



a shift from traditional to artificial milk production farm

P5 PRESENTATION



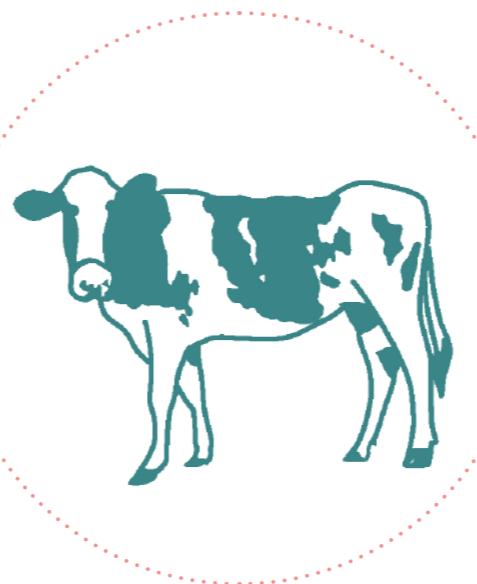
**The urgency for a more sustainable
productive model in animal-based food**



*Problem Statement:
global*

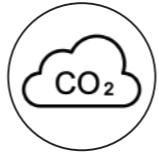
the environmental impact
of livestock





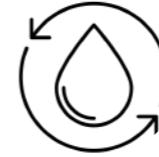
70%

of the global agricultural land
between arable land and grassland



7 billion tons/year
GHG emissions

15% of the global annual
GHG emissions

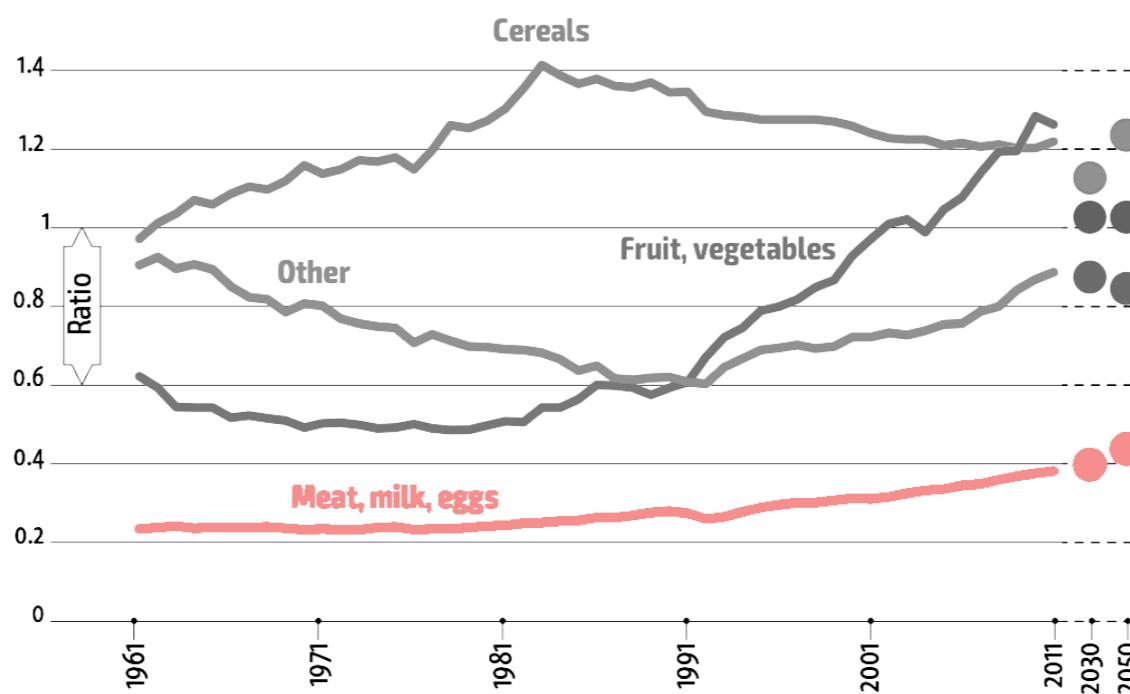


27% of the global
water footprint

is related to the production
of animal products

the increasing demand for
animal-based food

by 2050



Source: FAO Global Perspectives Studies, 2012

+2
billions people

←←← +70%
of demand for
animal-based food

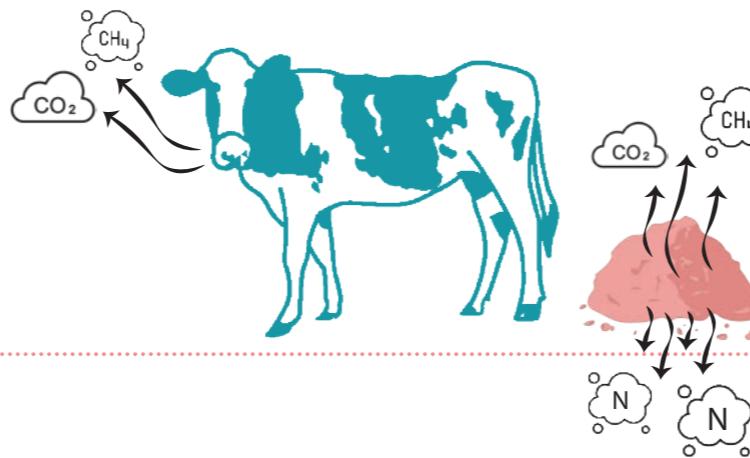


The urgency for a more sustainable productive model in the Dutch dairy system



*Problem Statement:
local*





Dutch cow poo overload causes an environmental stink

Dairy farms in the Netherlands are producing so much dung they can't get rid of it safely. Now the WWF is calling for a 40% cut in herd numbers to protect the environment



The Guardian, 2018

Science

Contents News Careers Journals

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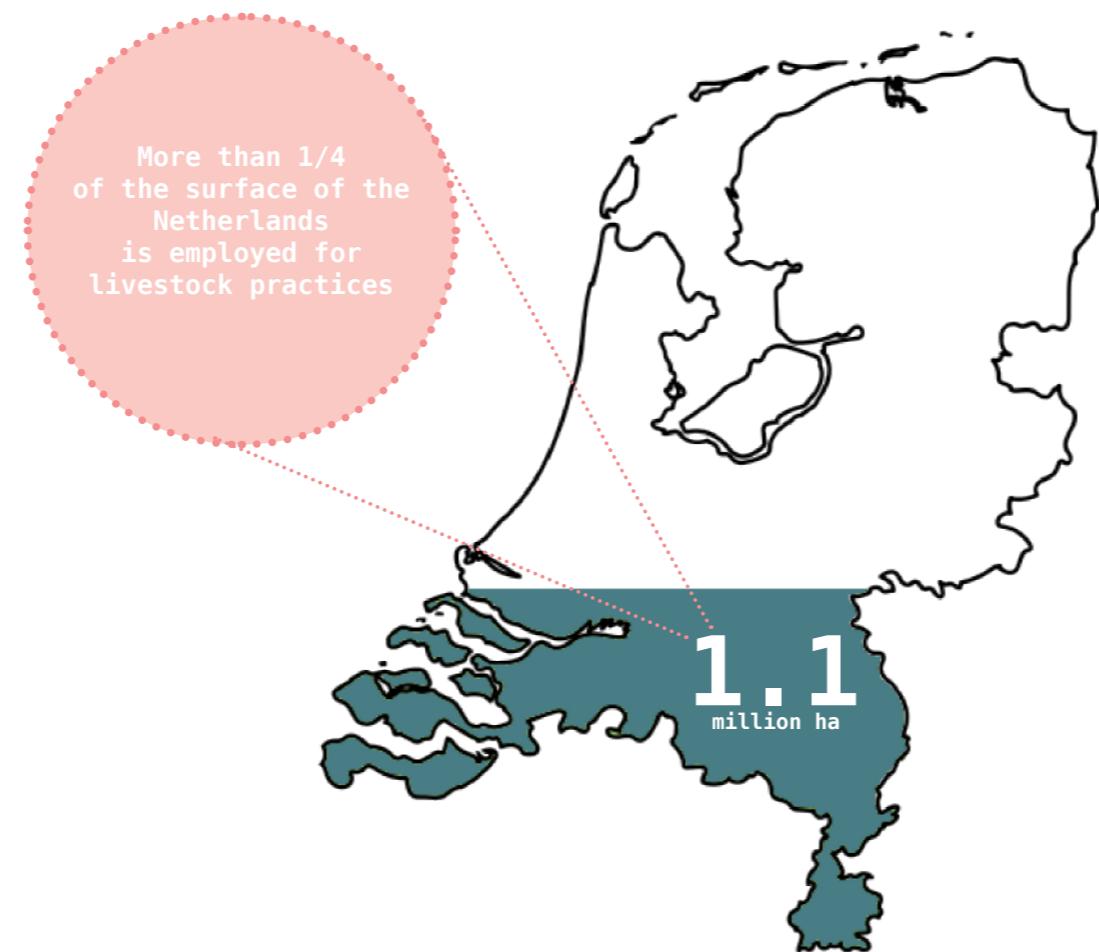


Dutch farmers have protested a ruling that curtails the expansion of livestock operations because of the nitrogen pollution they produce. VINCENT JANNINK/ANP/AFP/GETTY IMAGES

Nitrogen crisis from jam-packed livestock operations has 'paralyzed' Dutch economy

Science, 2019

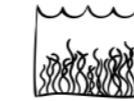
the Dutch dairy crisis:
land availability



population
growth



increasing demand
for dairy products



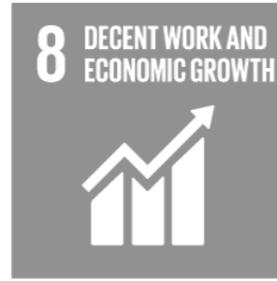
rising in the
sea level:

the surface of the Netherlands
is gradually shrinking
due to the climate change

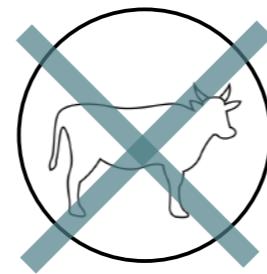
UNSUSTAINABLE PRODUCTIVE MODEL

SDG-2: food security

SUSTAINABLE DEVELOPMENT GOALS



the potential solution:
artificial milk technology



animal-free
milk proteins

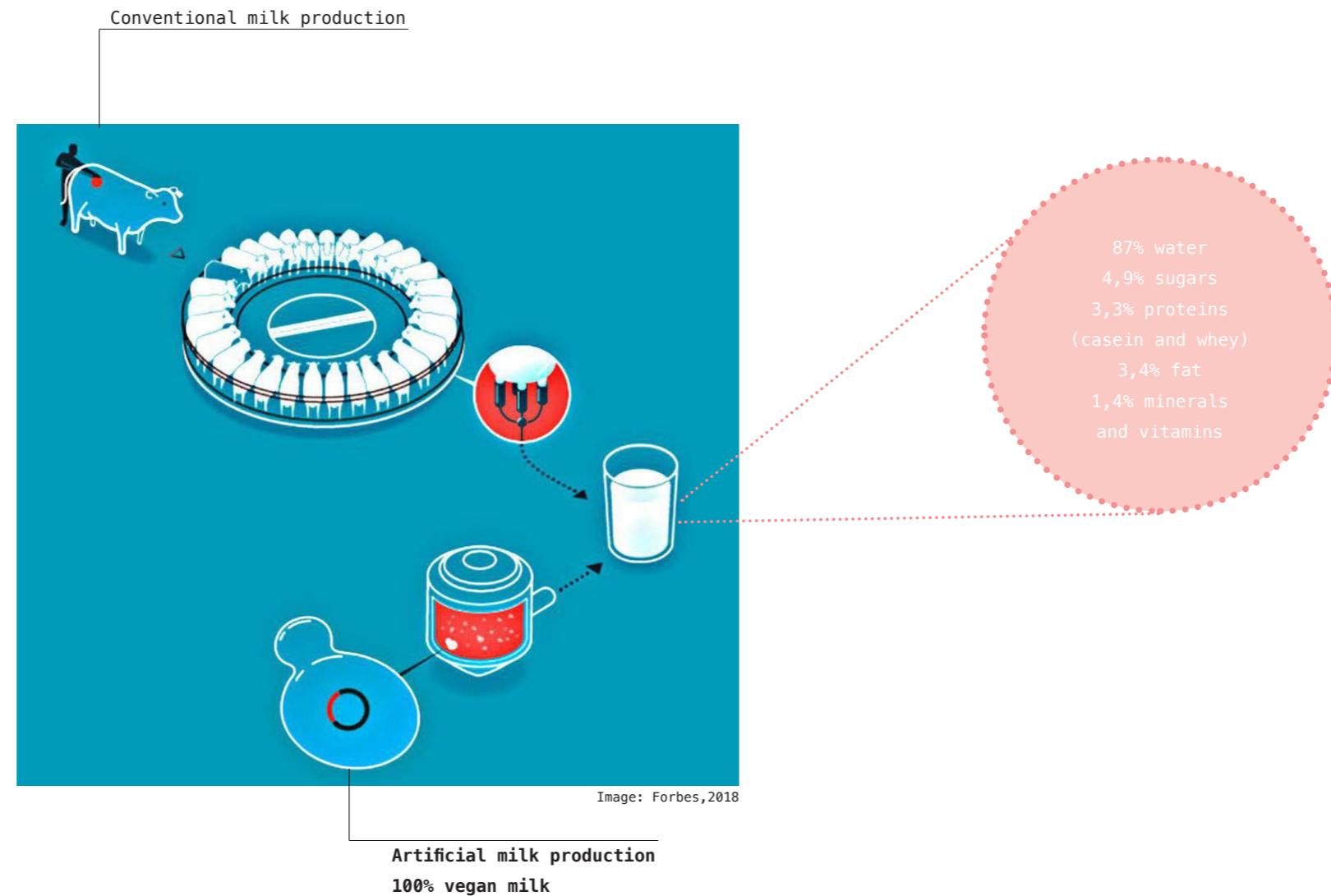
"We shall escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium. Synthetic food will, of course, also be used in the future".

