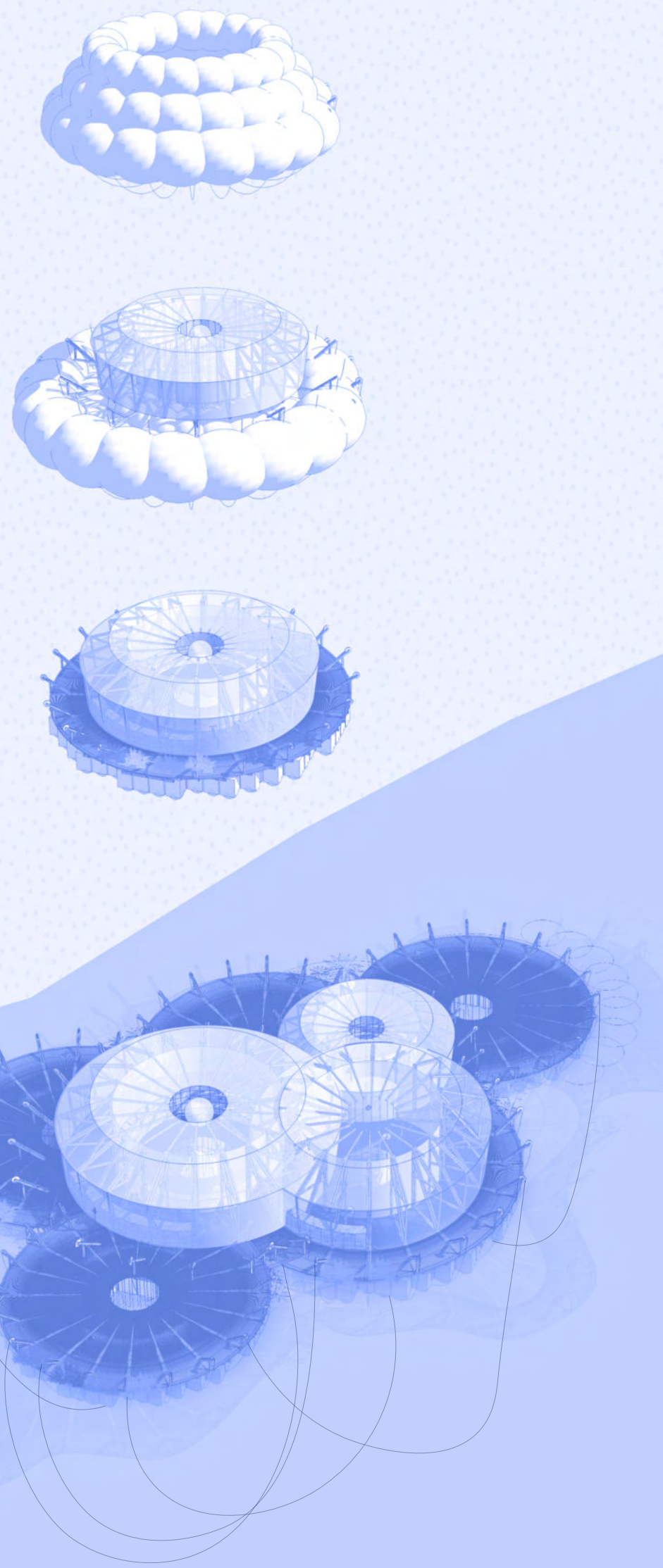
ACE 465 | urban prototypes
Constanza Quioza

Light & phytoremediation floating lab

water / cleansing.

A prototype of a family of iterations,
a public space that cleans the Mölndalsån

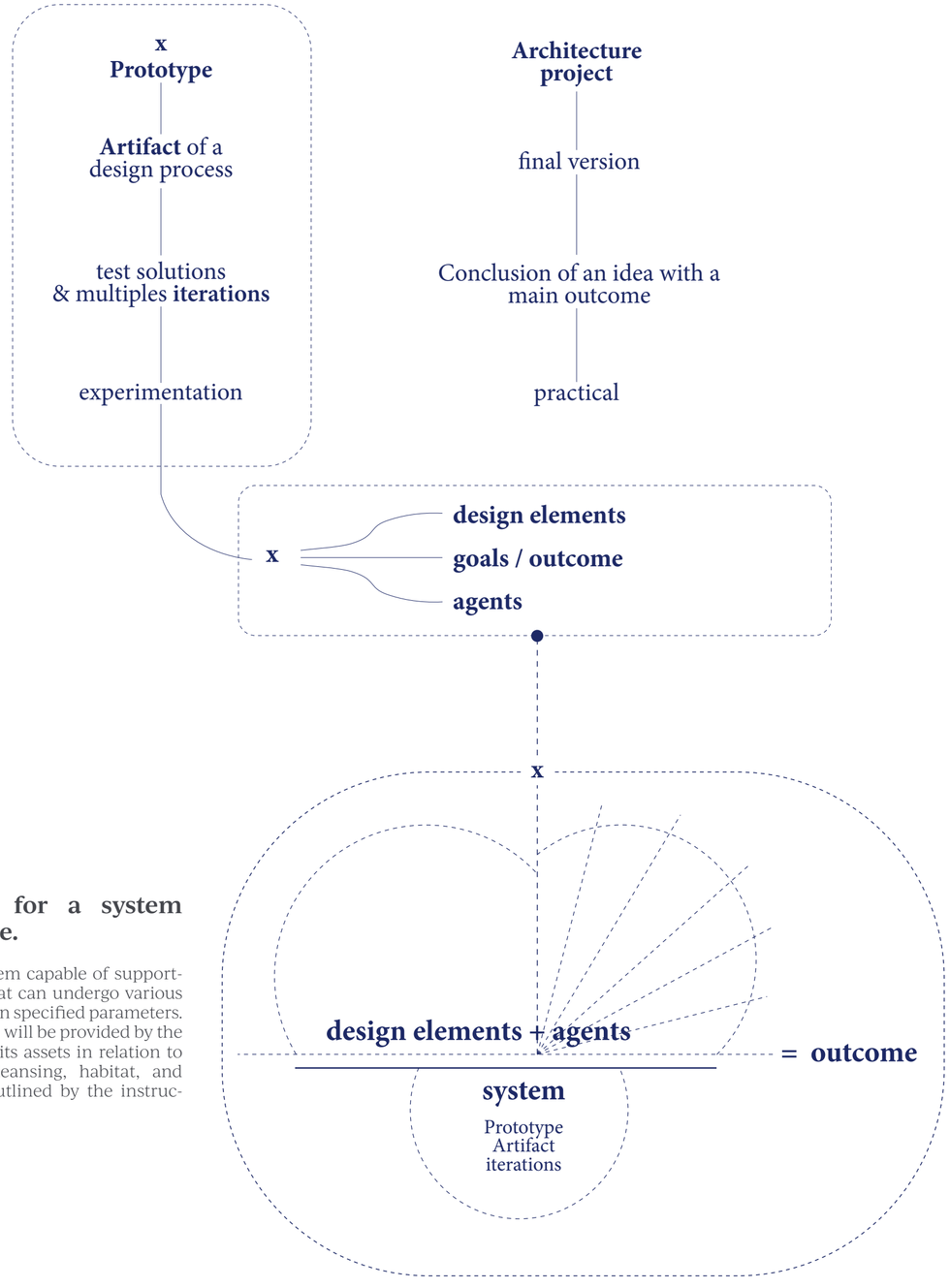


Index

I
What is a prototype?

