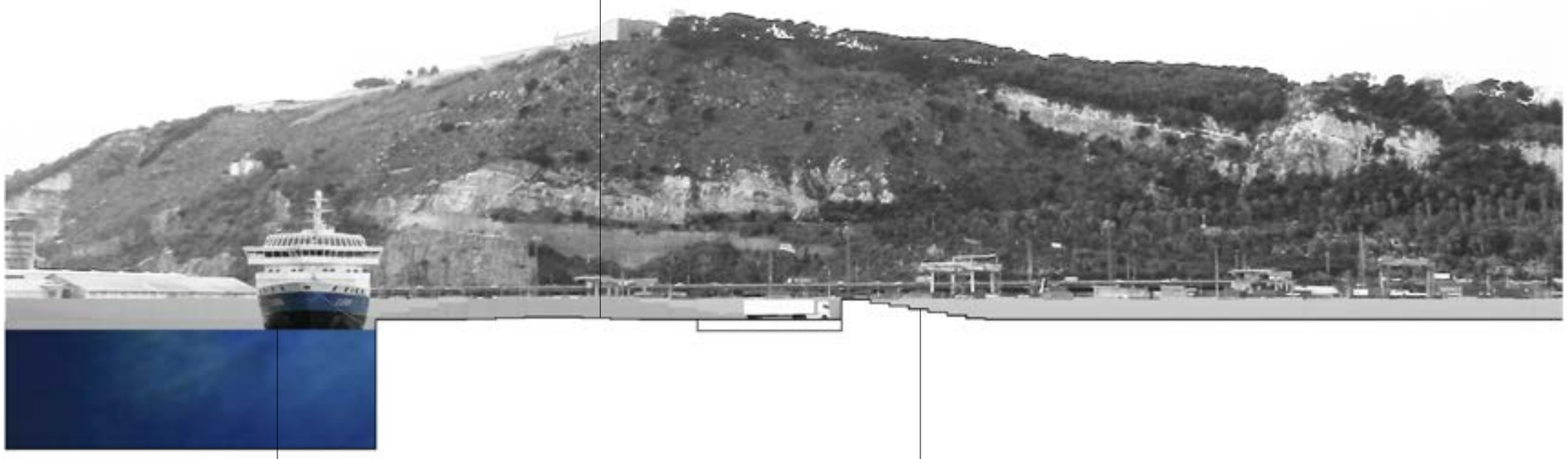
Time:
18:00

Imputs:

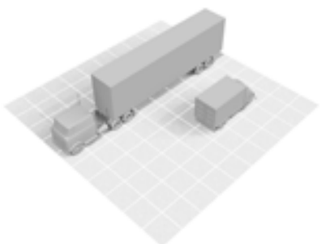
Container (Full)

Ship (x1)

B-02
Public Space



At zero (Flat)
Waterfront



B-02
Public Space

Events:

Storage and transit
Beach simulation
Spatial use enhancer
Spatial control and subdivision
Pedestrian and vehicular path definitions
Scenarios and seating configurations
Multifunctional topography generation

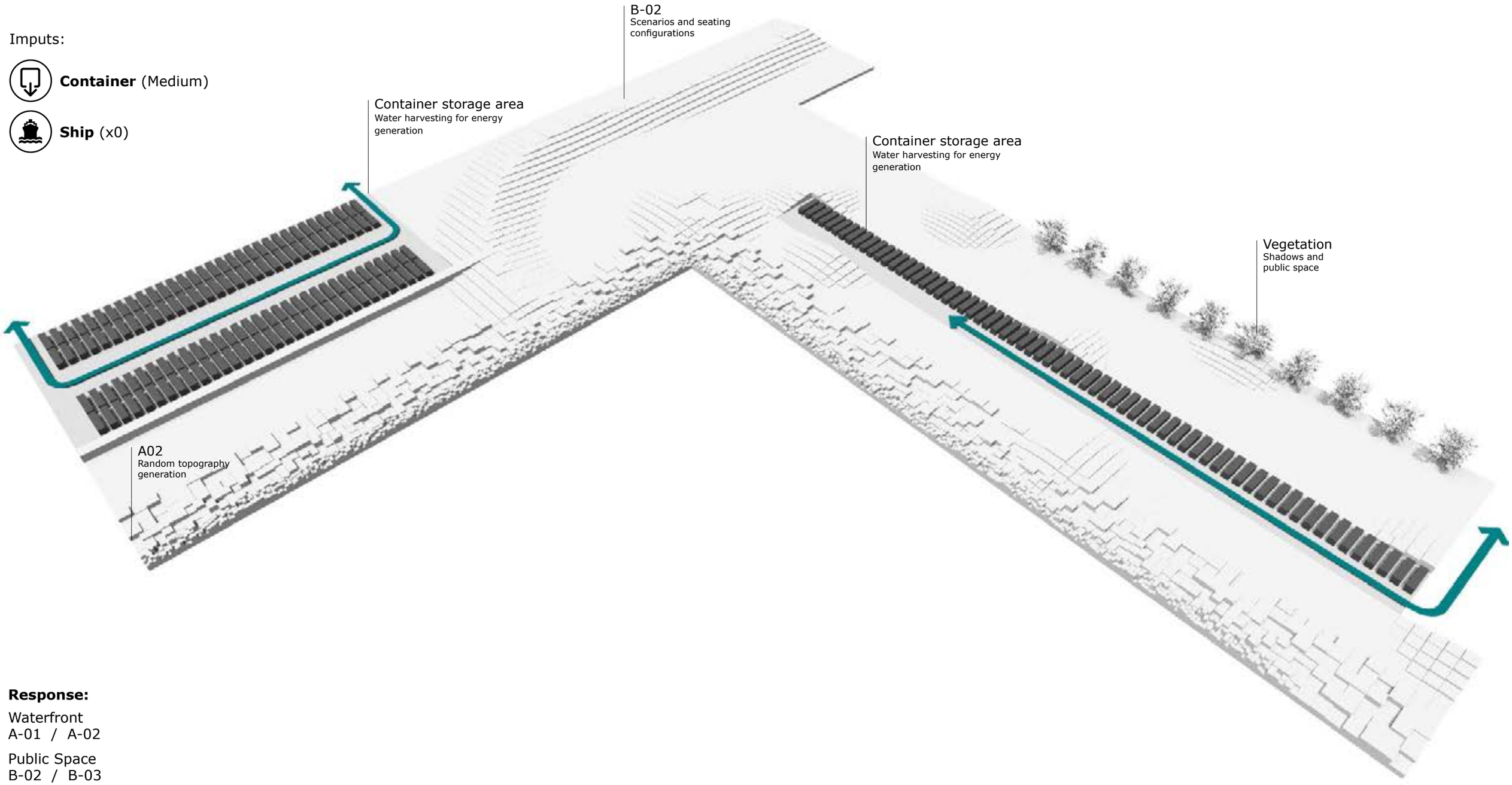
Time:

22:00

Imputs:

Container (Medium)

Ship (x0)



Response:

Waterfront
A-01 / A-02

Public Space
B-02 / B-03

Events:

Beach simulation
Spatial use enhancer
Random topography generation
Multifunctional topography generation
Scenarios and seating configurations
Spatial control and subdivision
Pedestrian and vehicular path definitions