Winston Churchill, 1931 (Von Masson & Gingerich, 2019)

"If we want the world to change its diet from a product that isn't sustainable to something that is, it has to be identical, or better than, the original product. The world will not switch from milk from a cow to the plant-based milks. But if our cow-less milk is identical and priced right, they just might"

(Gandhi, PerfectDay, 2014)

different processes,
same final product



cultured/cow-less milk



PerfectDay, founded in 2014 by Ryan Pandya and Perumal Gandhi



a disruptive technology



World's First Artificial Cow's Milk to Hit The Market Next Year

Bioengineers in the US are developing the world's first artificial cow's milk made from genetically engineered yeast in an effort to put a more environmentally sustainable option on the market.

BEC CREW 29 OCTOBER 2014

Science alert, 2014

How synthetic milk may put cows out of business

Synthetic dairy products are being developed for the global market

© Mon, May 25, 2015, 01:30

Eoin Burke-Kennedy



The Irish Times, 2015



Cow Milk Without the Cow Is Coming to Change Food Forever

Real Vegan Cheese is made from the same proteins found in cow's milk, but they came from genetically modified yeast.

Wired, 2015

This Futuristic Startup Could Disrupt The Dairy Industry

 Michael Pellman Rowland Former Contributor Food & Drink

© This article is more than 3 years old.

TWEET THIS

 Perfect Day is focused on disrupting the dairy industry.

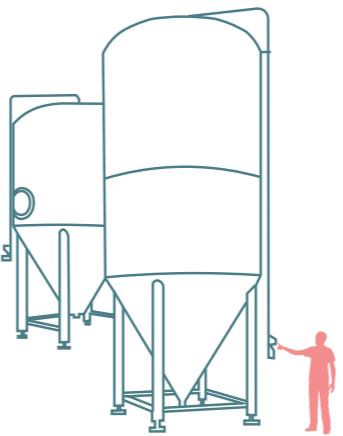
 Perfect Day could be the 'Intel Inside' for the dairy industry



Forbes, 2018

design question

HOW COW-LESS MILK TECHNOLOGY MIGHT BE DISRUPTIVE FOR OUR BUILT ENVIRONMENT?