Ia.
Parameters for a prototype

In the Urban Prototypes course, we are given a license to explore possibilities of urban prototypes based on spaces (rivers) and concepts (cleansing, production, habitat).
But, what is a prototype?.
The fundamental difference between a prototype and an architectural project lies in their nature and purpose.
An architectural prototype is an exploratory and experimental tool used to test ideas and concepts, while an architectural project is the detailed planning and documentation required to carry out the construction of a specific structure.



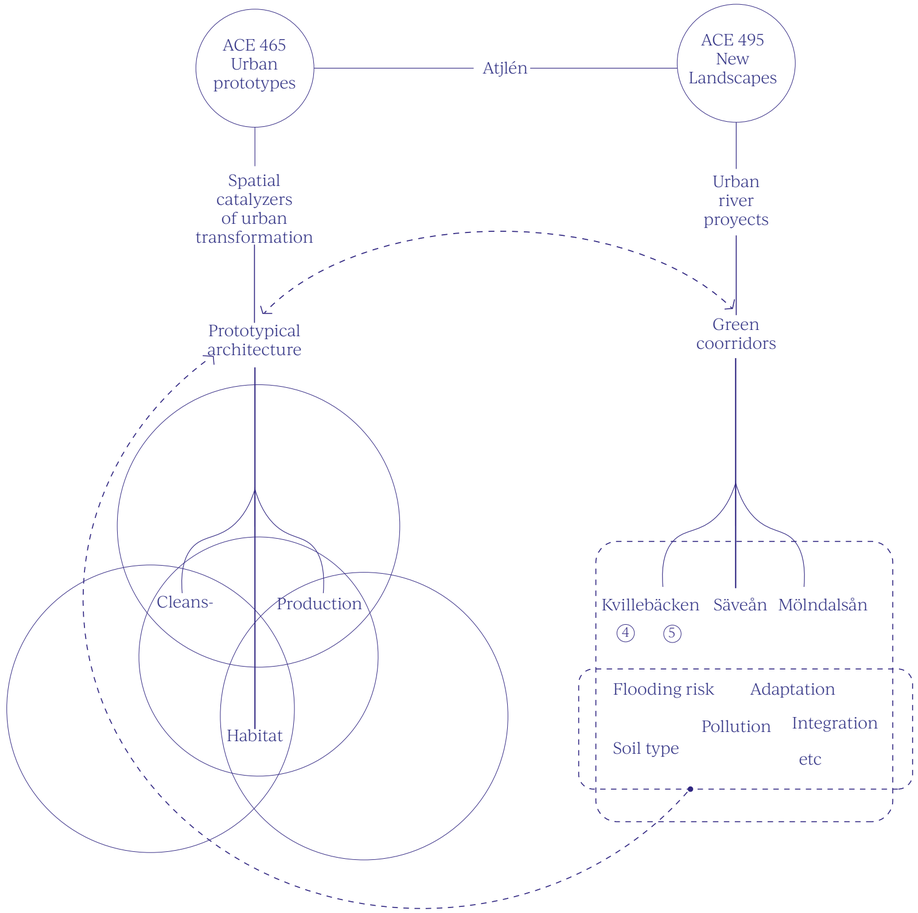
IIb.
Parameters for a system and outcome.

To provide a system capable of supporting an artifact that can undergo various iterations based on specified parameters. These parameters will be provided by the site, focusing on its assets in relation to the topics of cleansing, habitat, and production, as outlined by the instructors.

II
Context
Studio & Mölndalsån

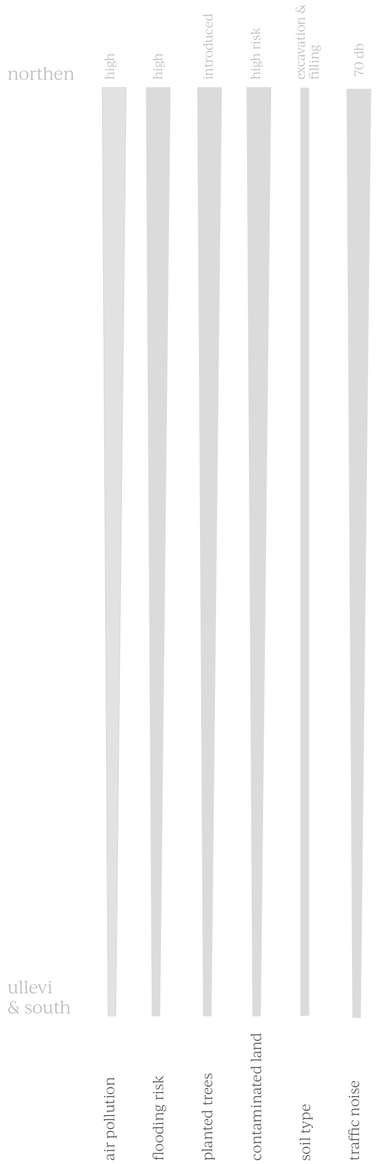
The concept of reflecting on the overall context, encompassing both the studio and site contexts, as a source of information for the prototype, is manifested in the subsequent pages.
The objective is to illustrate the different scales that shape the project, progressing from the operational system of Studio ACE465 and ACE495, to the studio site, and ultimately culminating in the prototype project scale.

" Natural landscapes have been transformed into urban logistics, industrial and waste landscapes "
(eg. meyer and nijhuis, 2014)



IIa.
The studio context

In the studio context, a collaboration is formed where the New Landscapes course provides relevant information regarding the site context we are going to intervene in. In my case, it is the Mölndalsån River, which crosses the city of Gothenburg from north to south.