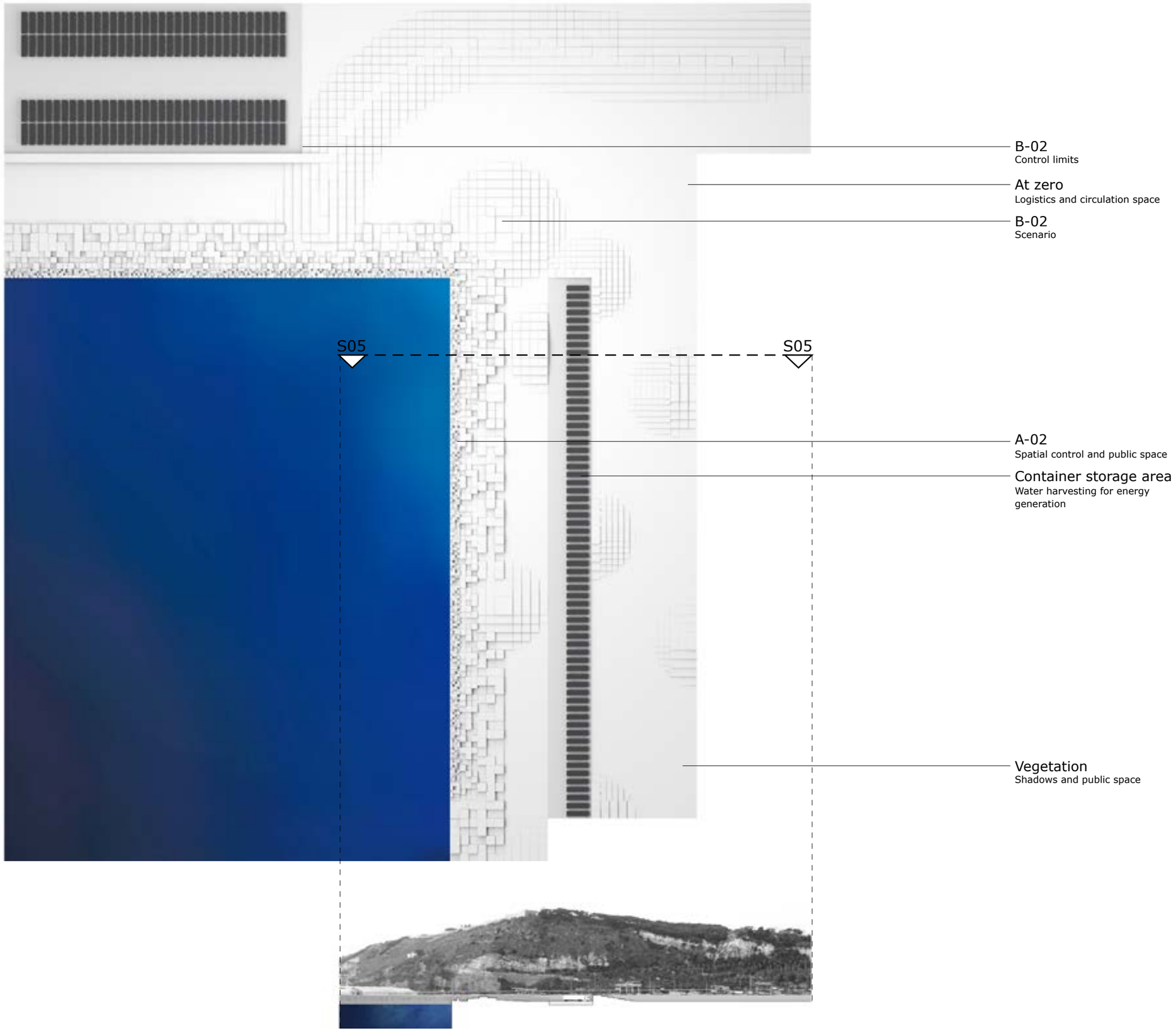
Heavy Circulation

Time:
22:00

Imputs:

Container (Medium)

Ship (x0)



Response:

Waterfront
A-01 / A-02

Public Space
B-02 / B-03

Events:

Beach simulation
Spatial use enhancer
Random topography generation
Multifunctional topography generation
Scenarios and seating configurations
Spatial control and subdivision
Pedestrian and vehicular path definitions

GRID BASIC REACTIONS / SATURDAY / **22:00**

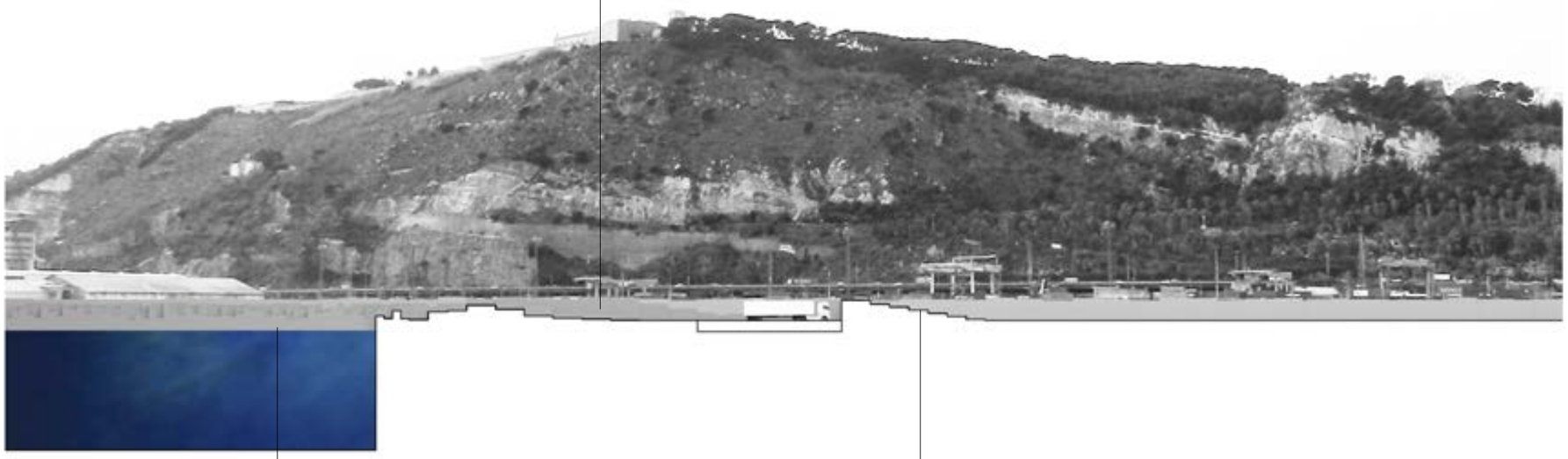
Time:
22:00

Imputs:

Container (Medium)

Ship (x0)

B-02
Public Space



A-02
Waterfront

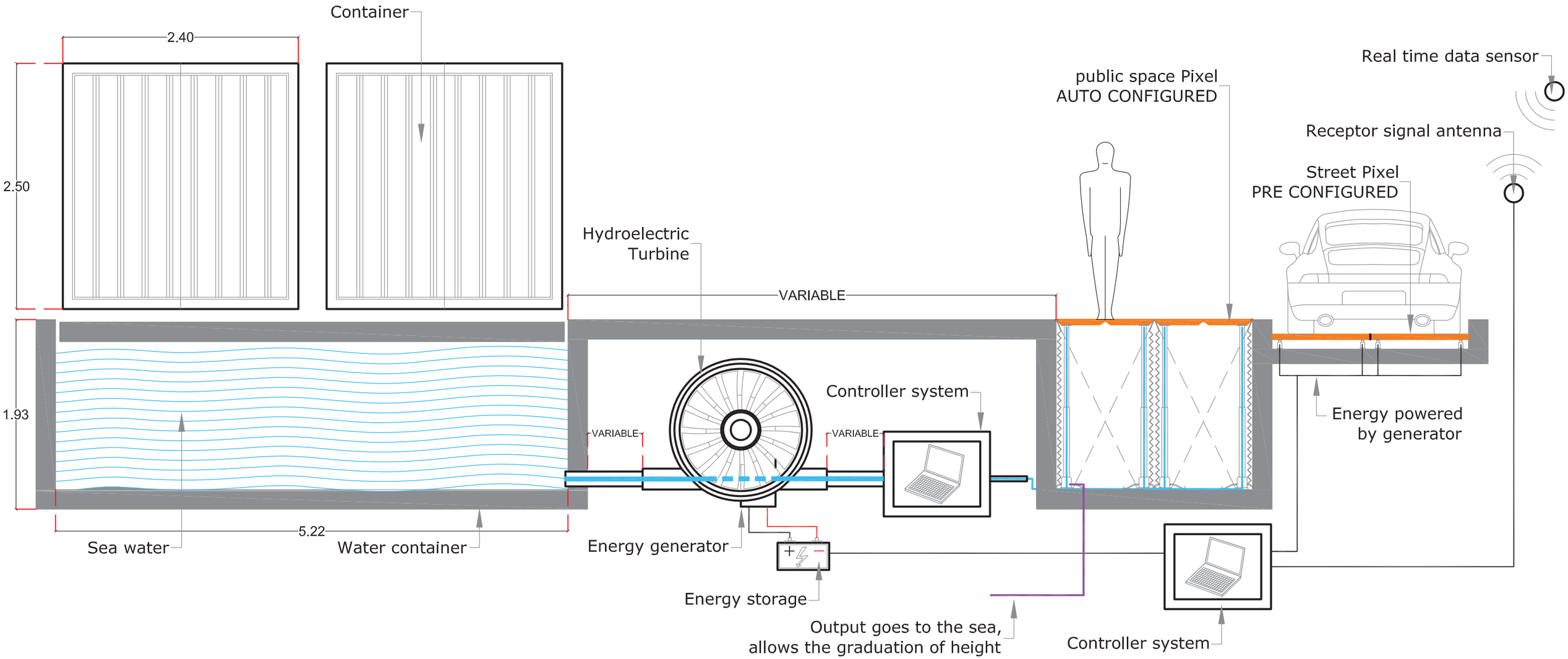
B-02
Public Space

Events:

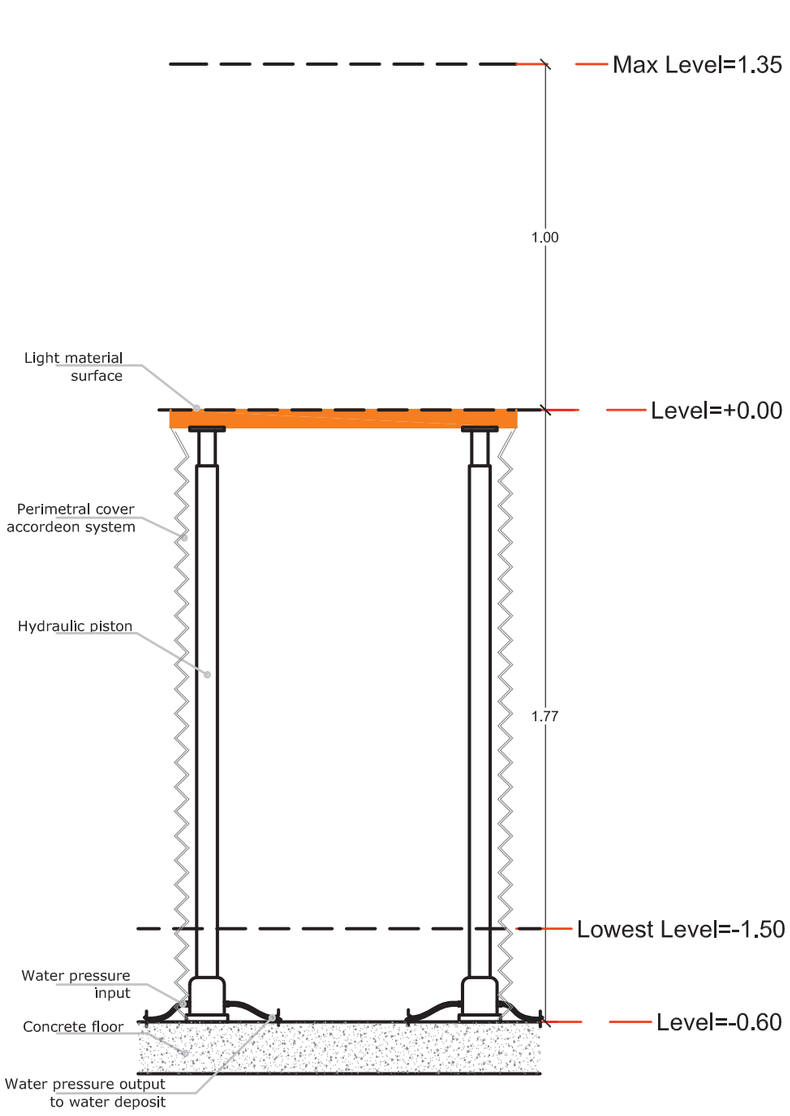
Beach simulation
Spatial use enhancer
Random topography generation
Multifunctional topography generation
Scenarios and seating configurations
Spatial control and subdivision
Pedestrian and vehicular path definitions

Component

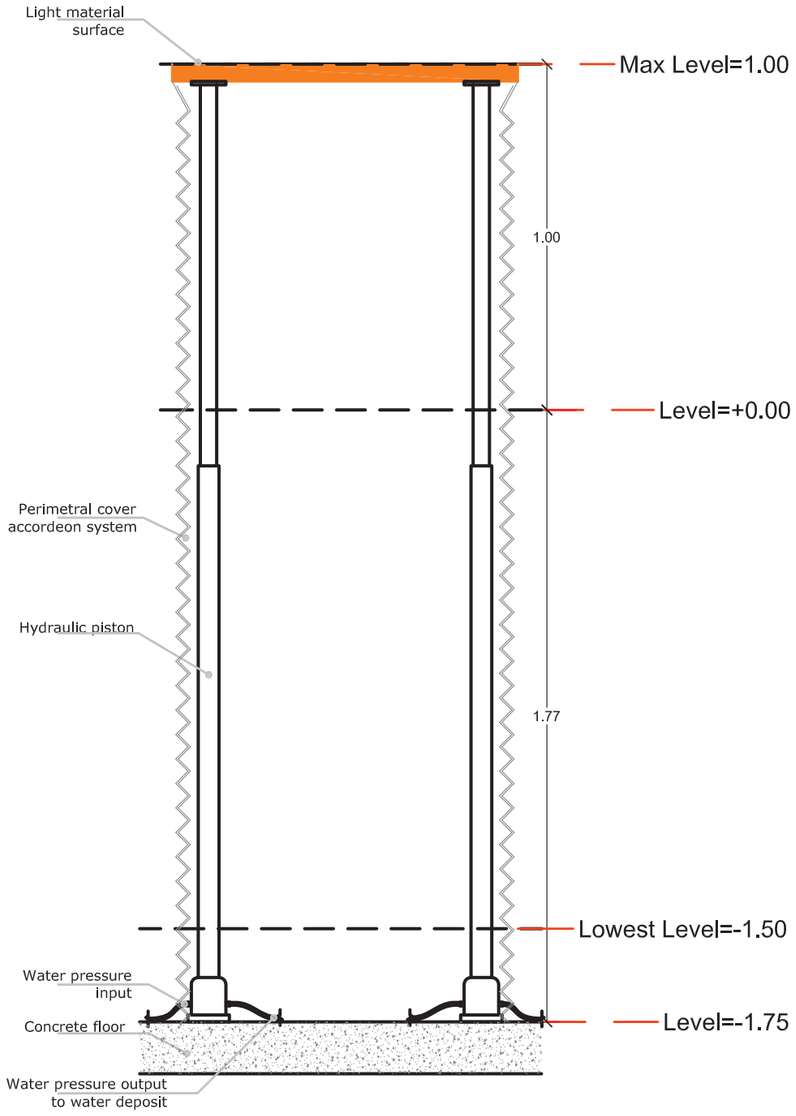
Functional Details


Container
2.40
2.50
1.93
Hydroelectric
Turbine
VARIABLE
public space Pixel
AUTO CONFIGURED
Real time data sensor
Receptor signal antenna
Street Pixel
PRE CONFIGURED
Controller system
VARIABLE
VARIABLE
Energy powered
by generator
5.22
Sea water
Water container
Energy generator
Energy storage
Output goes to the sea,
allows the graduation of height
Controller system