A shift in the paradigm



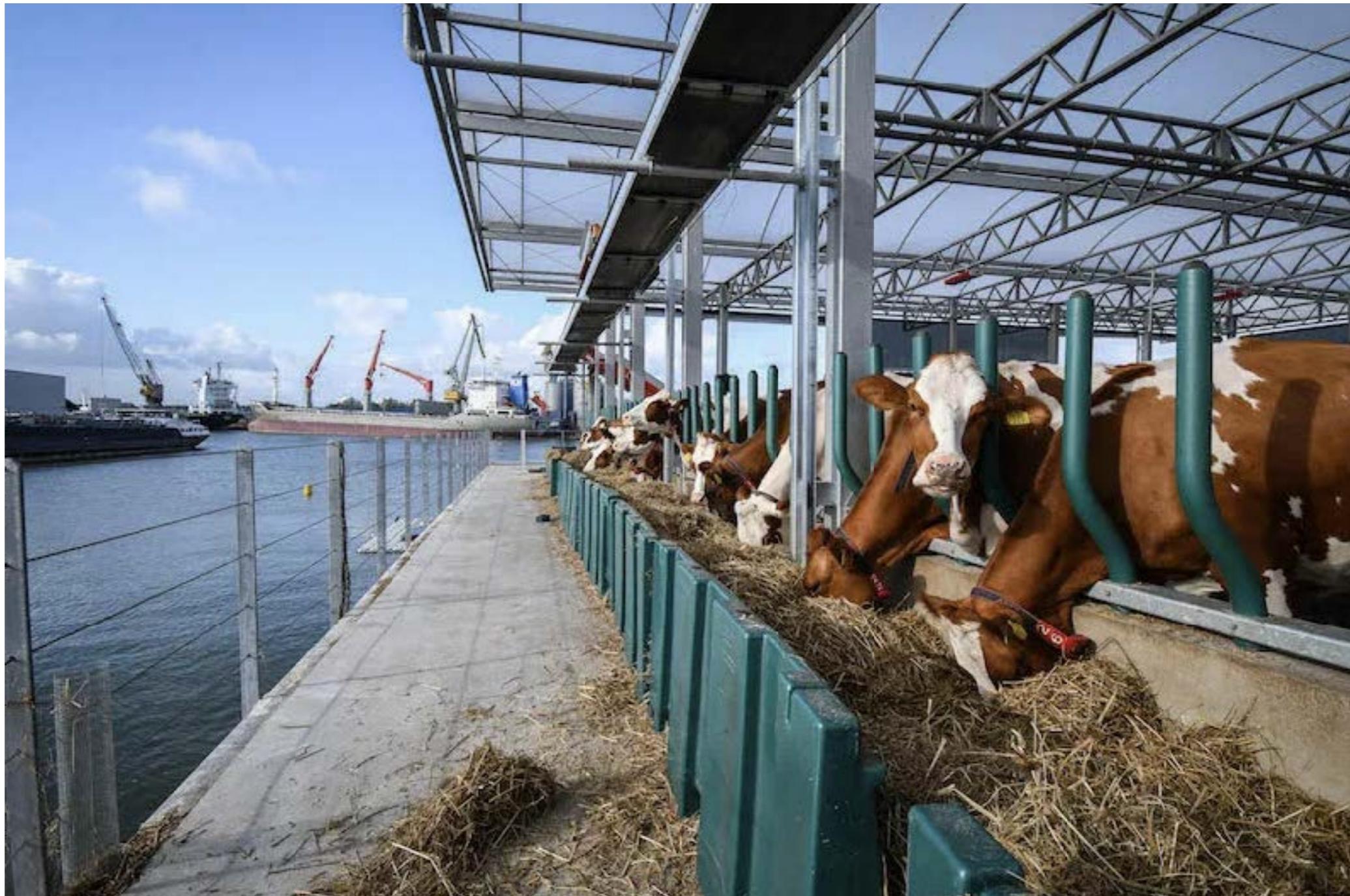
traditional dairy farm

A shift in the paradigm



intensive farming

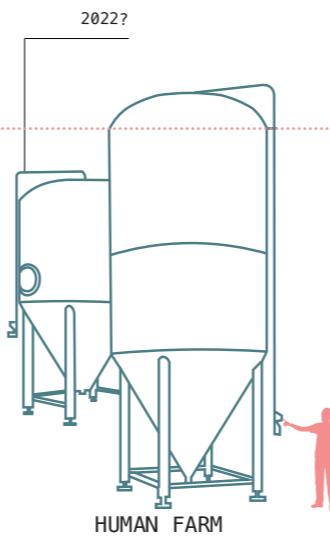
A shift in the paradigm



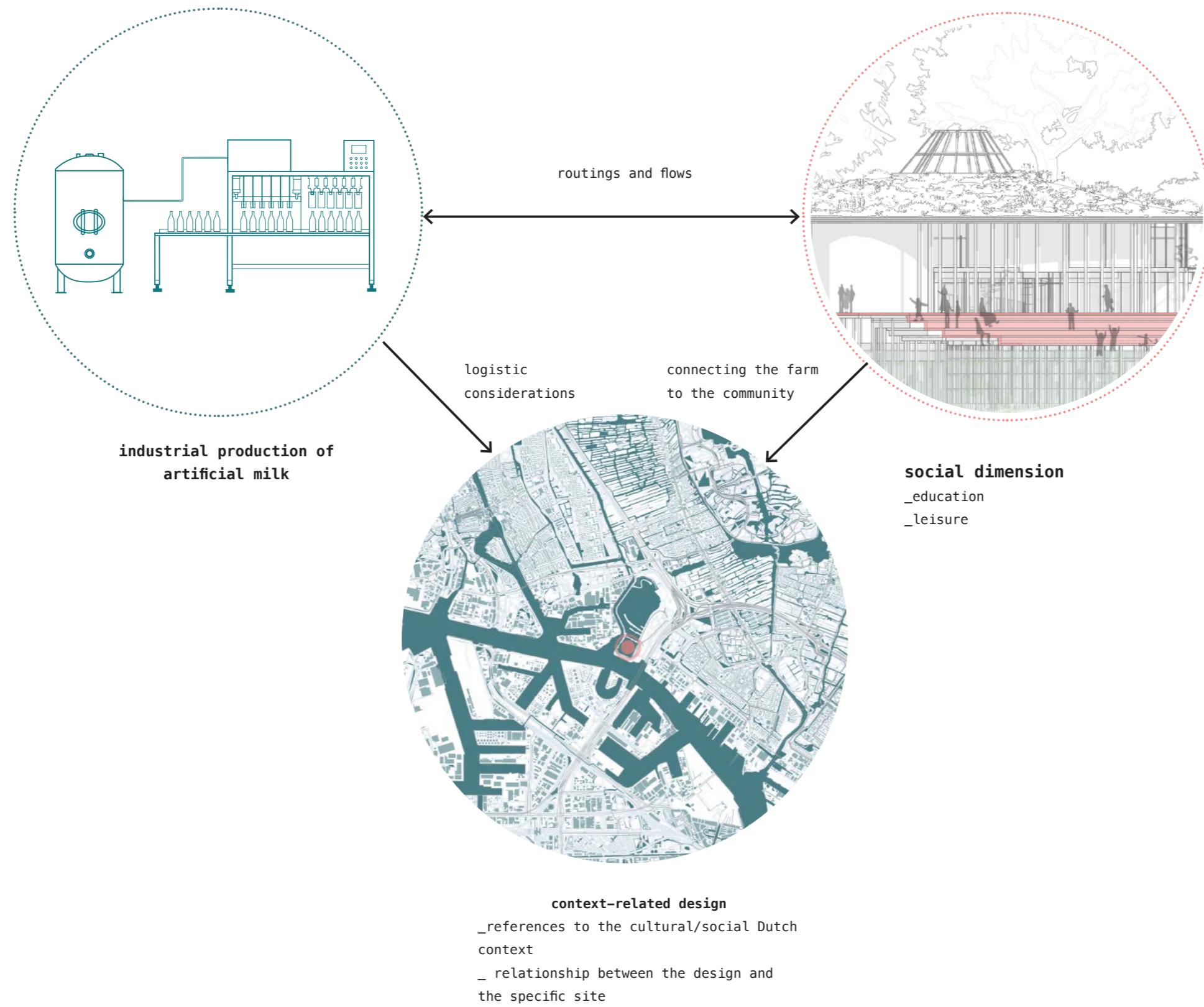
floating dairy farm

A shift in the paradigm

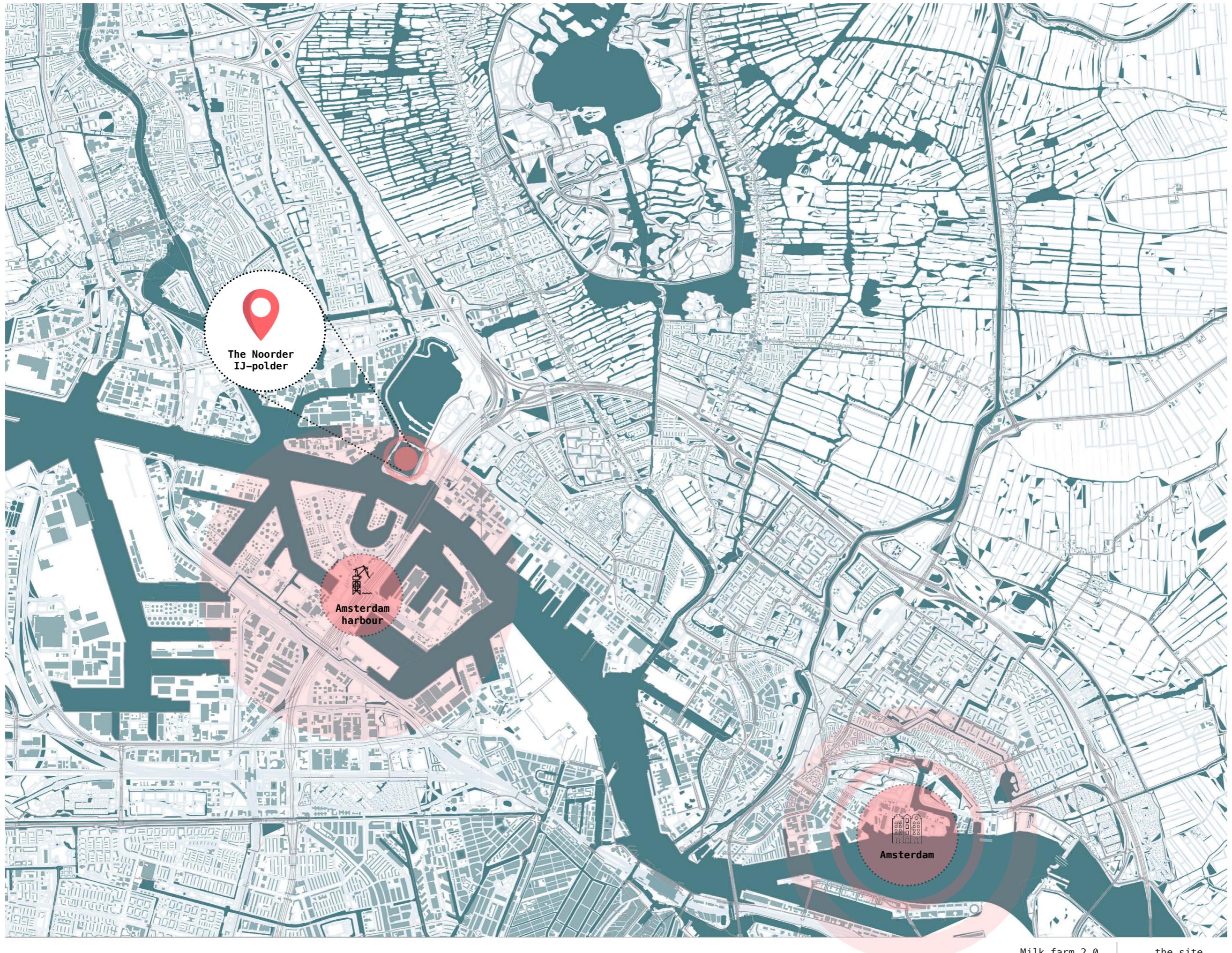
?







The site



Milk farm 2.0

the site

01

LOGISTIC STRATEGY

closeness of the Zuid plas to the North Canal and the Amsterdam harbour that can provide an easy and fast transportation of goods to and from the 'farm' on water

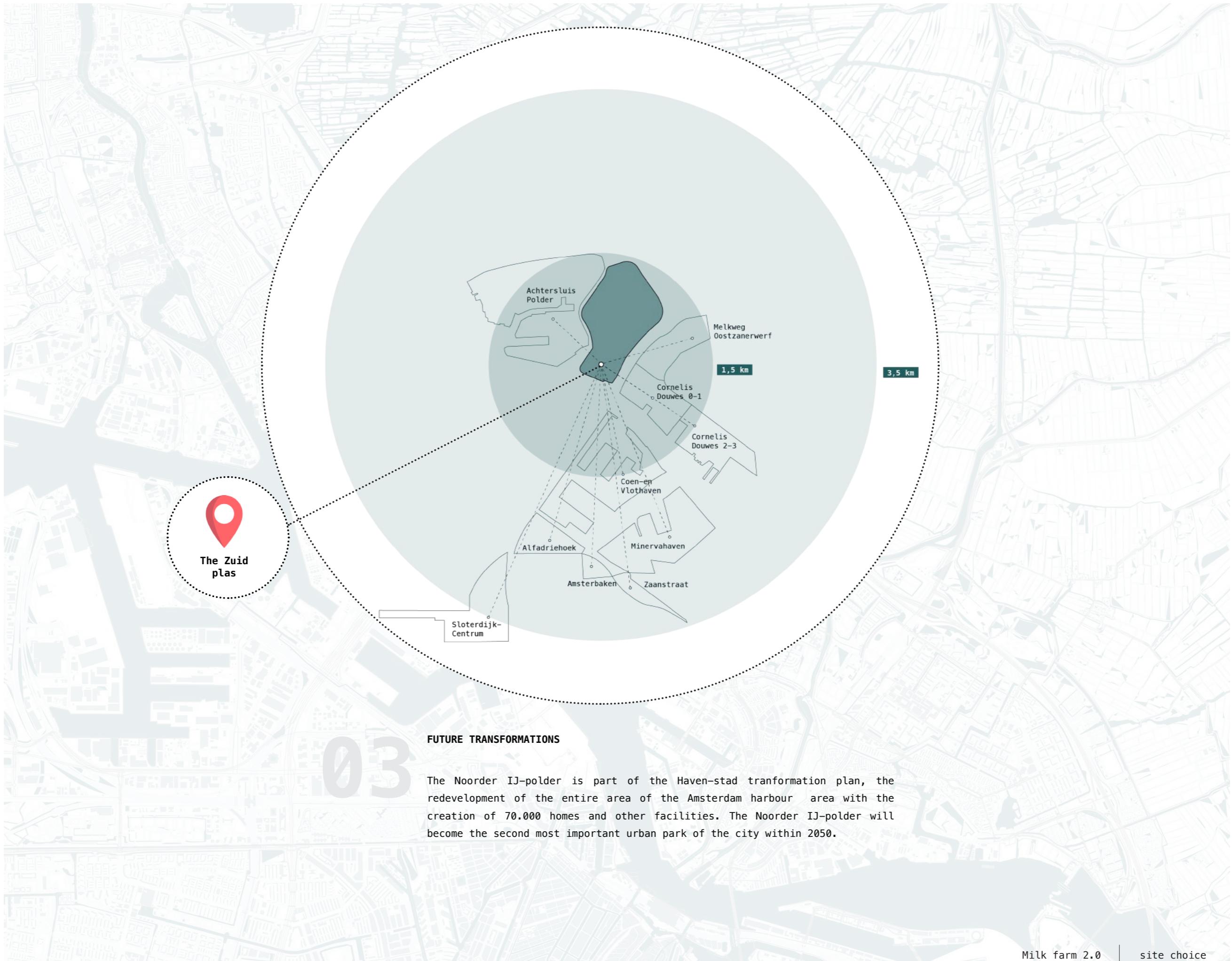


02



FUTURE TRANSFORMATIONS

The Noorder IJ-polder will become a thematic park aiming at educating the community to sustainability and circularity. On the Noord plas floating solar panels that will provide green energy to the closeby neighbourhoods will be installed within 2030.