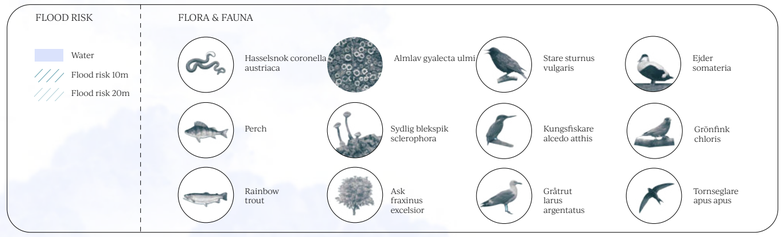
IIb.
The Mölndalsån

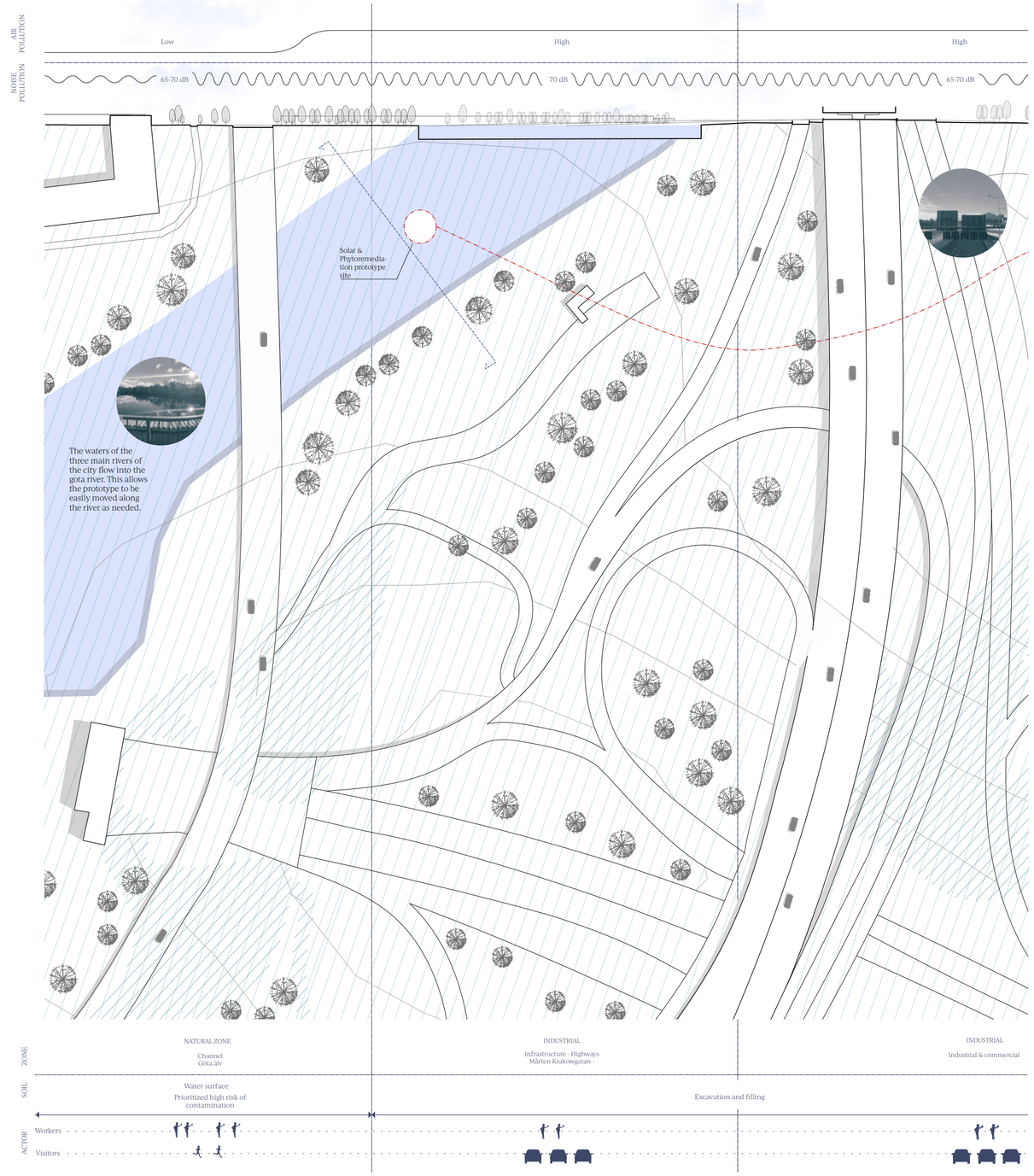
The Mölndalsån River traverses a variety of situations in the city, starting from the northern industrial part and extending to the southern residential area. Its northern part is the most problematic, experiencing higher pollution levels and increased flood risks. This area represents a space where the city has reclaimed land from the river through landfill.
Adding to this, the city of Gothenburg owes a substantial debt to access to a clean river, making the northern part of the river a significant attraction.