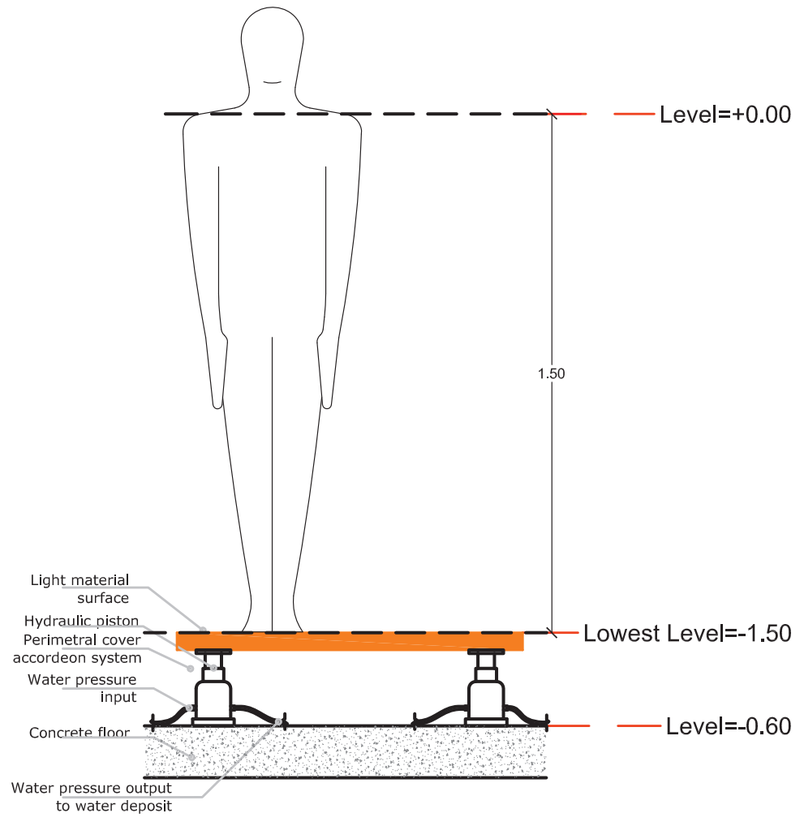
MECHANISM



INACTIVE PIXEL

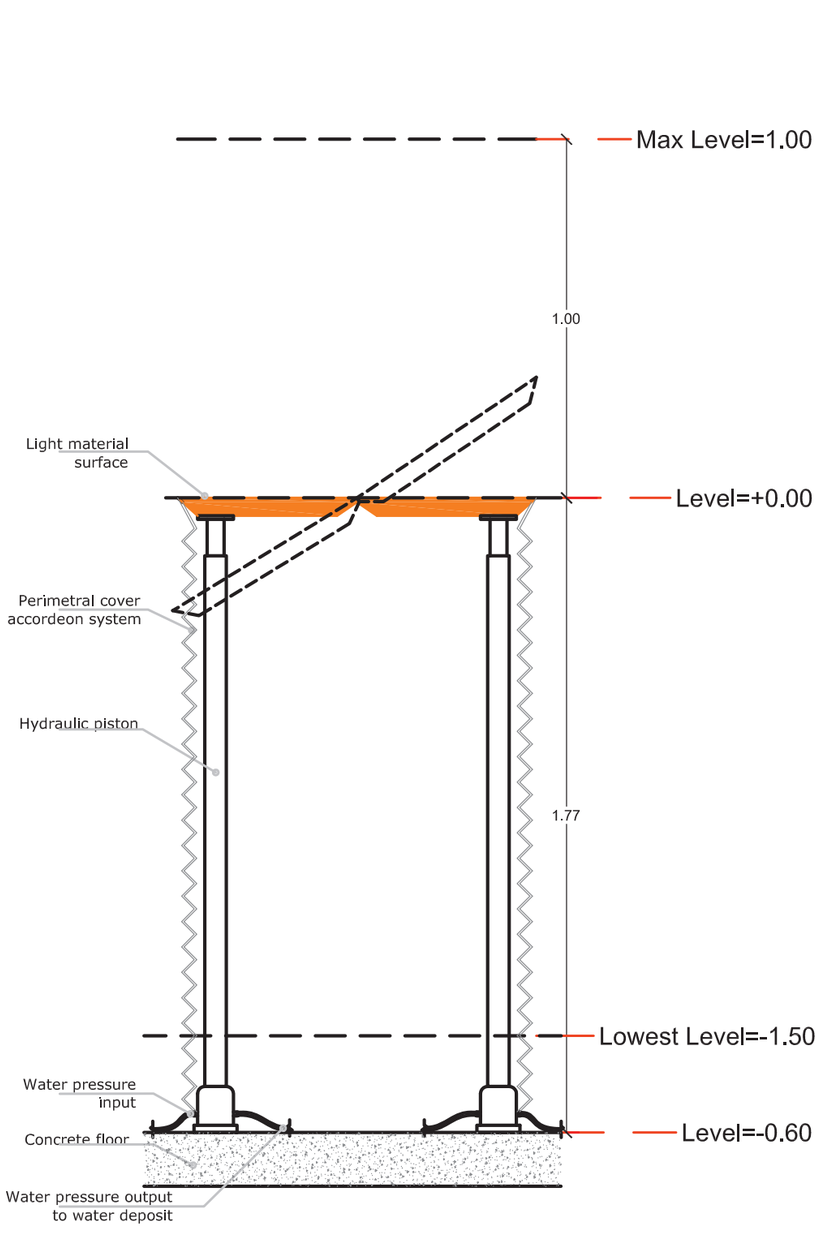


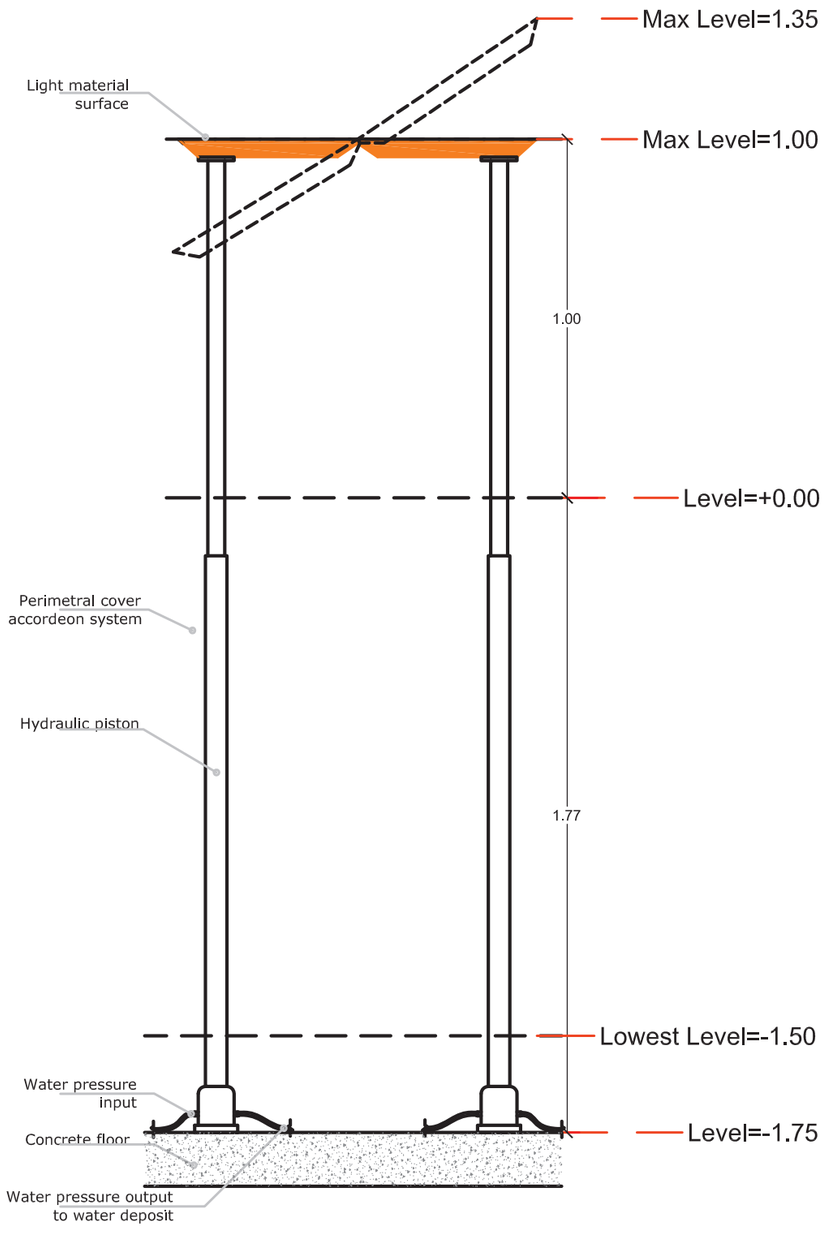
ACTIVE MAX HEIGHT PIXEL SECTION

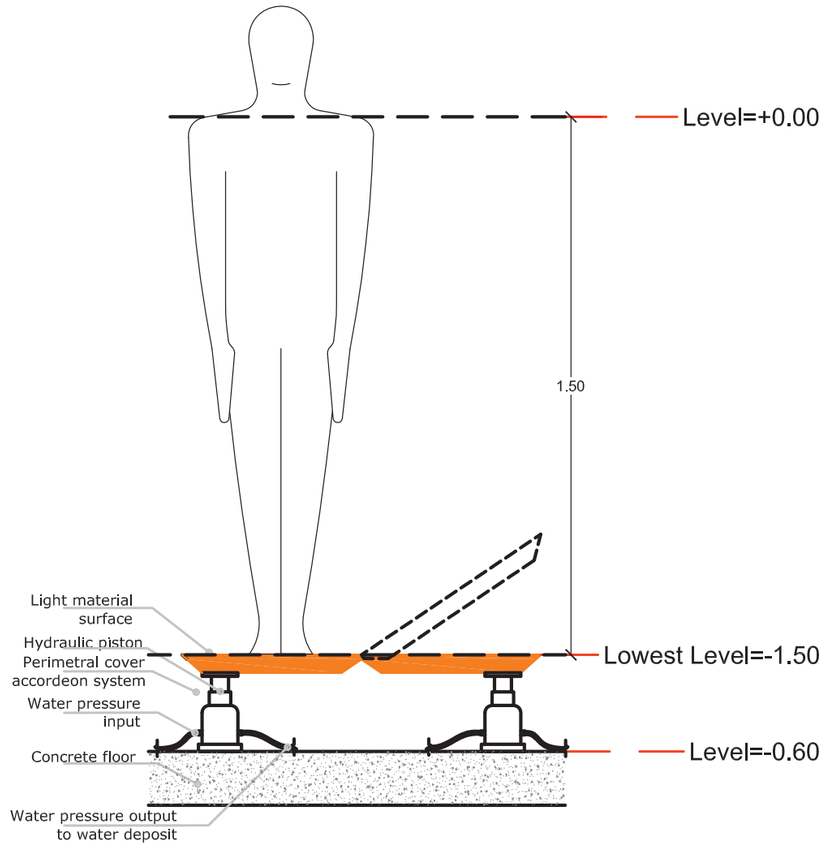


ACTIVE MIN HEIGHT PIXEL SECTION

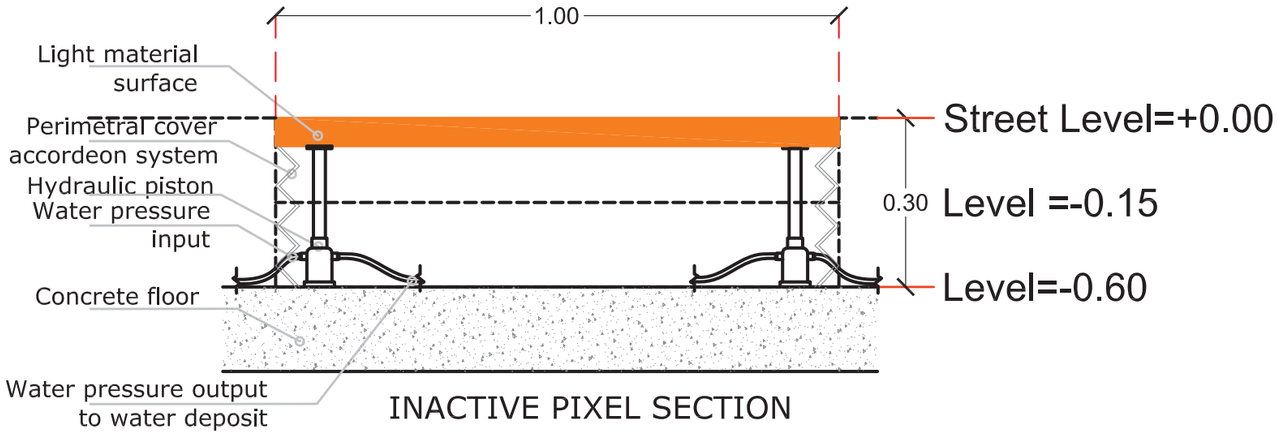
WATER FRONT MODULE



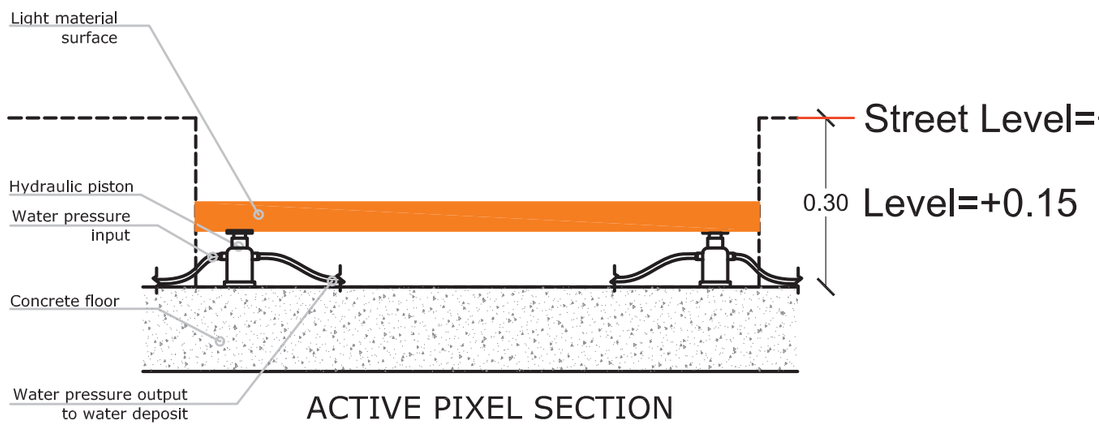




PUBLIC SPACE MODULE