The design

Scenario-based design

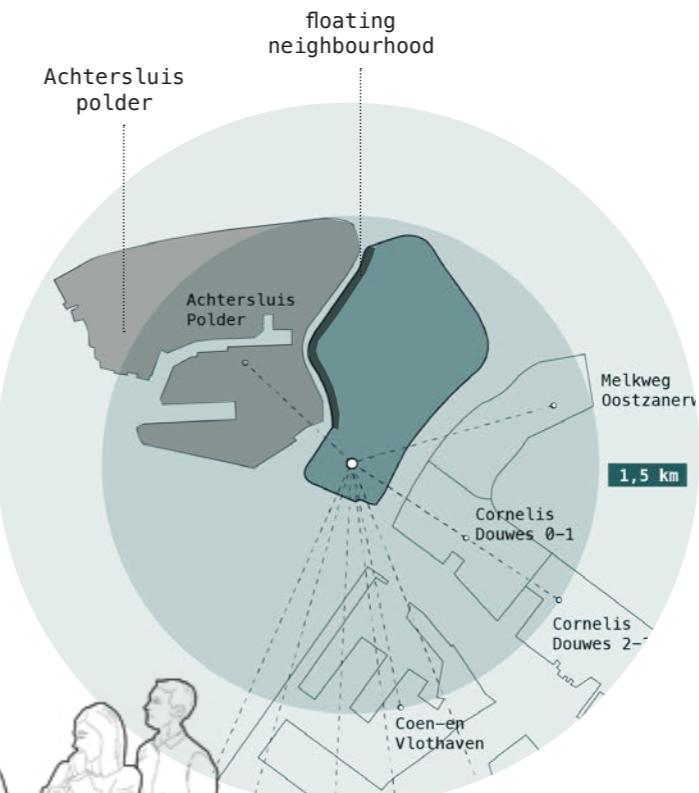


50%

of the daily milk demand
pro-capite

5.000L/day
artificial milk

25.000
people



resource savings

5.000L/day
artificial milk

traditional Dutch
dairy farm



Milk farm 2.0



GHG
emissions

5.975.000 g CO₂

- 84%

955.000 g CO₂

LAND
use

6.500 m²

- 91%

500 m²

WATER
consumption

5.100.000 L

- 98%

102.000 L