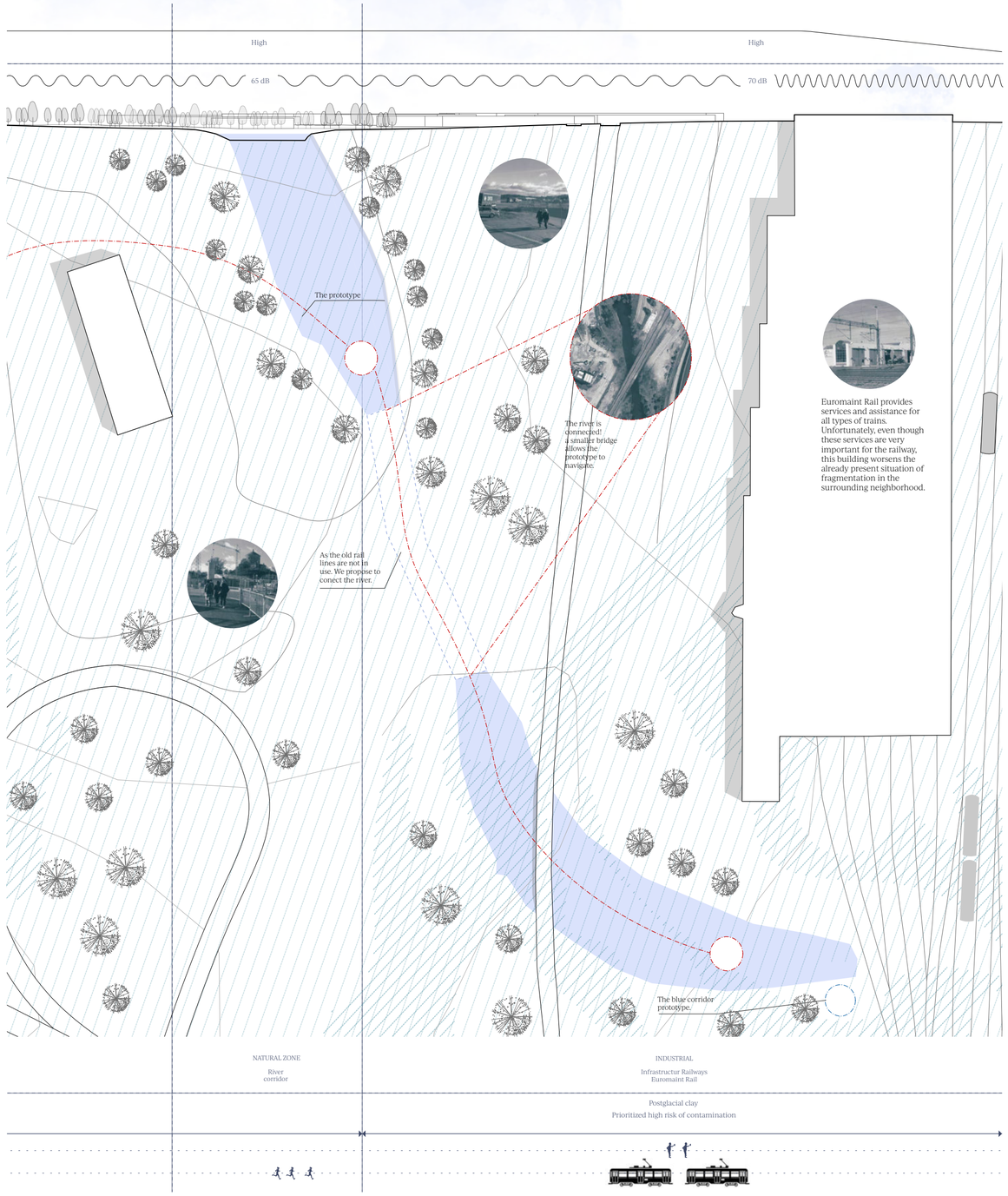
IIc.
The site area, transect

We chose the industrial area along the north of Möndal River, which is a problematic region due to pollution (air, soil and water), disconnection, and current issues with accessing the river's edge.
This leads to a highly fragmented space that can be divided into four main areas: to the north, an industrial and commercial zone, followed by a high-speed highway that further fragments this zone.
To the southwest, a large train maintenance building with closed perimeters blocks access to the water to the south of the city. In the southernmost area lies Olskroksgatan, a good income residential neighborhood.

The 80% of the land is highly polluted and there are high levels of air and noise pollution. Almost the entire area has a very high risk of flooding.
While the region has the potential to provide access to the river and develop new housing areas and green landscapes, a plan to regenerate biodiversity, clean and appropriate the space should be implemented.







IId.
Project site

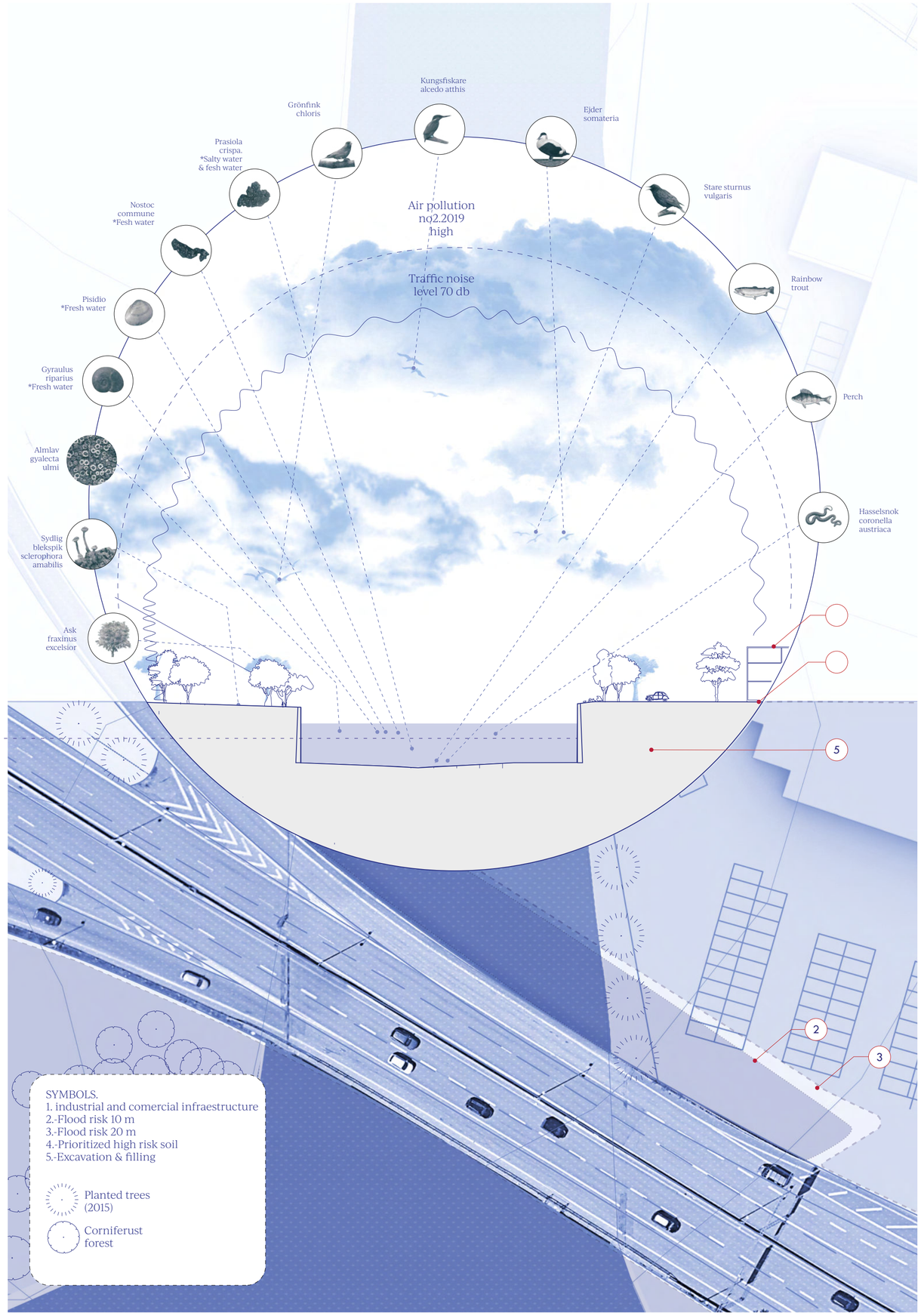
The exact location of my intervention is situated where Mölndalsån begins to flow northward, between the industrial area and the highway—an area known for its high pollution levels. One of my challenges is to reconnect people with the riverbank, starting by revitalizing the water and enticing individuals to explore this underutilized space in the city. This seems like a judicious decision to exploit the prototype and its variations.

Currently, the area lacks a significant aquatic fauna, but its surroundings do. It is hoped that by cleaning the contaminated waters, fish, algae, and other species may be drawn back to this place once again.