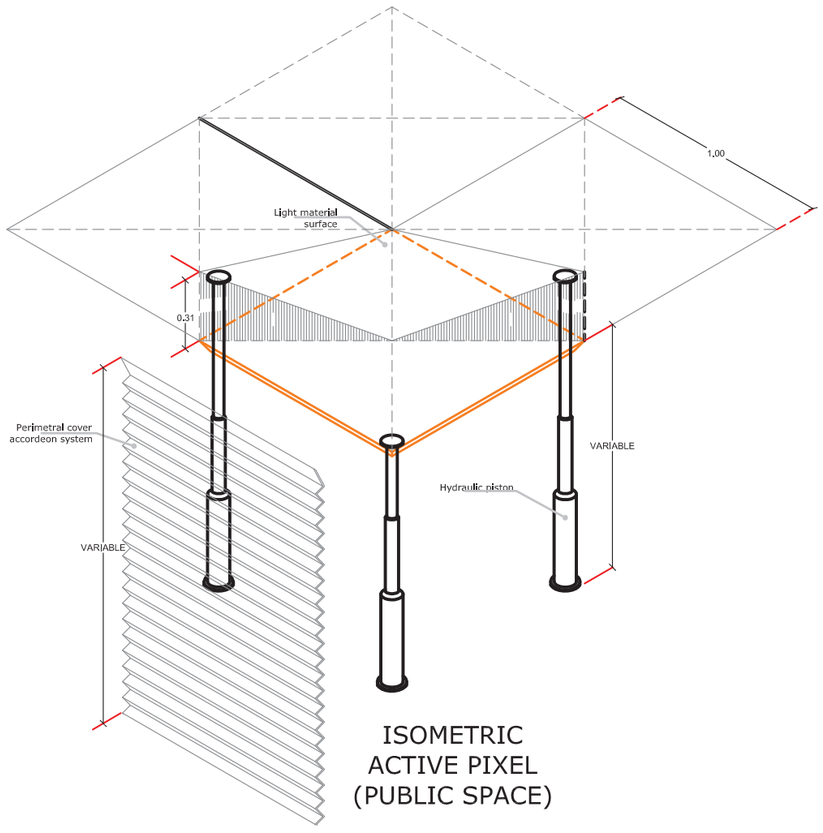


INACTIVE PIXEL SECTION

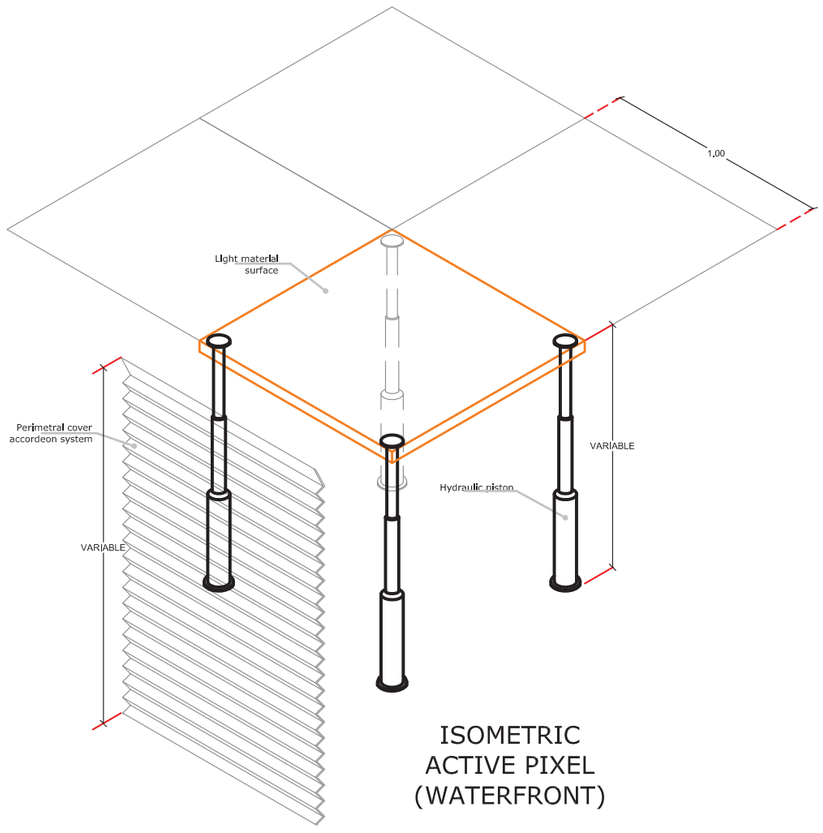


ACTIVE PIXEL SECTION

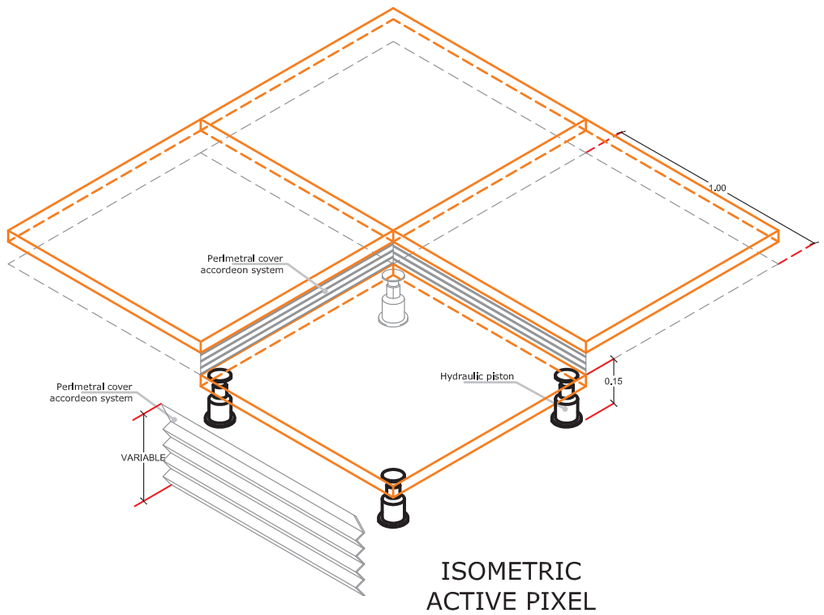
STREET MODULE



ISOMETRIC
ACTIVE PIXEL
(PUBLIC SPACE)



ISOMETRIC
ACTIVE PIXEL
(WATERFRONT)



ISOMETRIC
ACTIVE PIXEL
(STREET)

ISOMETRIC VIEWS

Max Level= +2.00

Level=+1.00

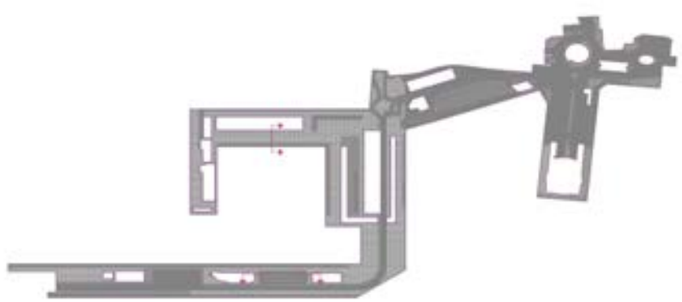
Level=+0.00

Level=-1.000

Level= -1.50