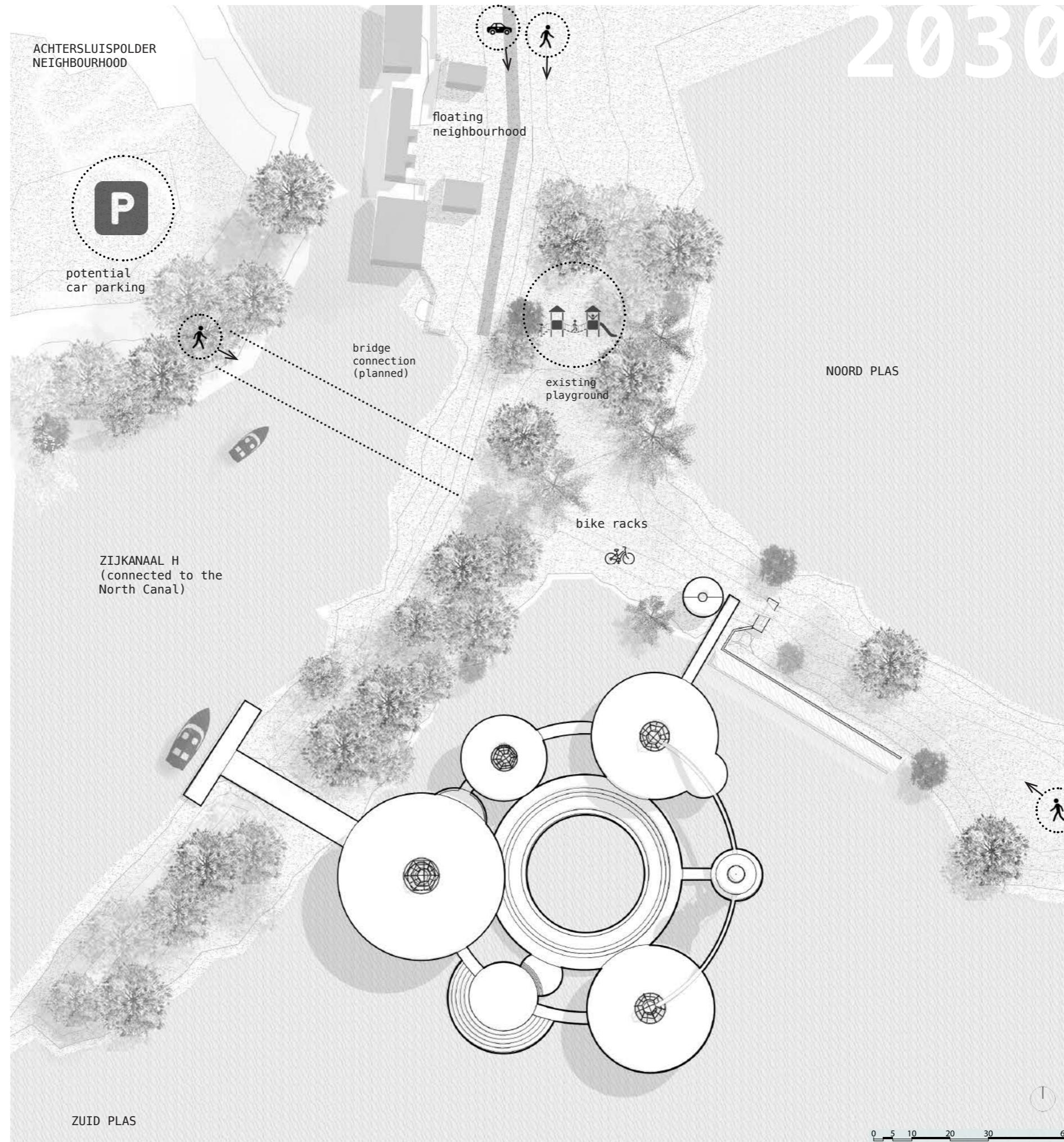
ENERGY
consumption

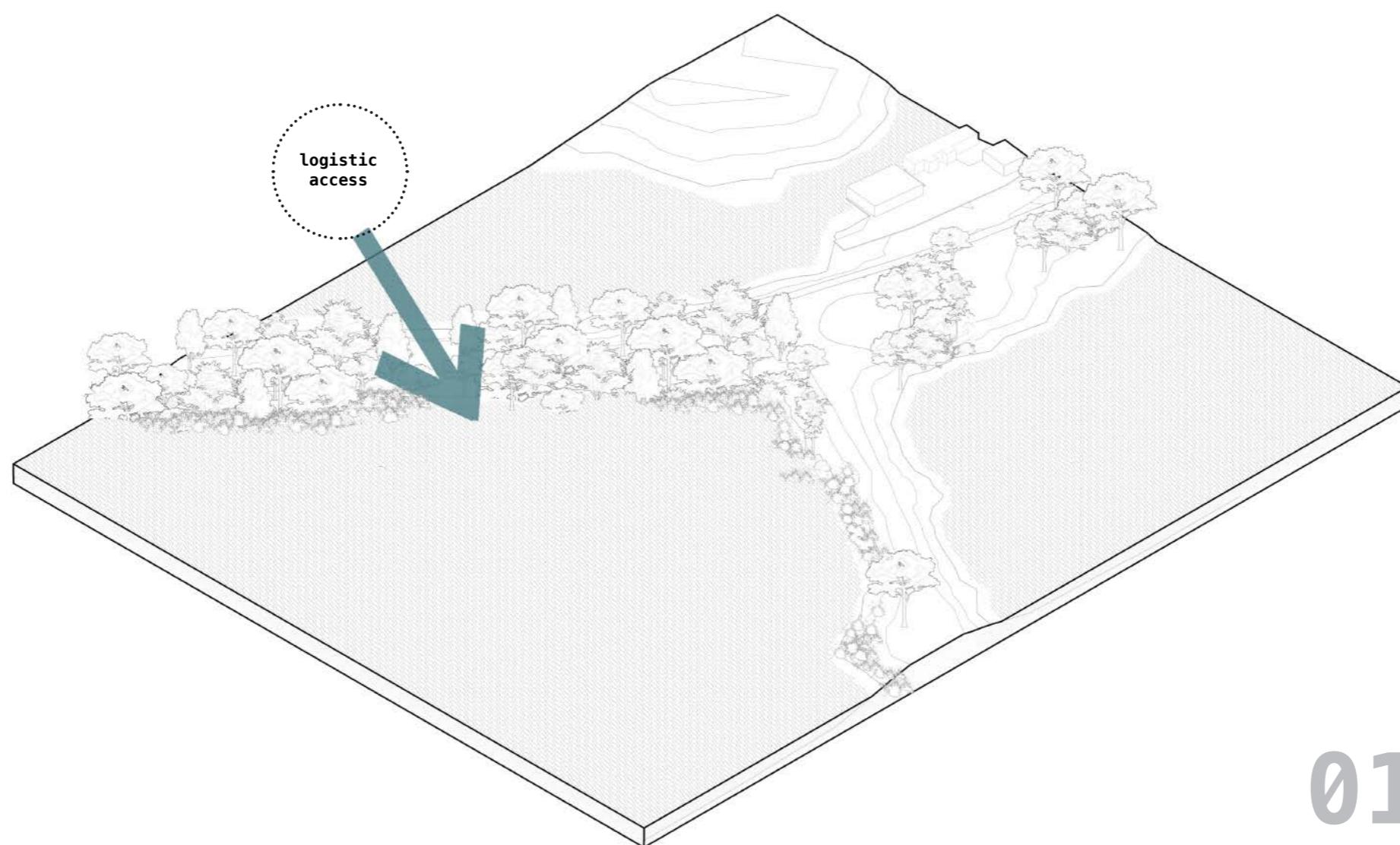
25.000 MJ

- 65%

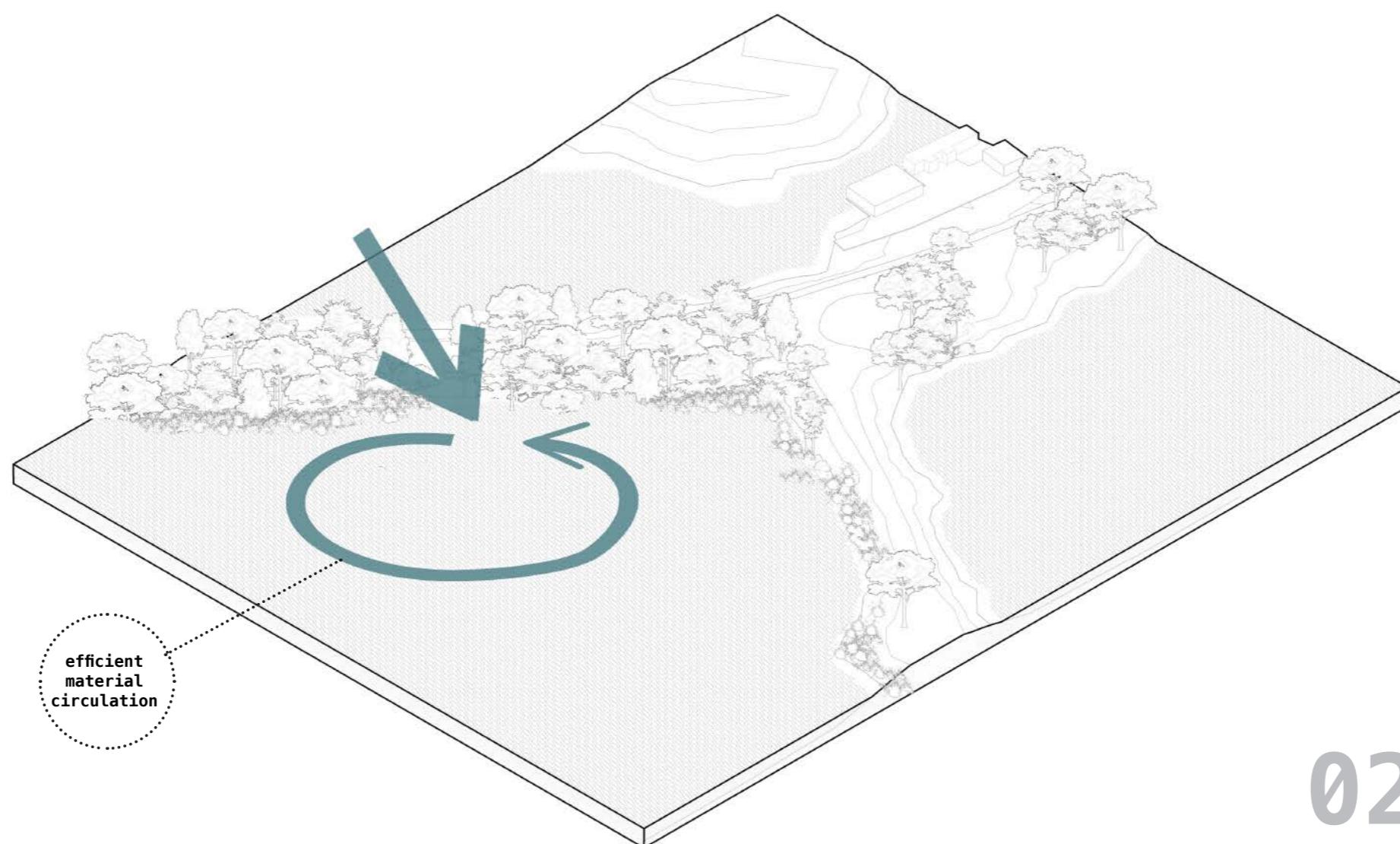
8.750 MJ

2030

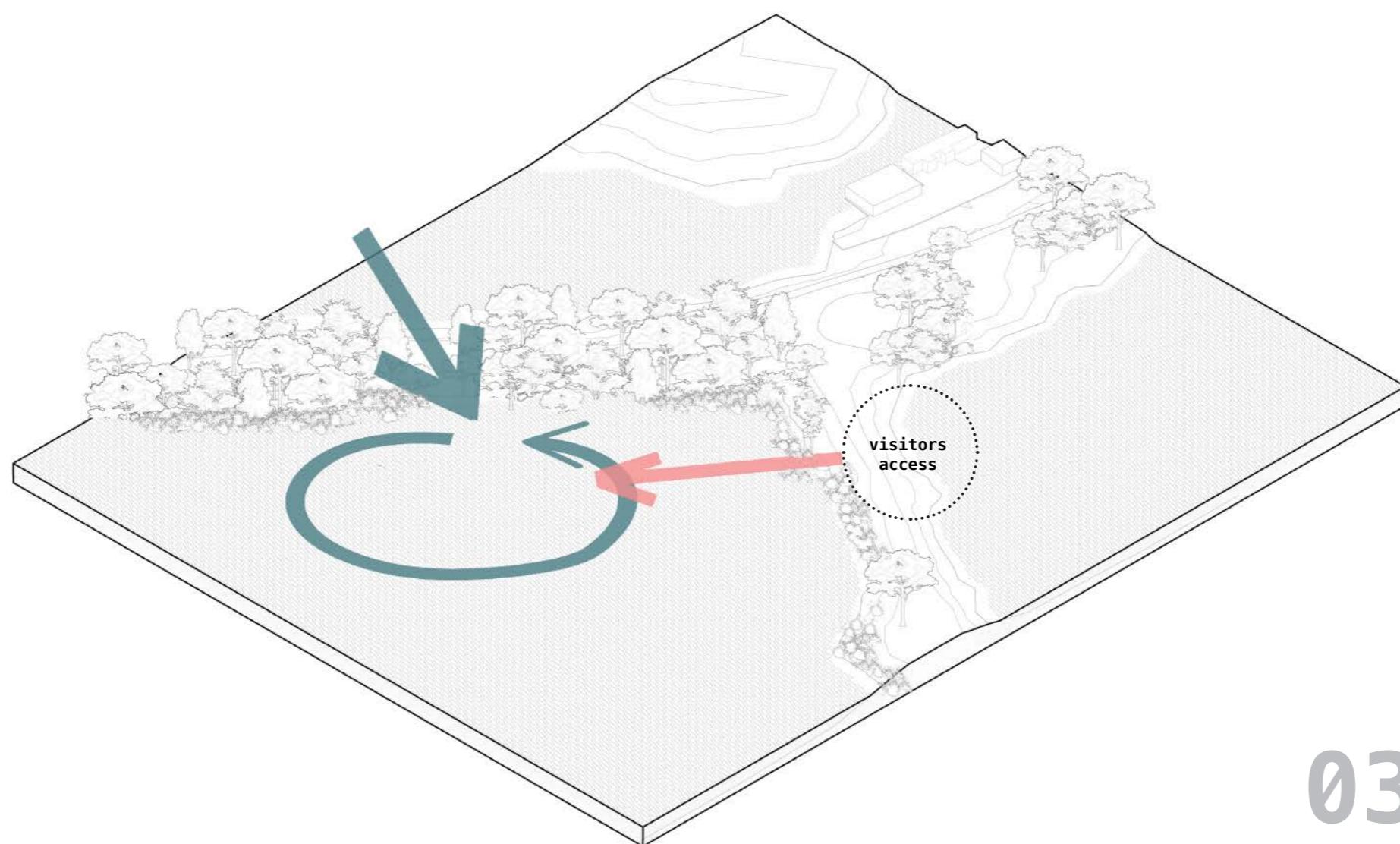




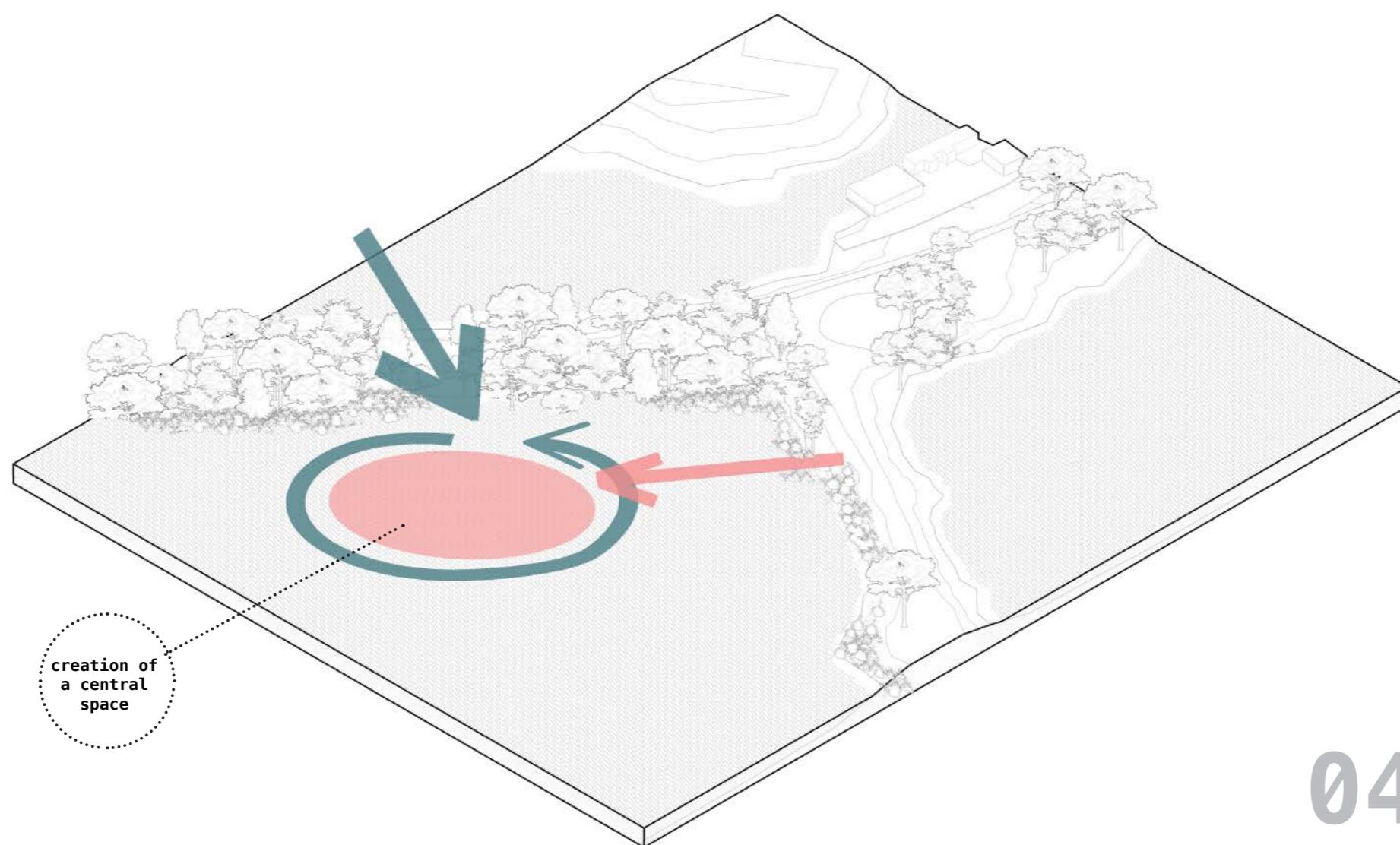
01



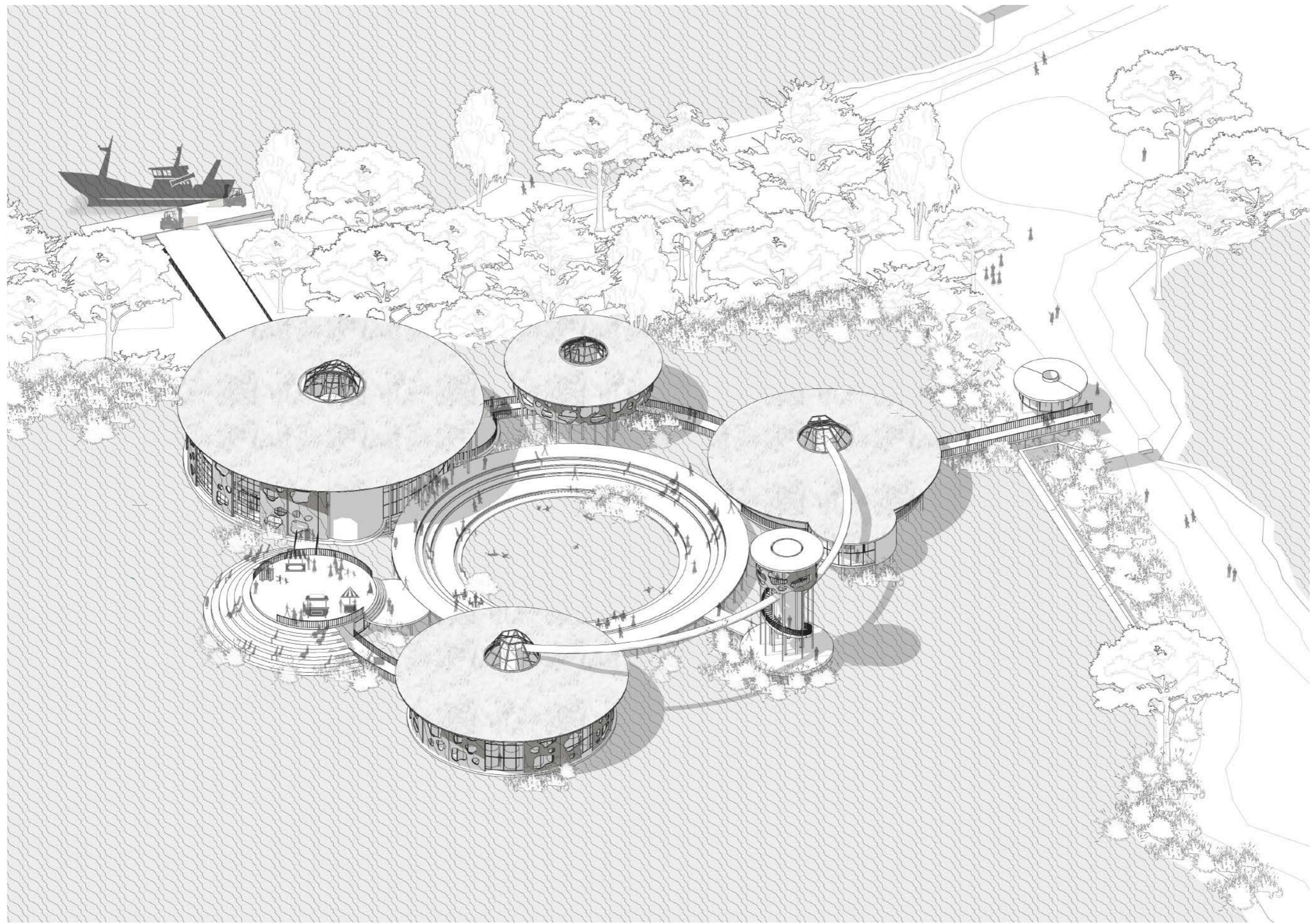
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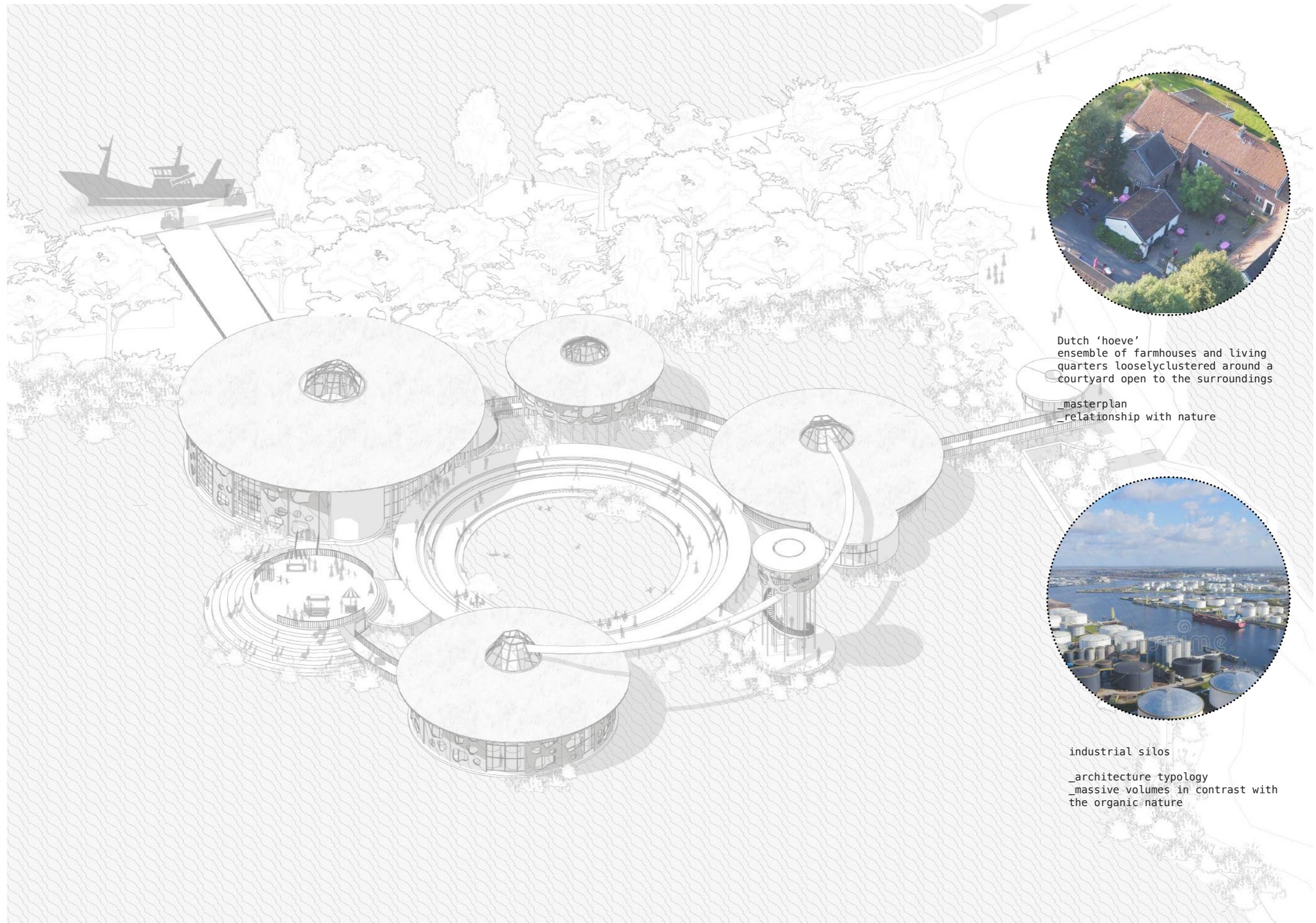
03