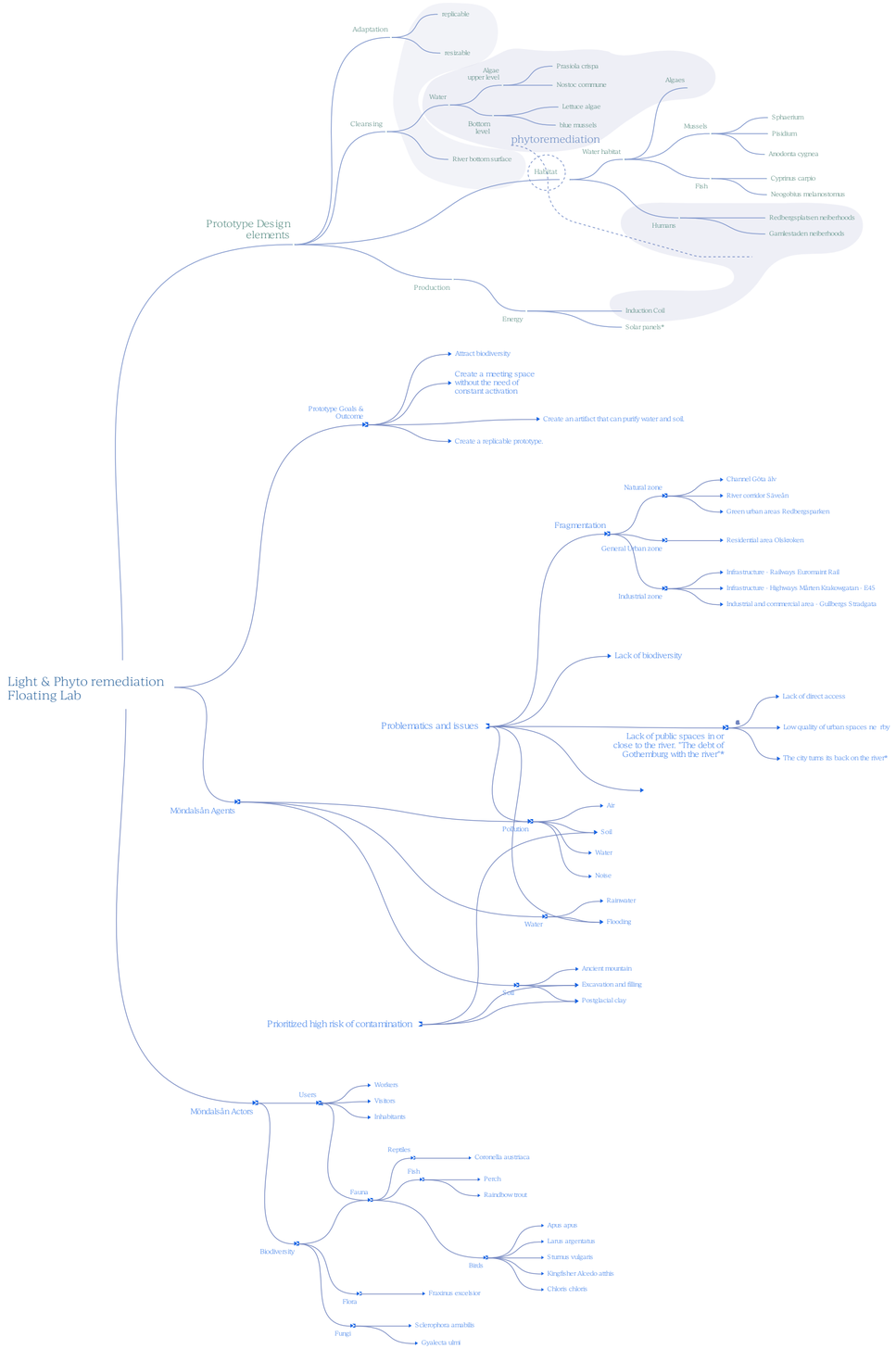
Another reason is that being closer to the Göta River increases the possibility of finding saltwater. This means a greater diversity of species that can contribute to water purification.

Fresh water: less density
Low salinity (10-15 ppu)
high turbidity
Fauna / Flora: Prasiola crispa, Nostoc commune

Salt water: more density
Higher salinity (20 -25 ppu)
Fauna / Flora: blue mussels / lettuce algae



III
The system
to build the outcome



IIIa.
Design elements

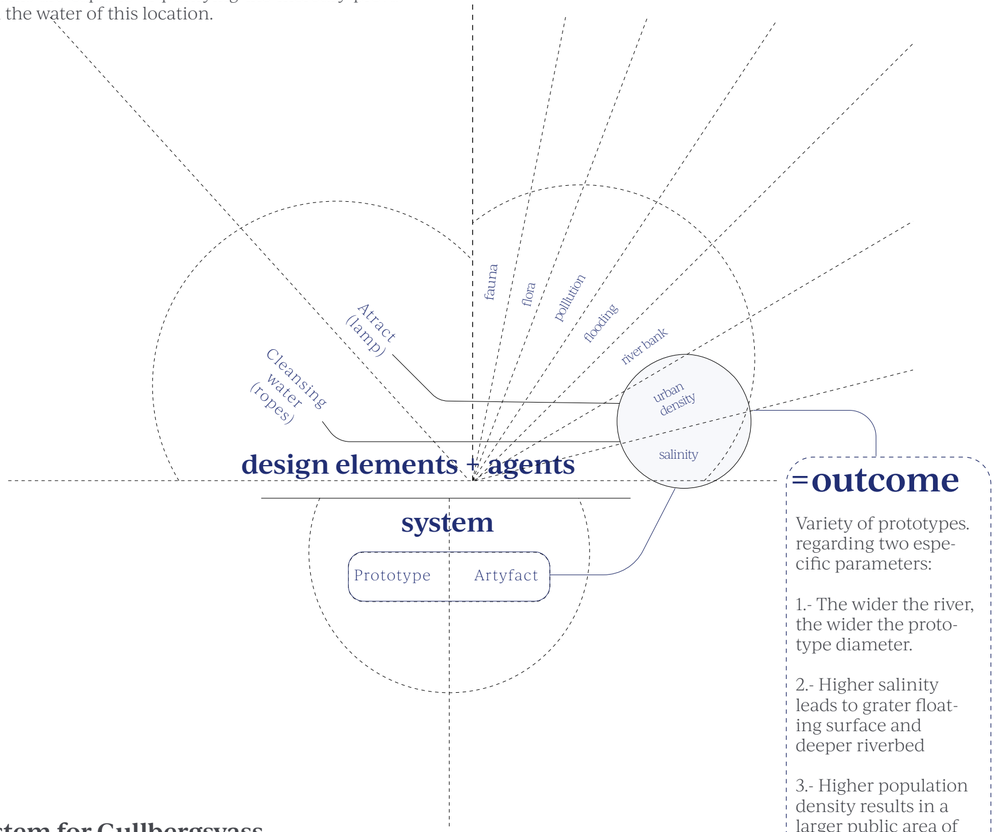
The design elements consist of two pillars: attracting and cleansing. The attraction aims to remedy the disconnection of this riverbank by city residents, while the cleansing addresses the elevated water pollution. These tasks are accomplished through different systems

To attract, a triple lamp is integrated, one of its bulbs emitting vitamin D—a nutrient scarce in Nordic countries—which can foster the creation of public spaces around it.