Level= -1.75

Unknown



SECTION A A' \ **INACTIVE**

Max Level= +2.00

Level=+1.00

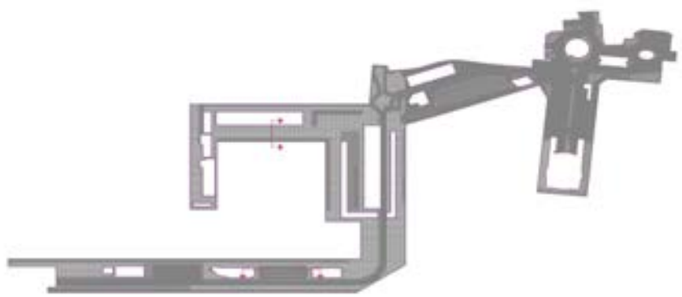
Level=+0.00

Level=-1.000

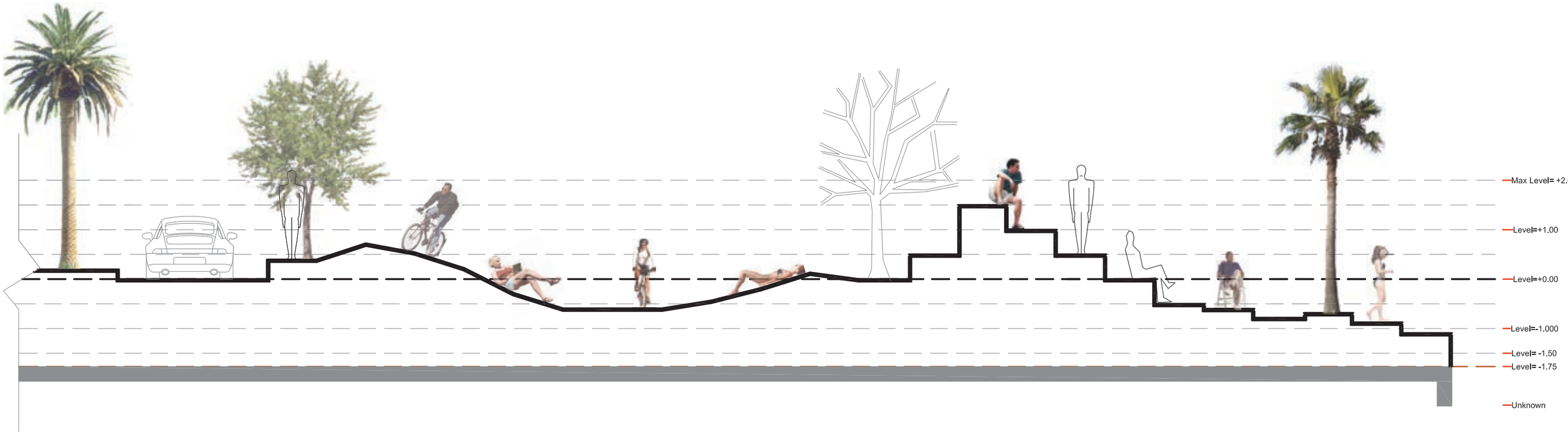
Level= -1.50

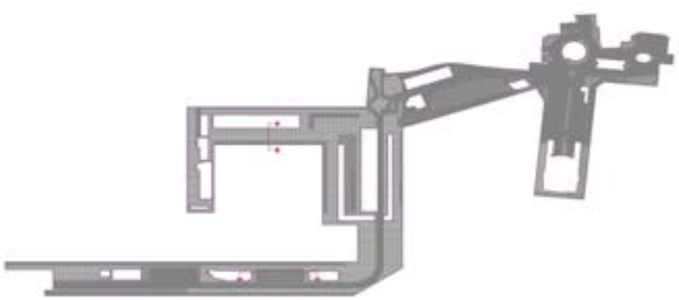
Level= -1.75

Unknown



SECTION A A’ \ **ACTIVE**


Max Level= +2.00
Level=+1.00
Level=+0.00
Level=-1.000
Level= -1.50
Level= -1.75
Unknown



SECTION B B’