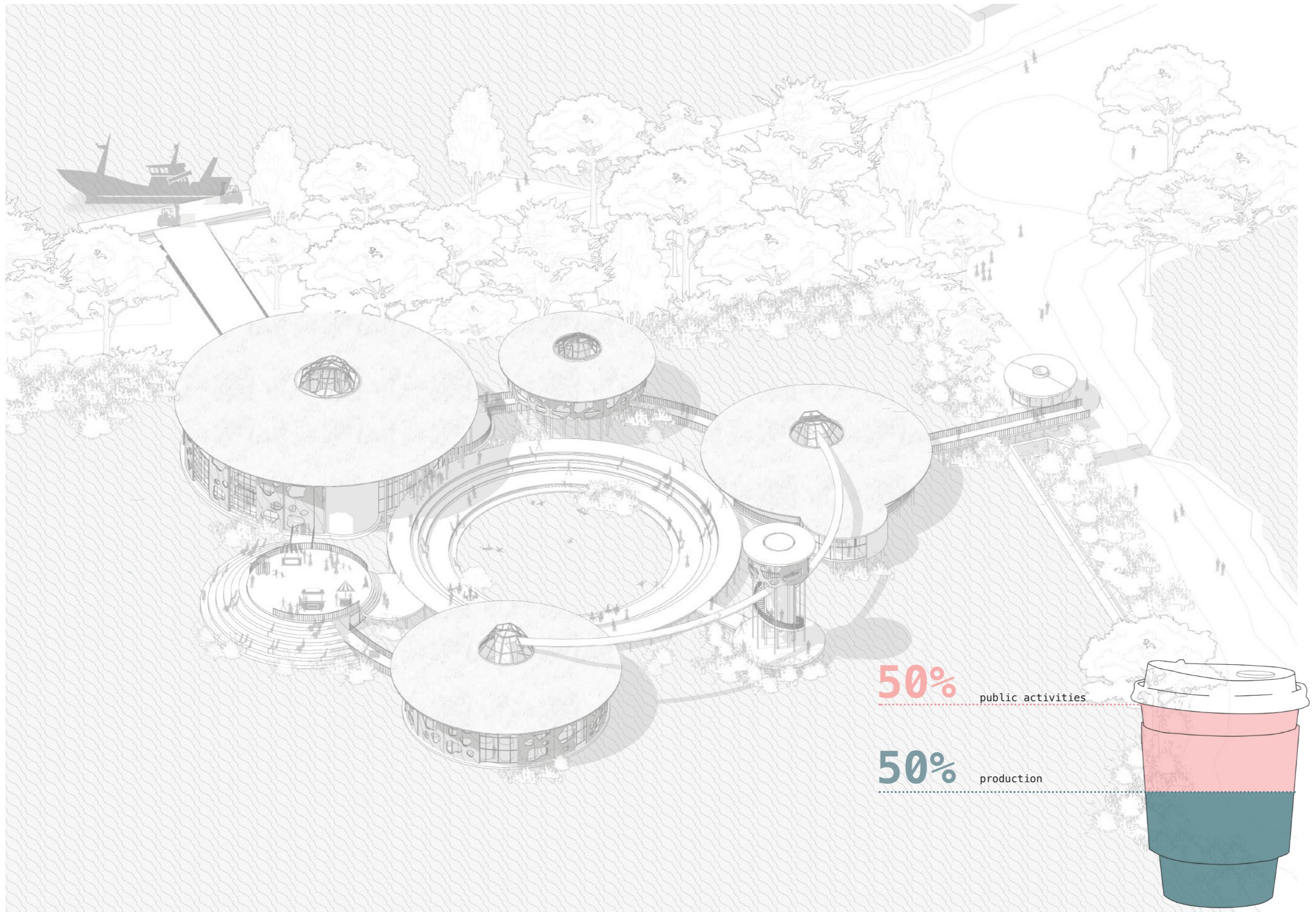
04



Milk farm 2.0 | design axonometry



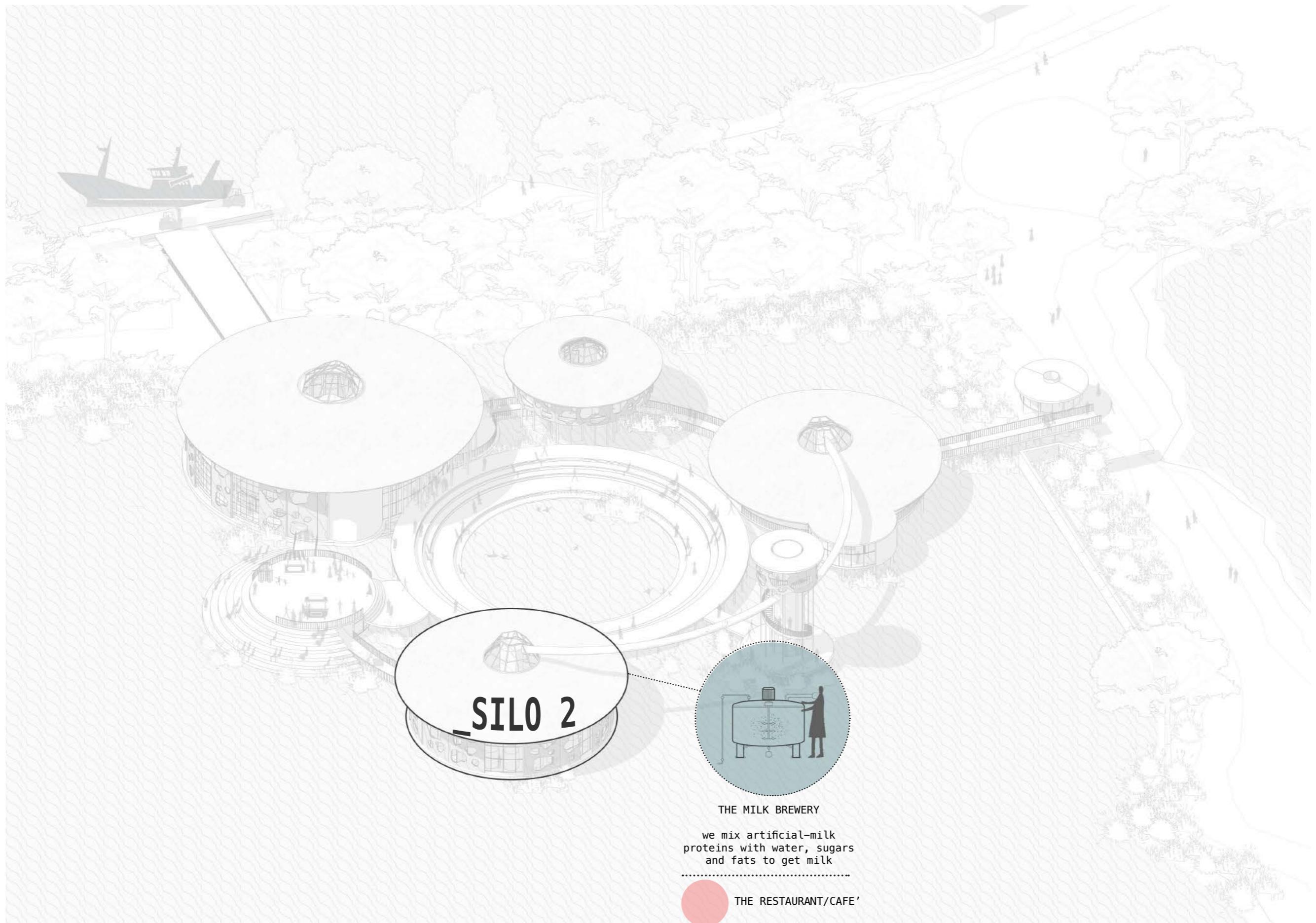
The design programme

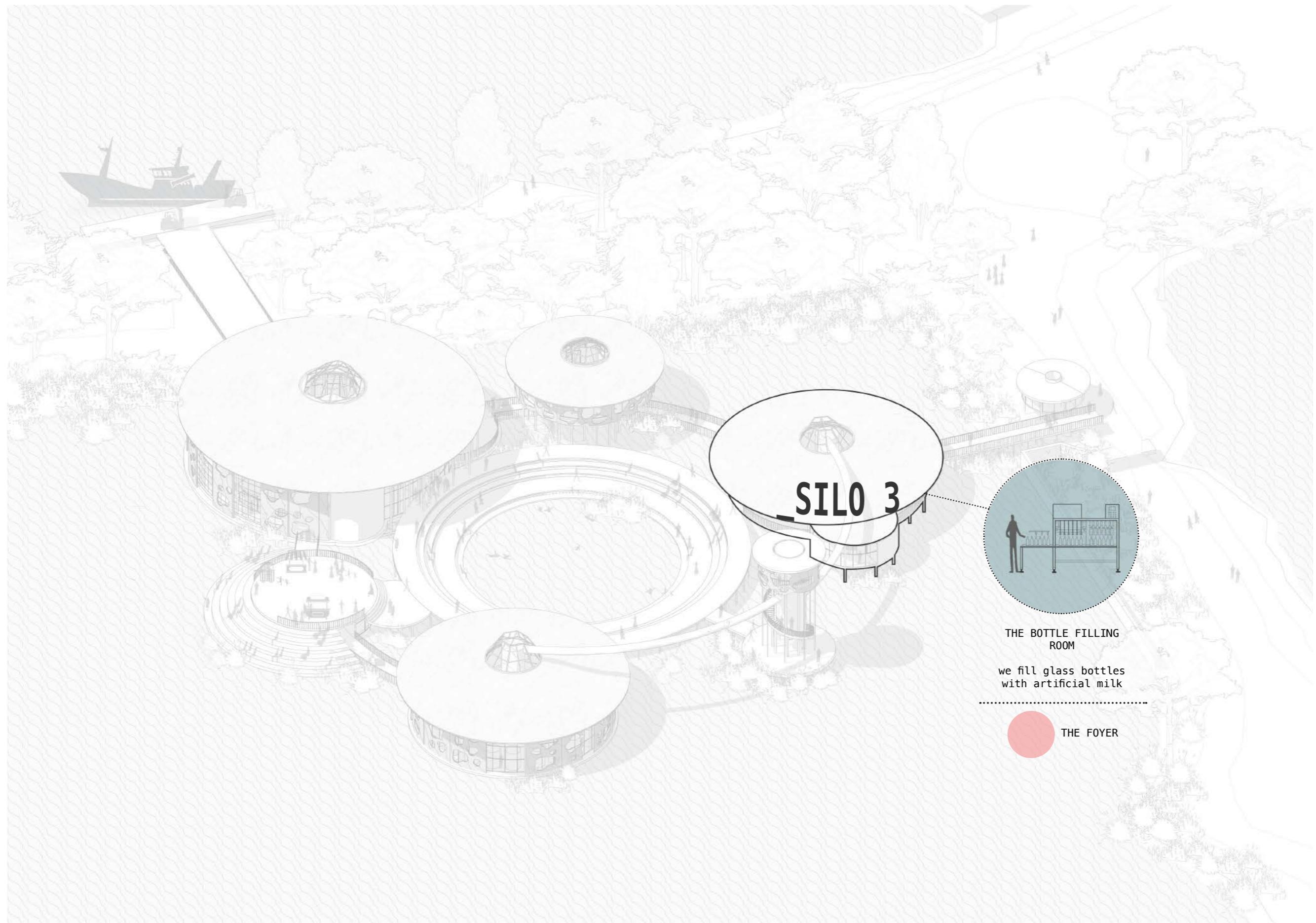




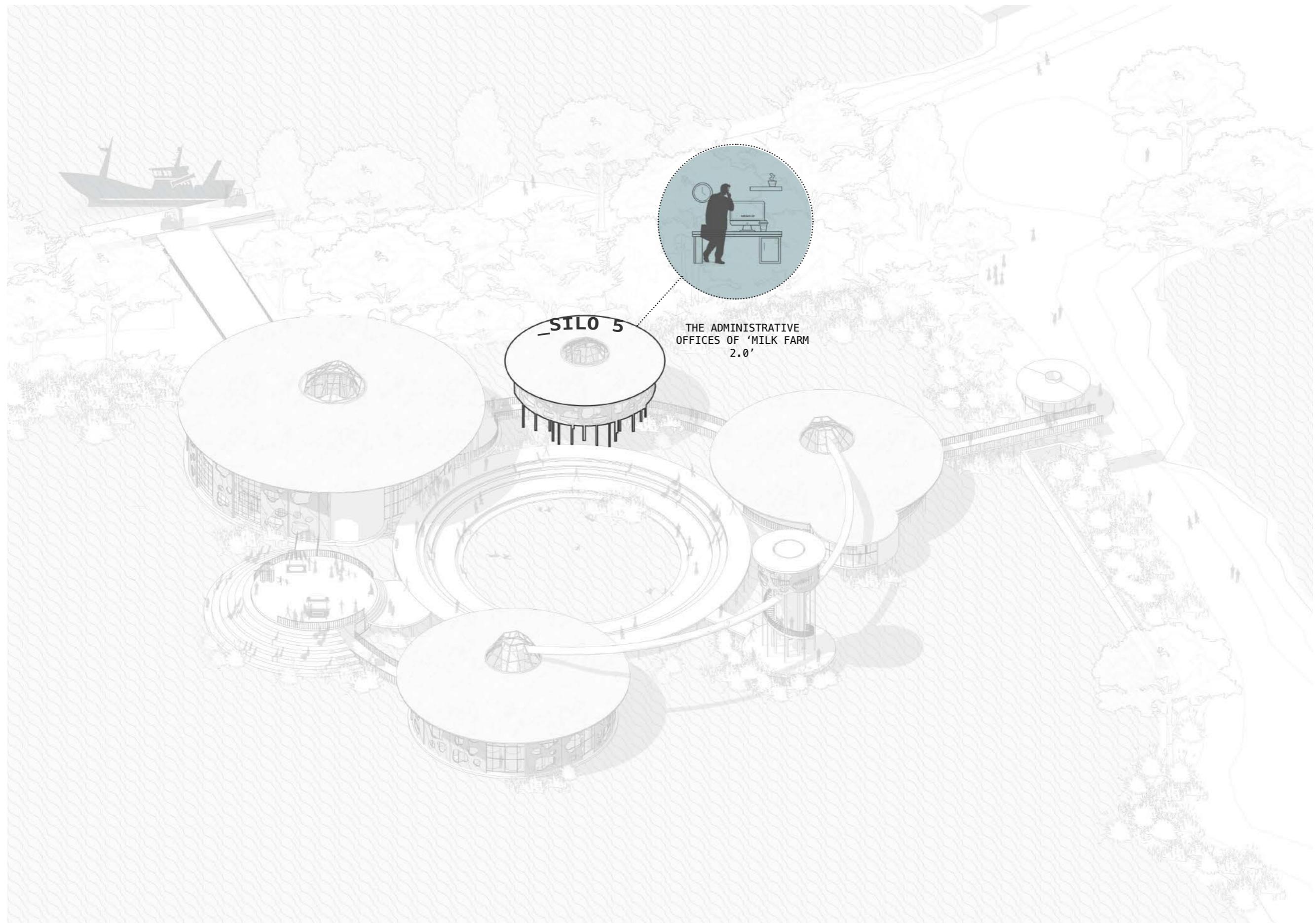
WORKSHOPS