For cleansing, a porous floating surface is created to attract fauna, and more importantly, a system is installed to cultivate algae and floating plants. These organisms are capable of purifying the mercury prevalent in the water of this location.

IIIb.
Agents

The factors provided by the study of the location, the flora and fauna (coogle), as well as the spatial densification based on neighborhoods (with the eastern neighborhoods being denser than those toward the west of the Göta River), are similarly observed with salinity. These two parameters appear to be very intriguing as determinants of the prototype's form.



IIIc.
A system for Gullbergsvass

57°43'15.23"N
11°59'36.21"E

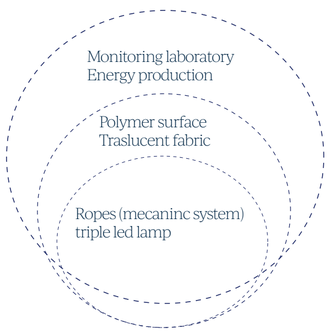
To develop,

With of river bank (x) : 50 mts = aprox 20 mts to allow 2 prototype navigates.
Salinity (a) : low = the surface is less, is not necessary polymers that grows for all the facades
Population density (b) : medium+ diameter (20 mts)= 30 people.
General equation:

Shape and outcome:
(diameter =x * 20/50)+
(surface(a)(none/floating surface in vertical)+
(area for lamp= b*20/50)

IIId.
From a growing system to the prototype

The floating phytoremediation and light therapy lab is capable of changing its shape and elements to adapt to different polluted areas as well as different social contexts. Various parameters are determined in relation to salinity and social vulnerability, which are indeed correlated: areas in the river with salinity in the water exhibit lower social vulnerability to the Göta Alv, while areas with lower salinity are more vulnerable in the Mölndalsån. The artifact can operate in both fresh water, exerting influence on the bottom part of the river (using ropes) and the upper part (wetlands). Different configurations can be employed based on the river's position, as illustrated in the diagram. However, these configurations are always tied to the three main spaces: phytoremediation cleansing, atrium, and lab.
In this case the most accurate prototype to develop is the number 3 for the Gullbergsvass

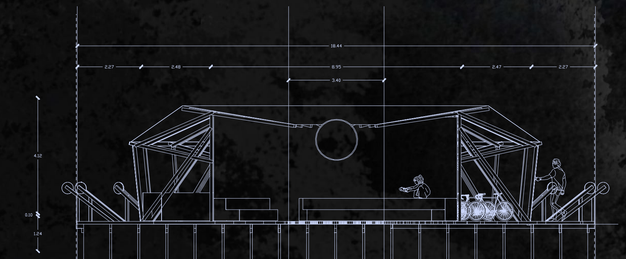


Layers of importance

IV
The prototype

IVa.
Section, plans and usage.

The prototype consists of four main components, resembling expanded halos. It functions as a cleaning device that brings people together without requiring the activation of space but rather by attracting them through a specific need, in this case, a source of vitamin D. The artifact operates as a system, incorporating a lamp that contains a low-UV vitamin D lamp and an effective UV lamp for photosynthesis. This system benefits not only the visitors but also the aquatic and submerged plants located in the center of the prototype.
Access to the inner space is gained through the exhibition hall, where visitors may have the opportunity to observe scientists engaged in phytoremediation.



Lamp with three uses (3 LED lights):
1.- Ultraviolet B (UVB) light (Vitamin D)
2.-Full spectrum led
3.-Warm LED (2700-3000K),
high CRI and blue light reduction

Mobile roof in relation to rain and the need to climb the ropes to check them.

Disassembling structure 3"X5" using stainless metal joints

Textured biodegradable polymer buoy designed to facilitate the growth of aquatic life on its surface. These buoys measure one meter by one meter and can be easily replaced as they begin to degrade

load hoisting that allows raising and lowering the ropes

Phytoremediation monitoring laboratory

Vitamin D intake atrium and phytoremediation observation

Bicycle recreation and energy production area.

Wetland species:
Warnstofia fluitans
Nymphaea odorata
Spiranthes spiralis
Mentha Aquatica
Warnstorfia fluitans
Carex pseudocyperus

Conditions
high levels of mercury, acifification and eutrophication

Fresh water - density
Low salinity (10-15 ppu)
high turbidity

Salt water + density
Higher salinity (20 -25 ppu)

3'x7'
double structure grid

Generation of electricity by movement of the river through turbines

IVb
Exploded axonometric & SWOT

Examining the materials and the extruded prototype suggests the ease of its construction, the real possibility of making it feasible, and the modularity that makes it replicable.

The SWOT analysis is derived from all the information provided earlier. Problematics are often viewed as potential opportunities.

Strengths

Flexibility

Replicable

Adaptability

lLow budget construction

deployable

Growing method,

Self-activation

Cleansing

Gathering

Weaknesses

Difficulty in reaching the

prototype when

navigating,

Felicate materials,

Experimental

Not very organi shape

Opportunities

Shape

Variation of contexts

Cleansing

Re-activate

Re-connect

Make a standardized

system

Threats

Low fauna proliferation.

Technical issues

Climate change

Low impact due to small

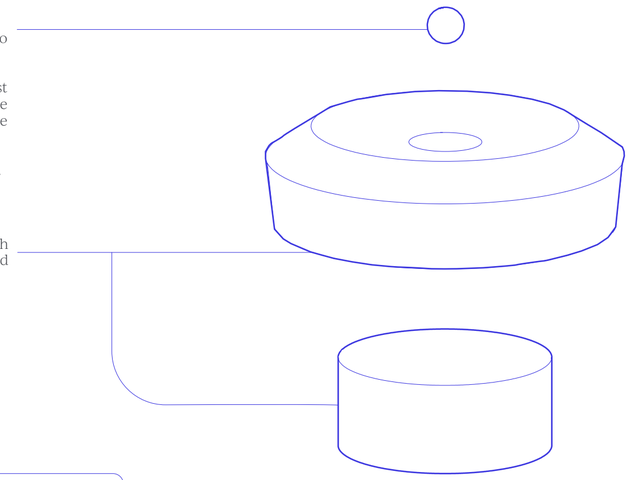
scale.

PHOTOTHERAPY LAMP

Lamp with three bulbs:
-Vitamin D bulb:
Light with ultraviolet B light, ranging from 280 to 320 nanometers.
-Bulb for algae growth:
While ultraviolet B light works for algae, the most effective is an LED light with a color temperature of 6500K and good light distribution in the blue and red spectrum.
-Normal bulb with warm light:
It will allow resting in the dark hours for visitors.

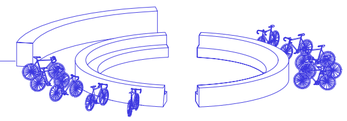
ETFE

Unlike potentially health-hazardous plastics such as PVC, ETFE is easily recyclable and durable, and it withstands extreme weather conditions.