Prototypes

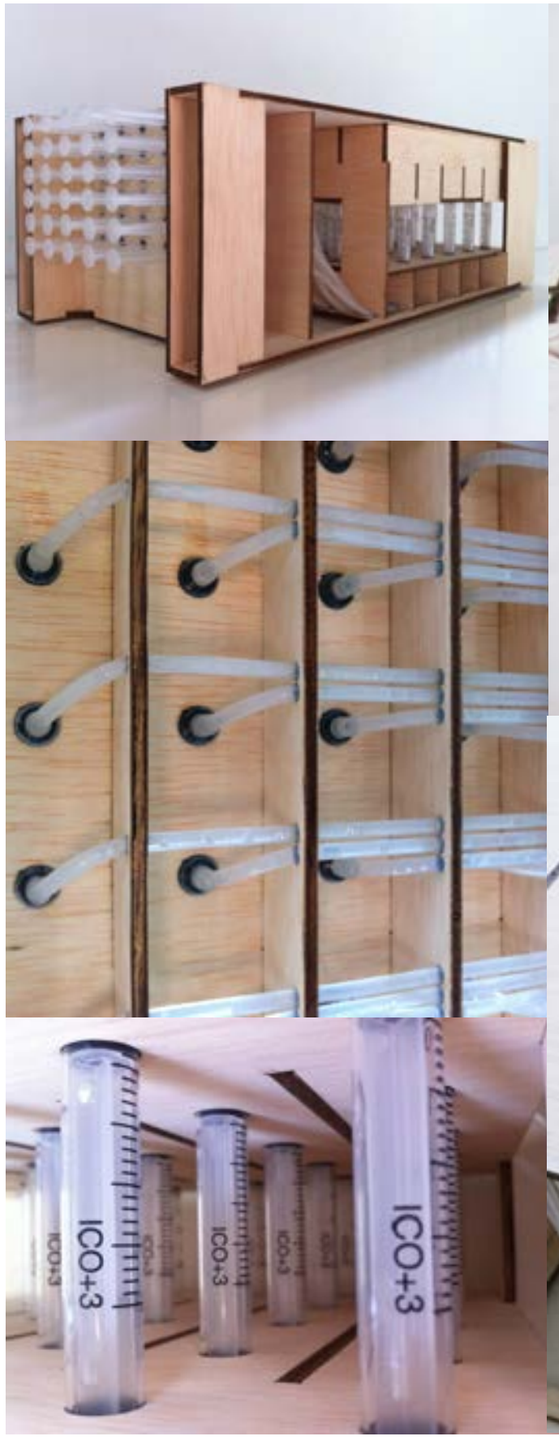
Tests and final piece

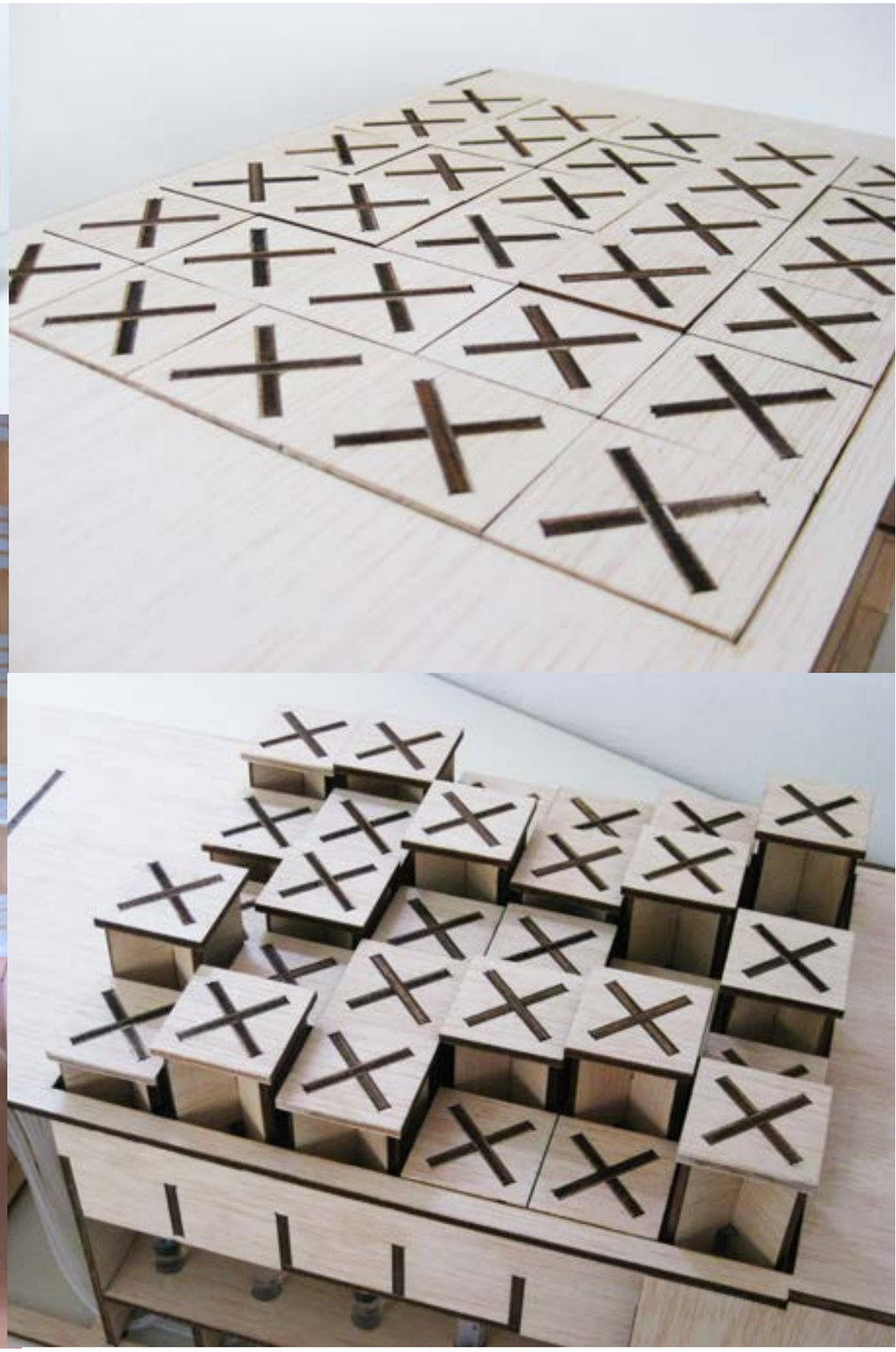
Ballon experiment

Ballon system + wood structure

PROTOTYPE EVOLUTION

Syringe sytem: single component

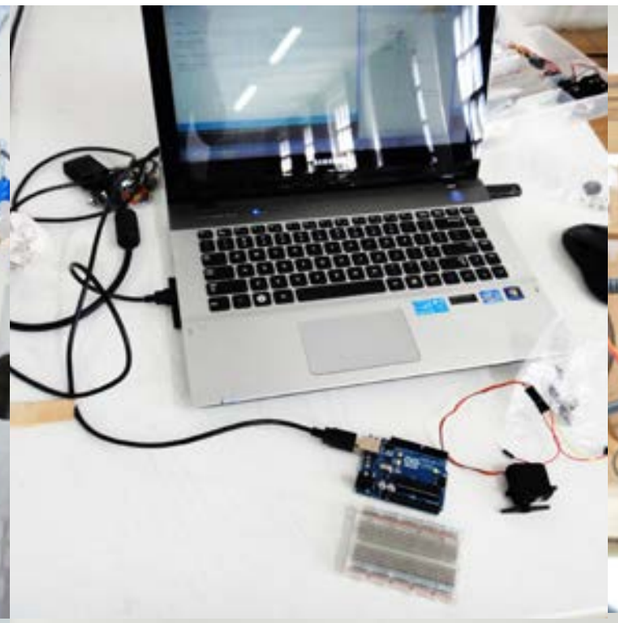




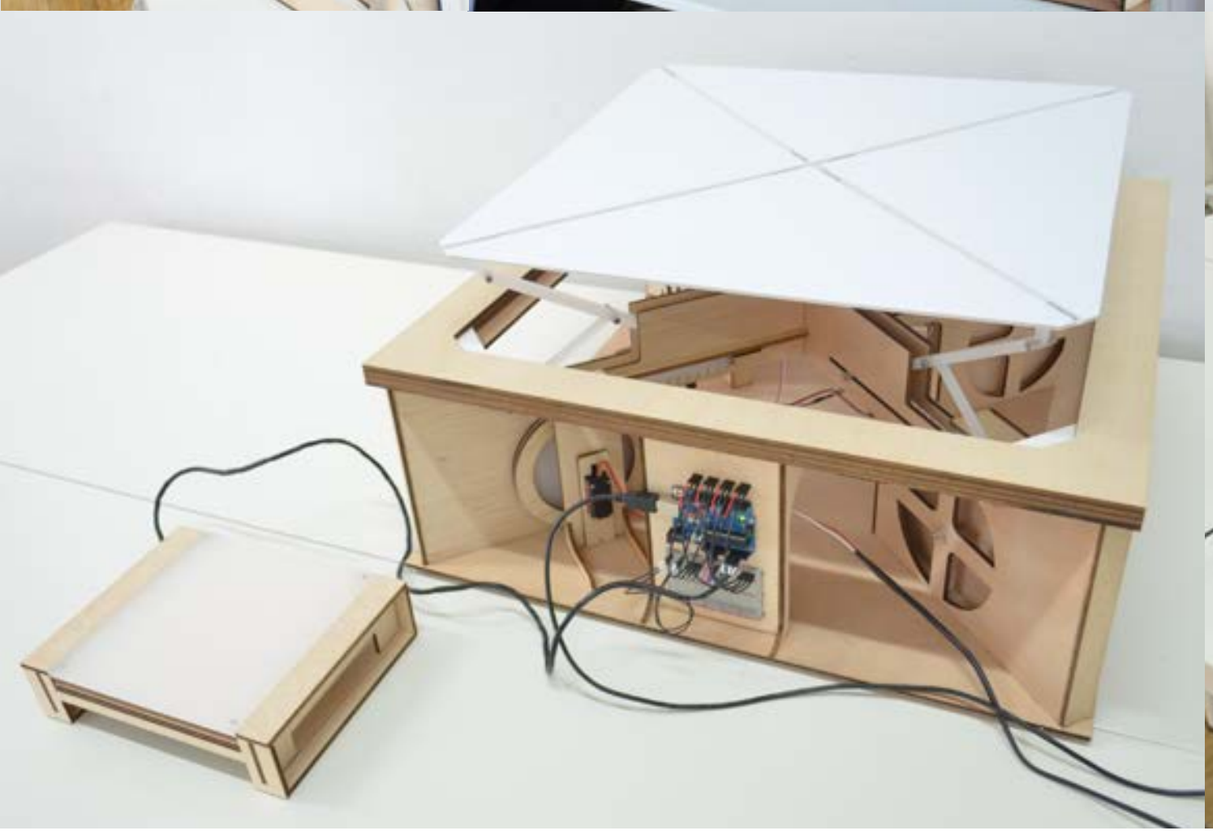
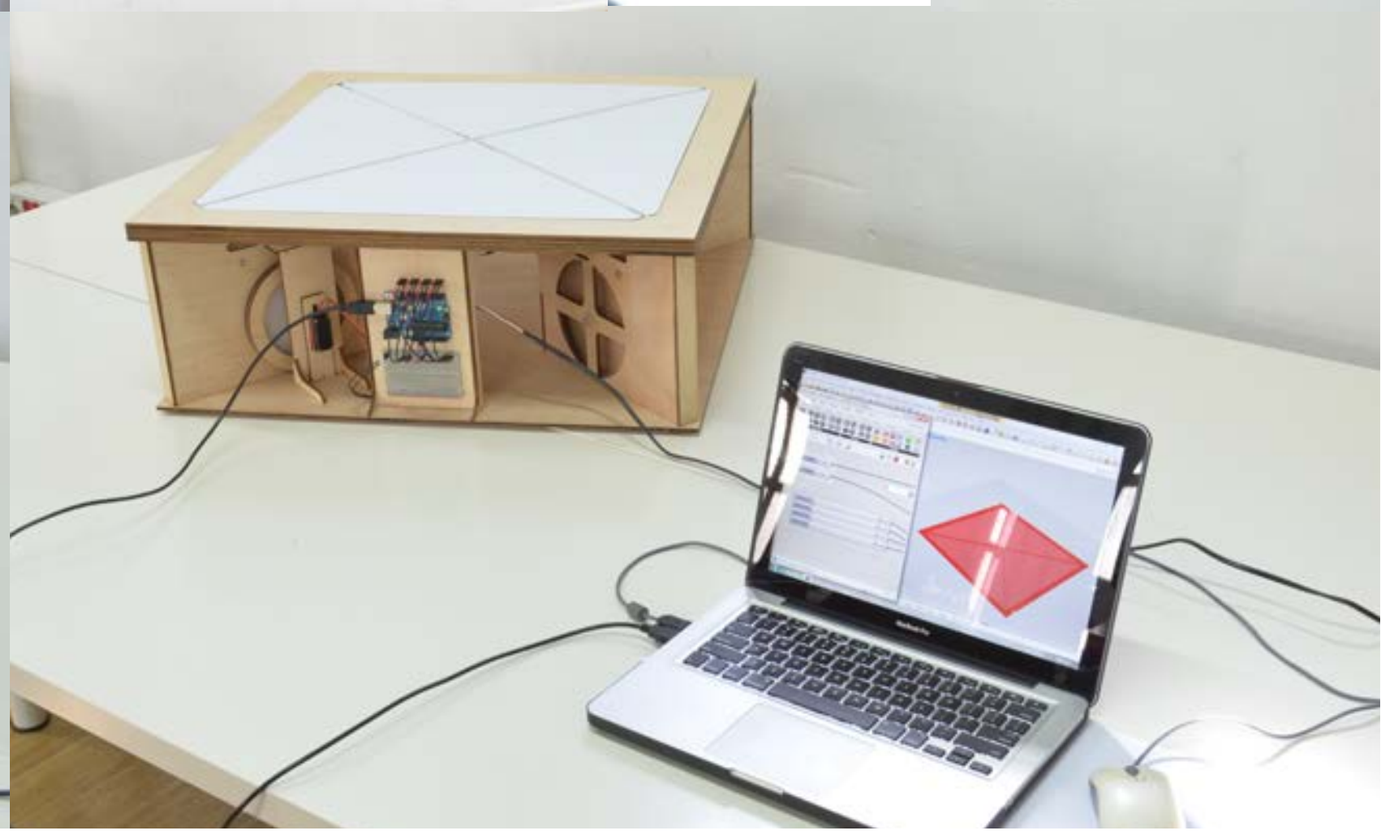
Syringe sytem: multiple modules performance

PROTOTYPE EVOLUTION