AUDITORIUM
EVENT SPACE

we daily produce artificial
milk proteins and we send
them to the milk brewery

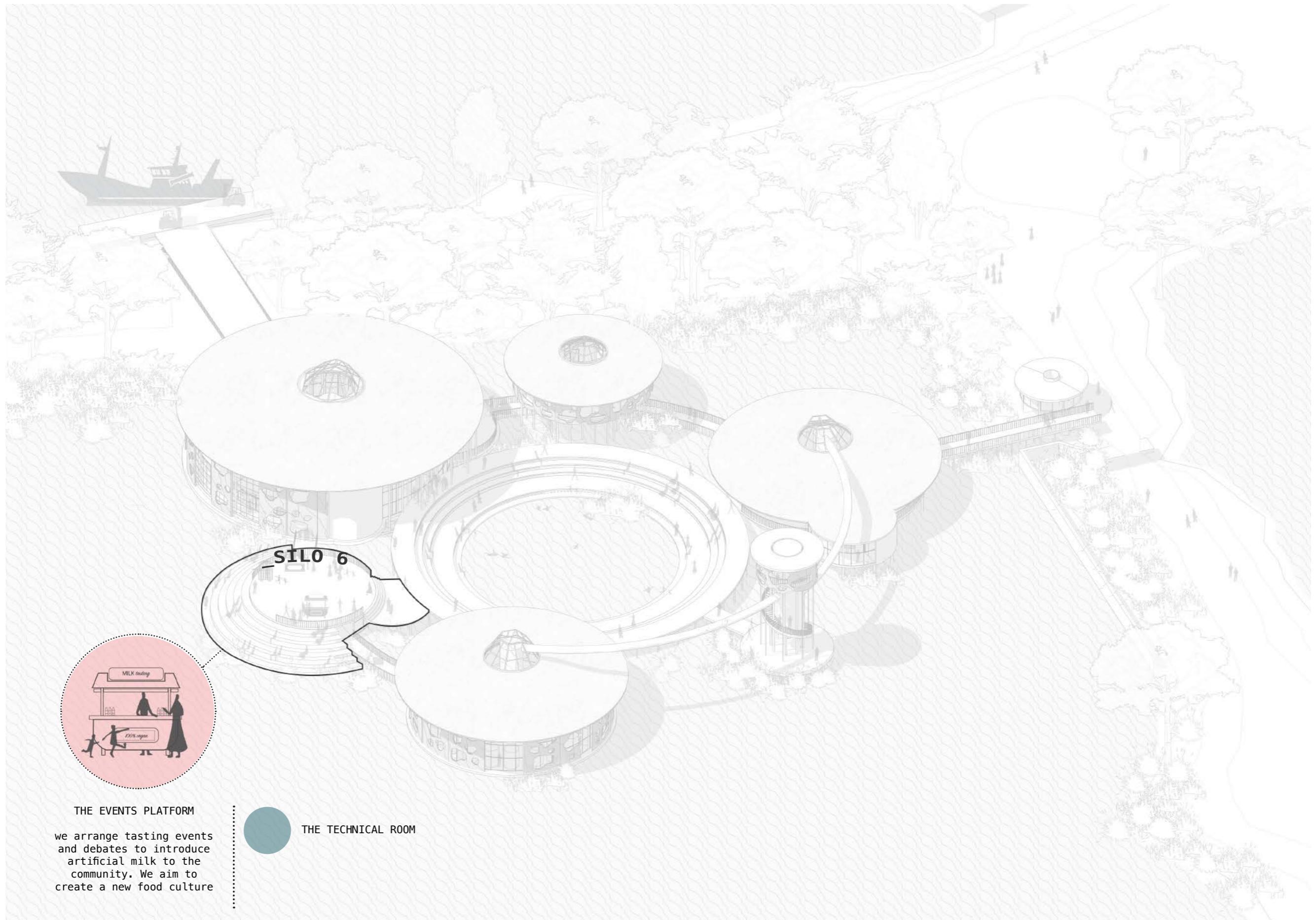








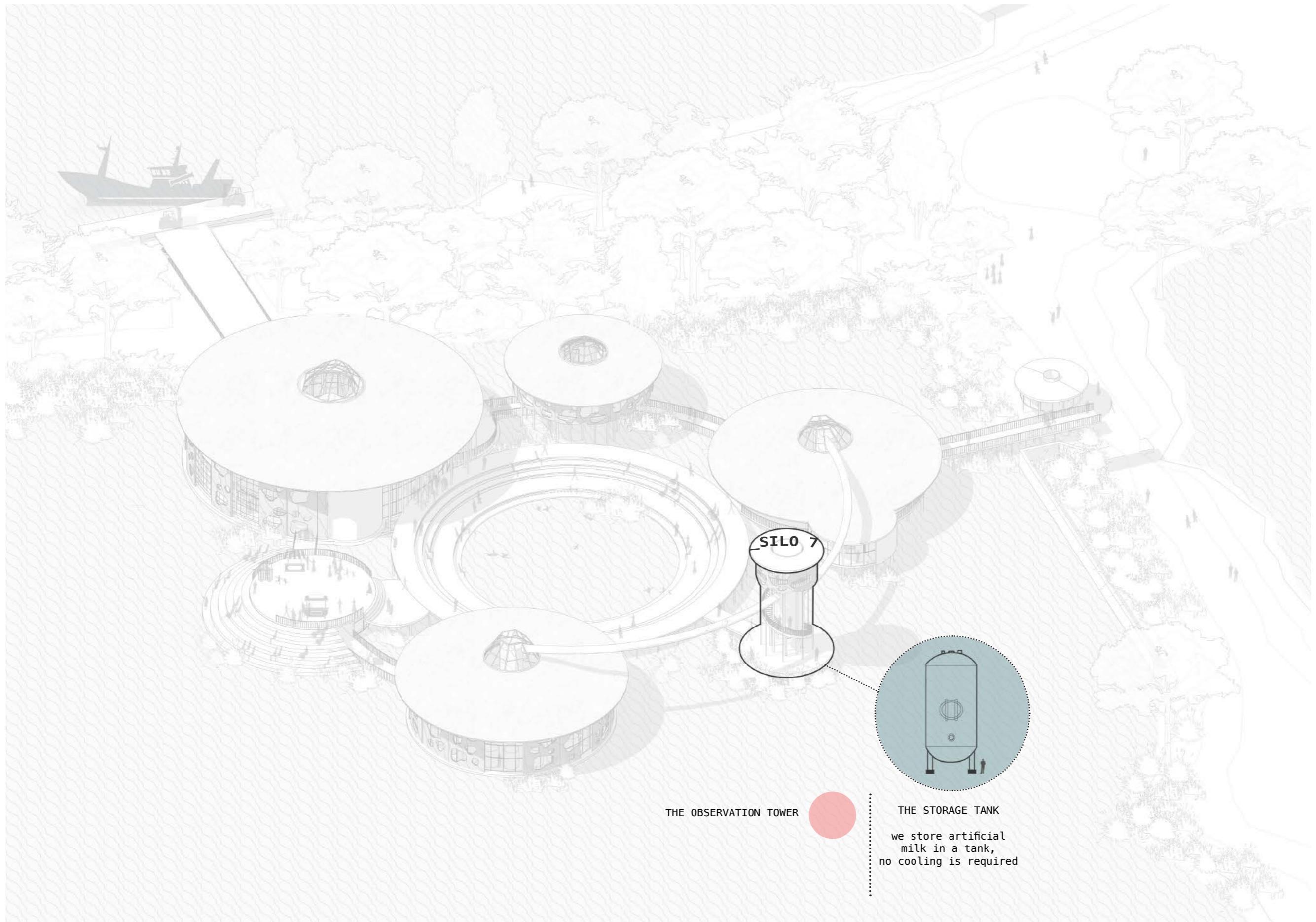
THE ADMINISTRATIVE
OFFICES OF 'MILK FARM
2.0'