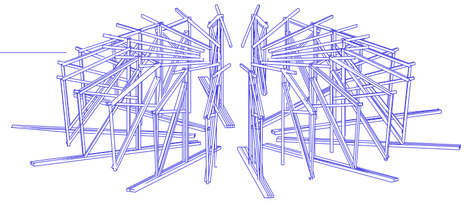
PROGRAM

The outer ring is composed of three spaces:
1.- Entrance hall for visitors with exhibition on the ongoing research.
2.- Phytopurification laboratory,
a space for scientists.
3.- Light production and exercise space: a set of bicycles are positioned around the vitamin D lamp to make it work or store energy.



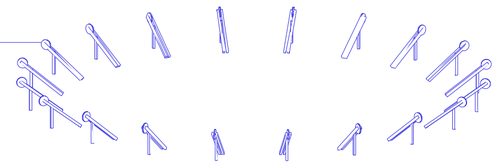
STRUCTURE

Replicated wood structure that has the logic of framing for the growth or bracing of different wood profiles. It could also function as a finishing structure in a second stage.



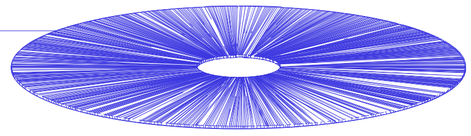
OUTTIGGERS

Structure designed for the retraction and deployment of seaweed and other marine animal harvesting lines. The open center of the project enables a thorough inspection of the entire length of the lines. The lines are anchored to the seabed in accordance with weights.



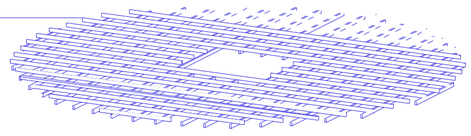
FLOOR

The floor is an addition of concentrically arranged 2x3 beams, meaning that there is no distinction between the structure and the floor



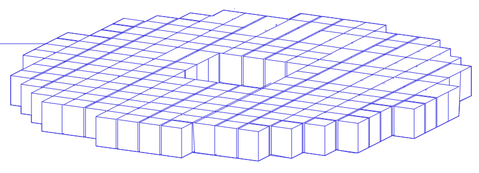
FLOATING BASE

A wooden structure composed of stacked 3"x7" beams to create a distinction between the water surface and the structure, providing separation to avoid direct exposure



BIODEGRADABLE BUOYS

A series of biodegradable polymer buoys on the lower surface of the project create a habitat for aquatic life due to their high roughness. Additionally, the buoy system, consisting of 1x1 meter buoys, facilitates their extraction and replacement at the end of their lifespan, preventing the 'blanket' effect that would otherwise complicate maintenance.



V
The process

IVa.
Evolutionary three

The evolution of the project follows the feasibility framework.
The prototype aims to be an artifact that can be constructed in reality, maintained on a low budget, and serve as a landmark for urban acupuncture. The two core ideas (A) that underpin the project have guided it throughout its evolution. Beyond considerations of aesthetic form, a process of assimilating uses has been undertaken, aiming for coherence with design agents and site agents. This process is geared towards developing a system (b) that can be sustained through all corrections.

Central space of gathering

Polymer surface buoy

Led Lamp (UVB V dit D)

Landscape Polymer textured

Led Lamp (UVB V dit D)
Space for laboratory,
scientific dissemination
and energy generation

option A

The polymer is not flexible enought
to reach the river bottom

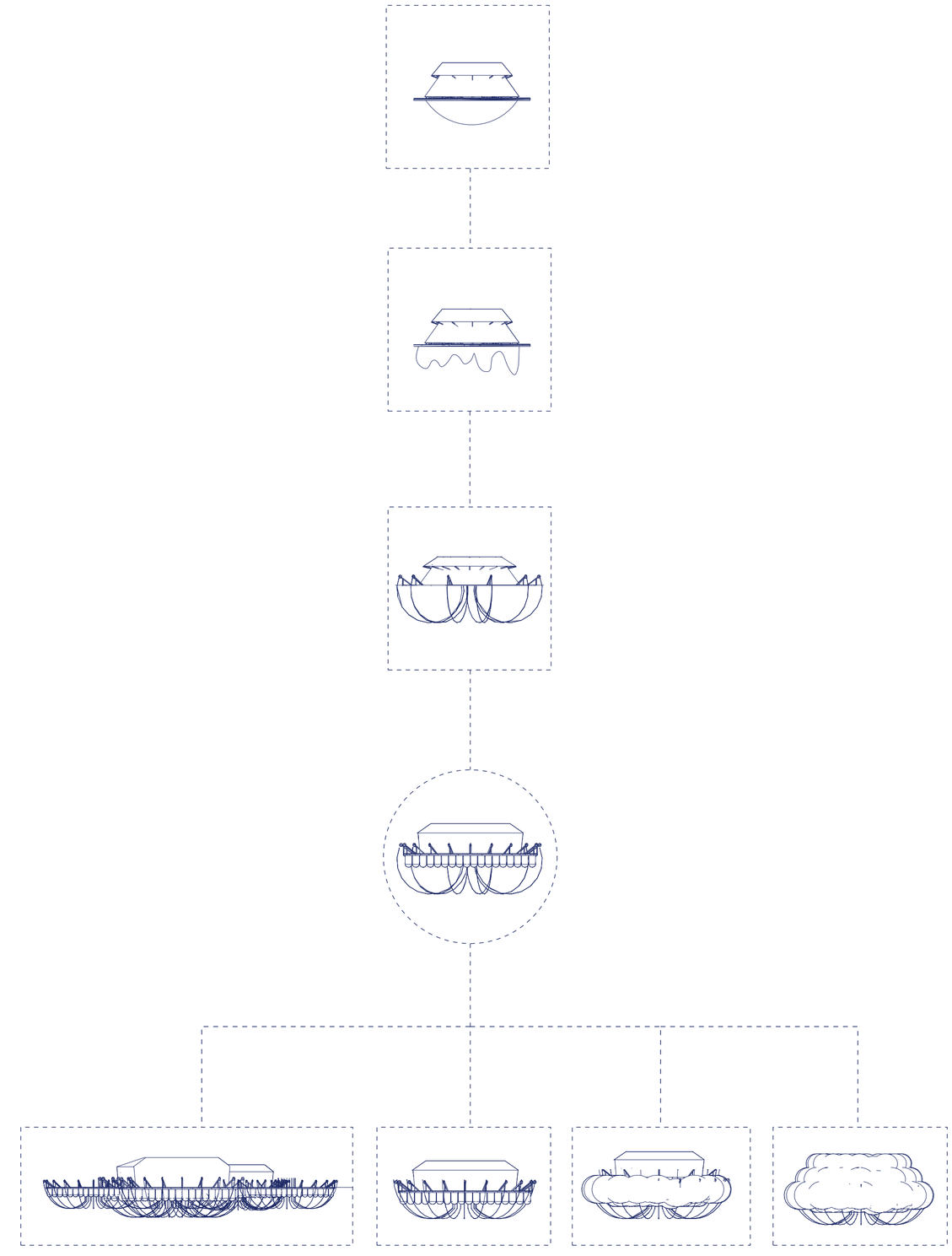
option B

Ropes that can be adapted to
different sites.