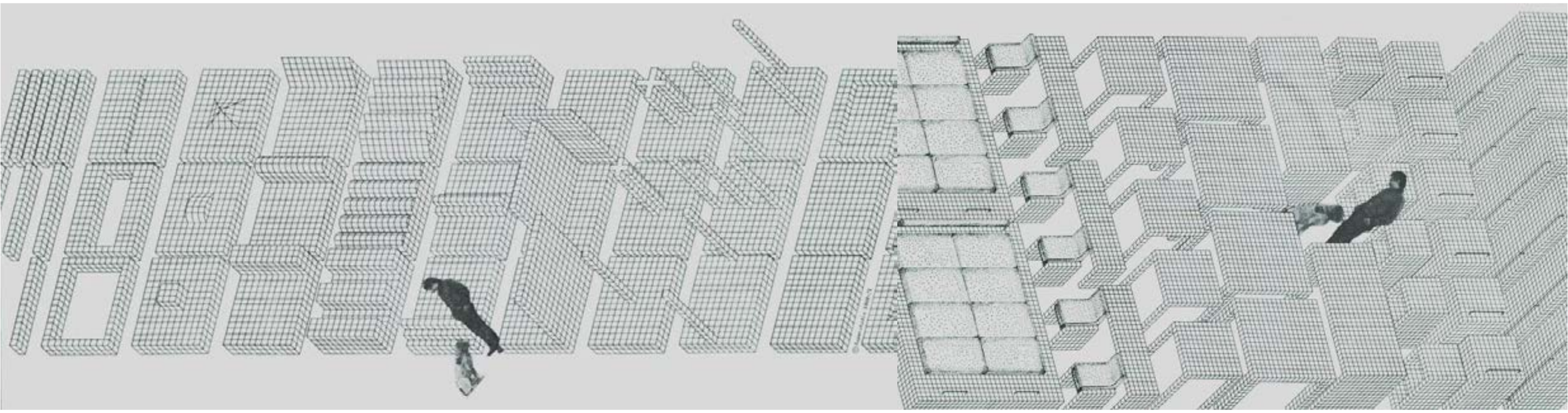
Single component: wood prototype + sensor + digital control

PROTOTYPE EVOLUTION

References

Selected Projects

The Holocaust Memorial. Berlin, Germany. Peter Eisenman, 2005.



Superstudio’s Misura furniture series, 1969/70.

REFERENCES

La Ville Molle, Atelier Raum Architects. France. 2010.

Morske Orgulje, Nikola Basic. Zadar, Croatia. 2005.

REFERENCES

Renders

Hyperbordered Port


MSC


MSC