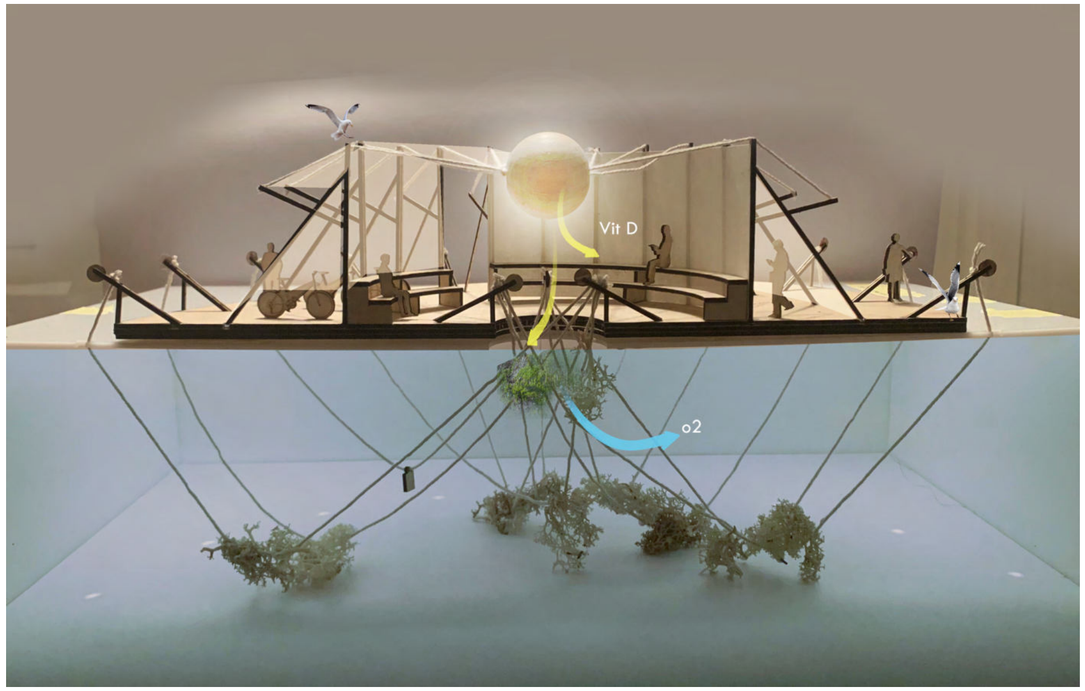
Led Lamp (UVB V dit D)
Space for laboratory,
scientific dissemination
and energy generation

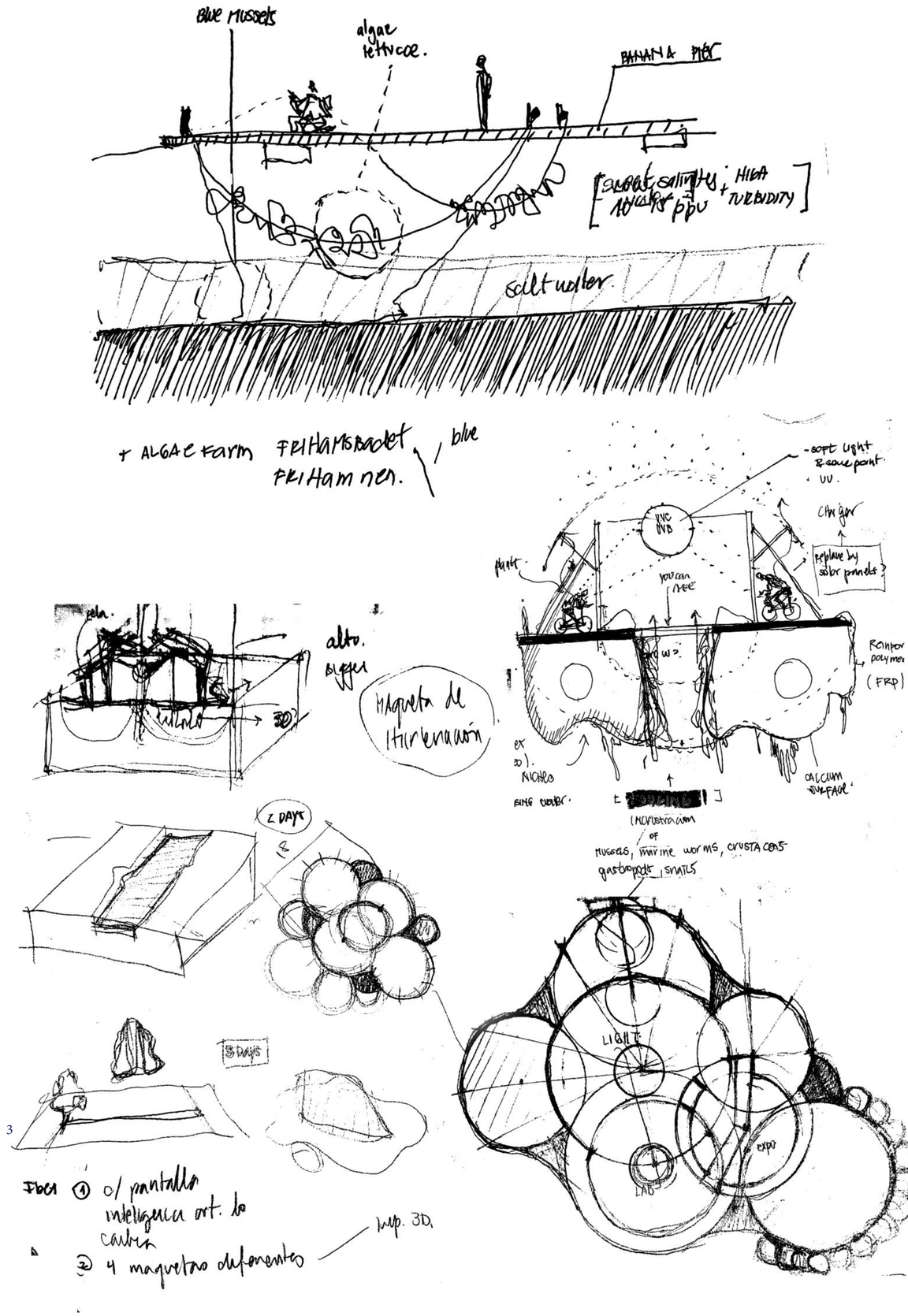
It is decided to adapt the previously discarded polymer as individual floating buoy in addition with the ropes

To maximize the potential of the space, the option of water purification with floating plants is also added



IVb
Photos and process





Light & phytoremediation floating lab