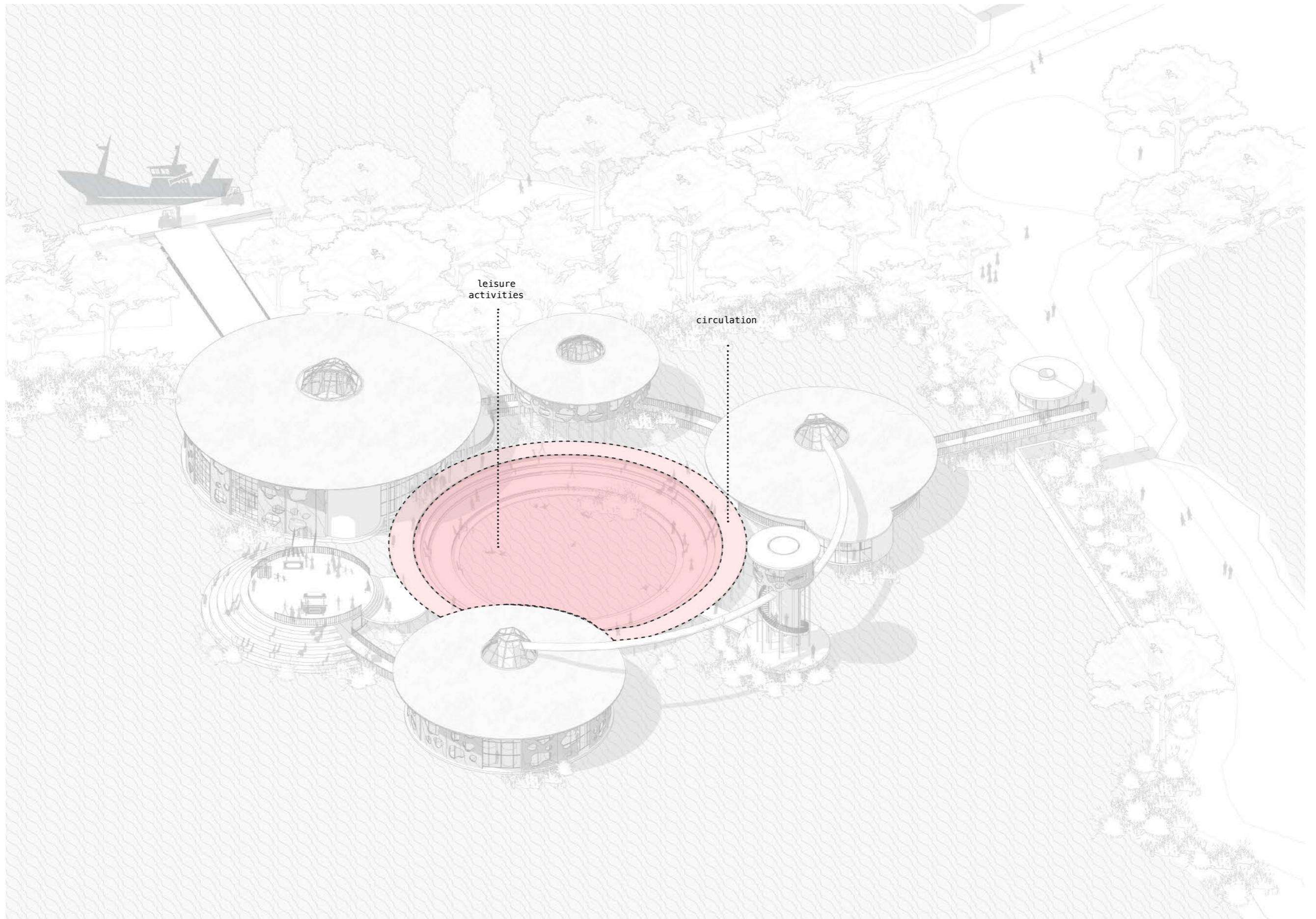


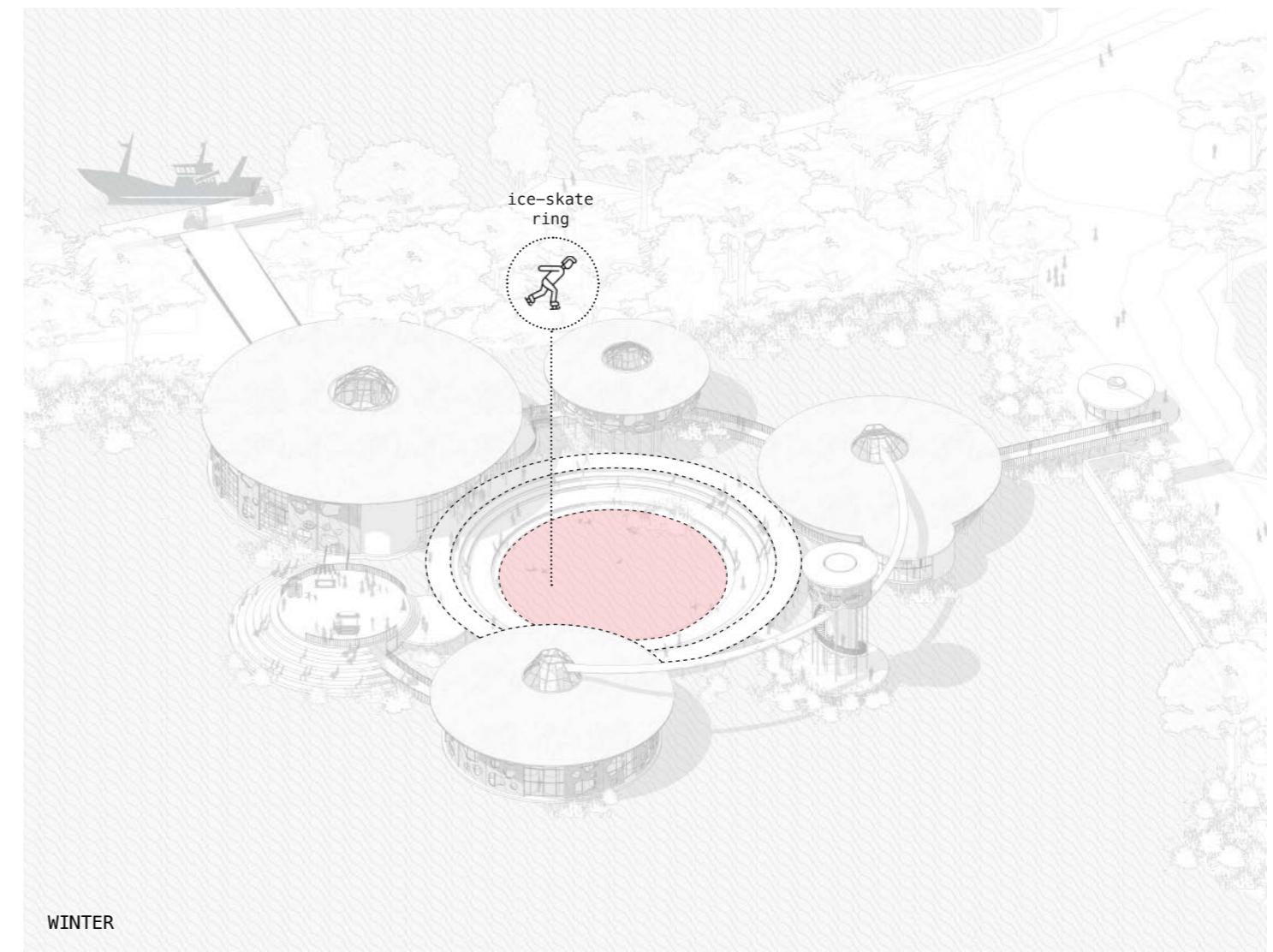
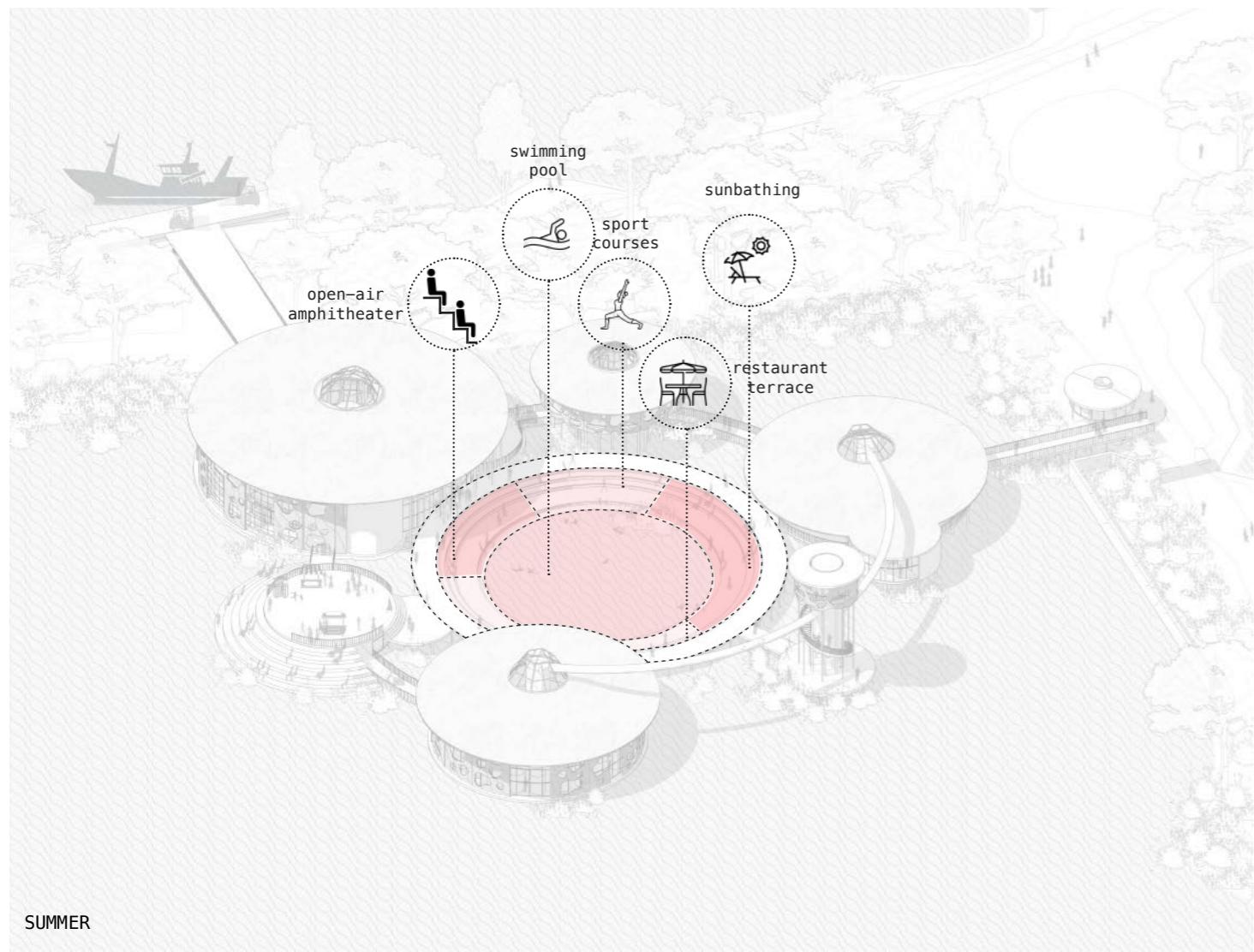
THE EVENTS PLATFORM

we arrange tasting events and debates to introduce artificial milk to the community. We aim to create a new food culture

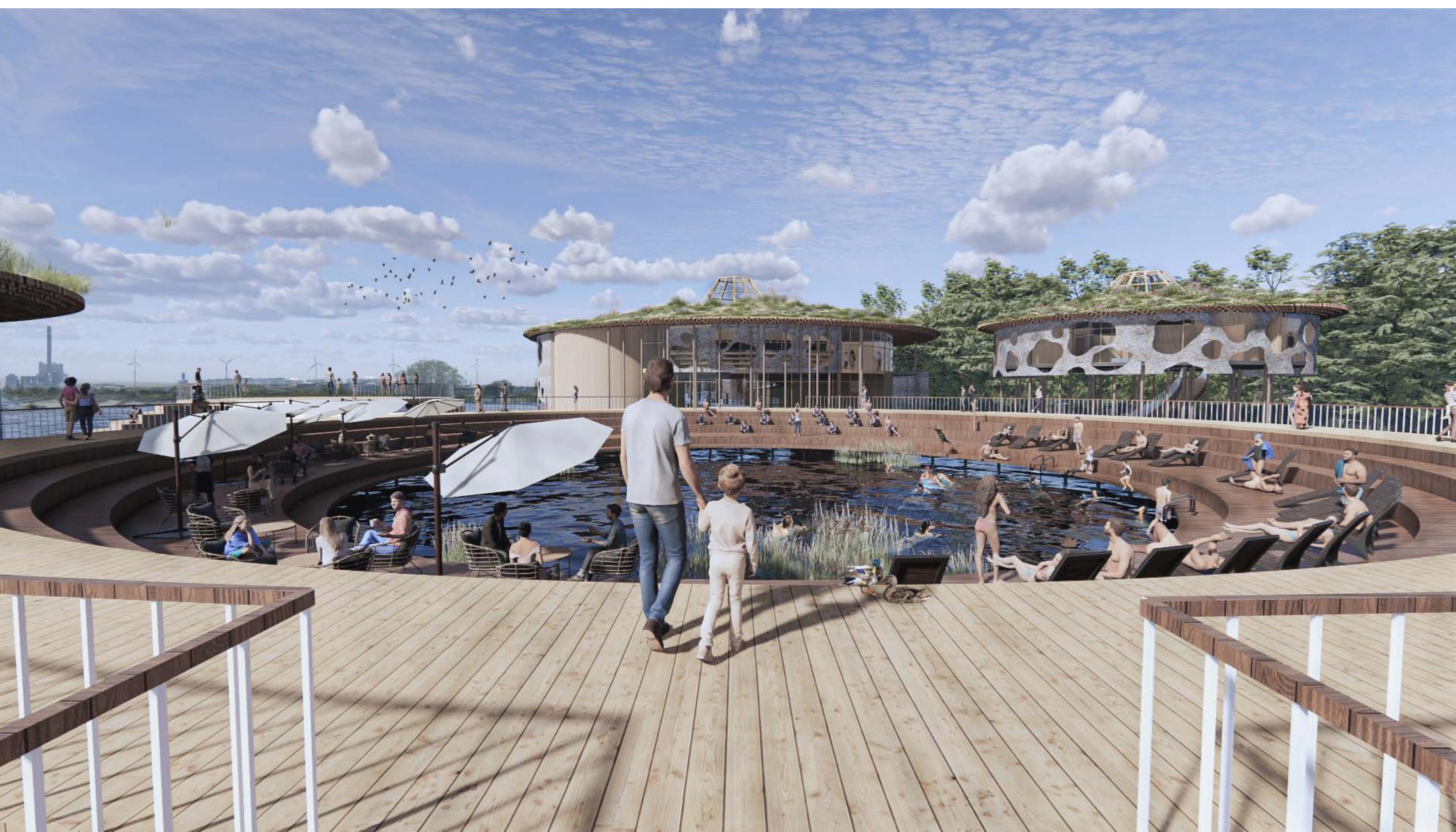
THE TECHNICAL ROOM

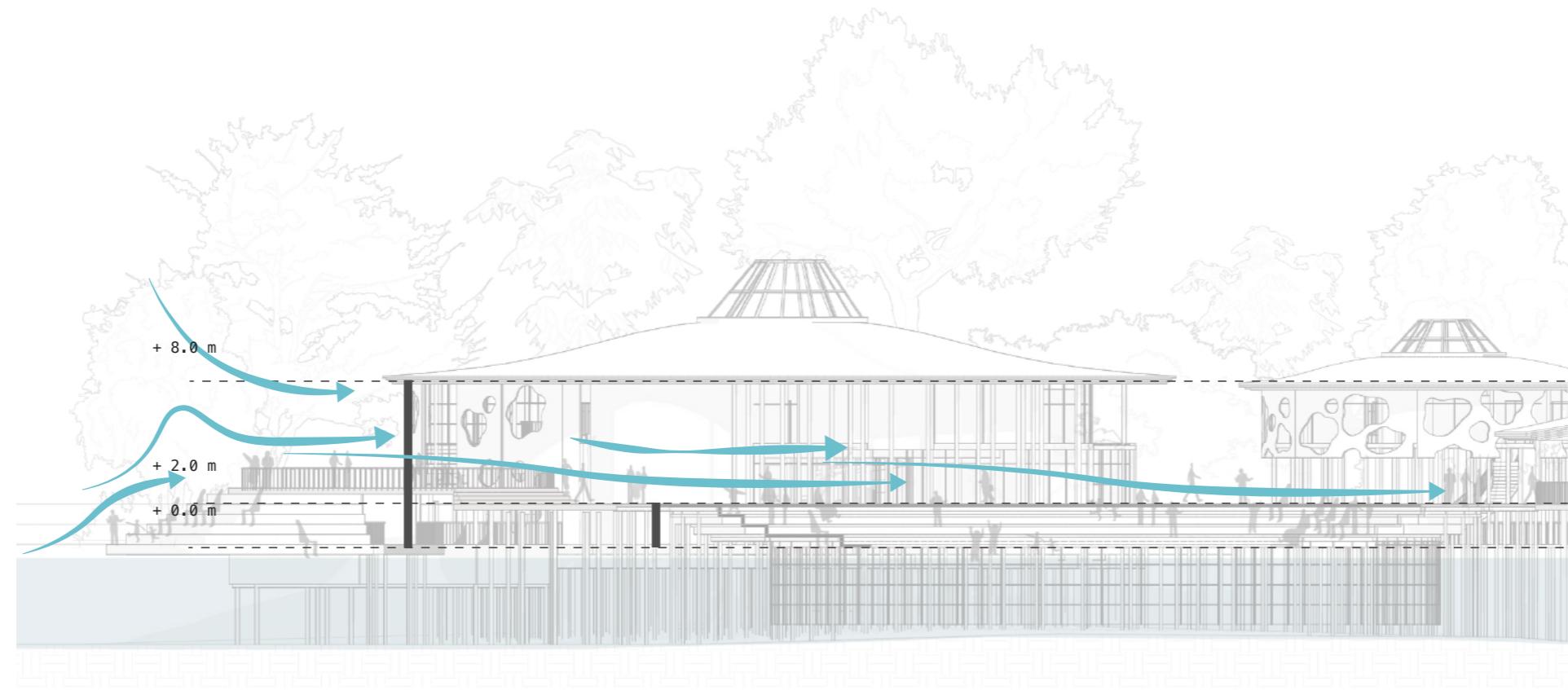






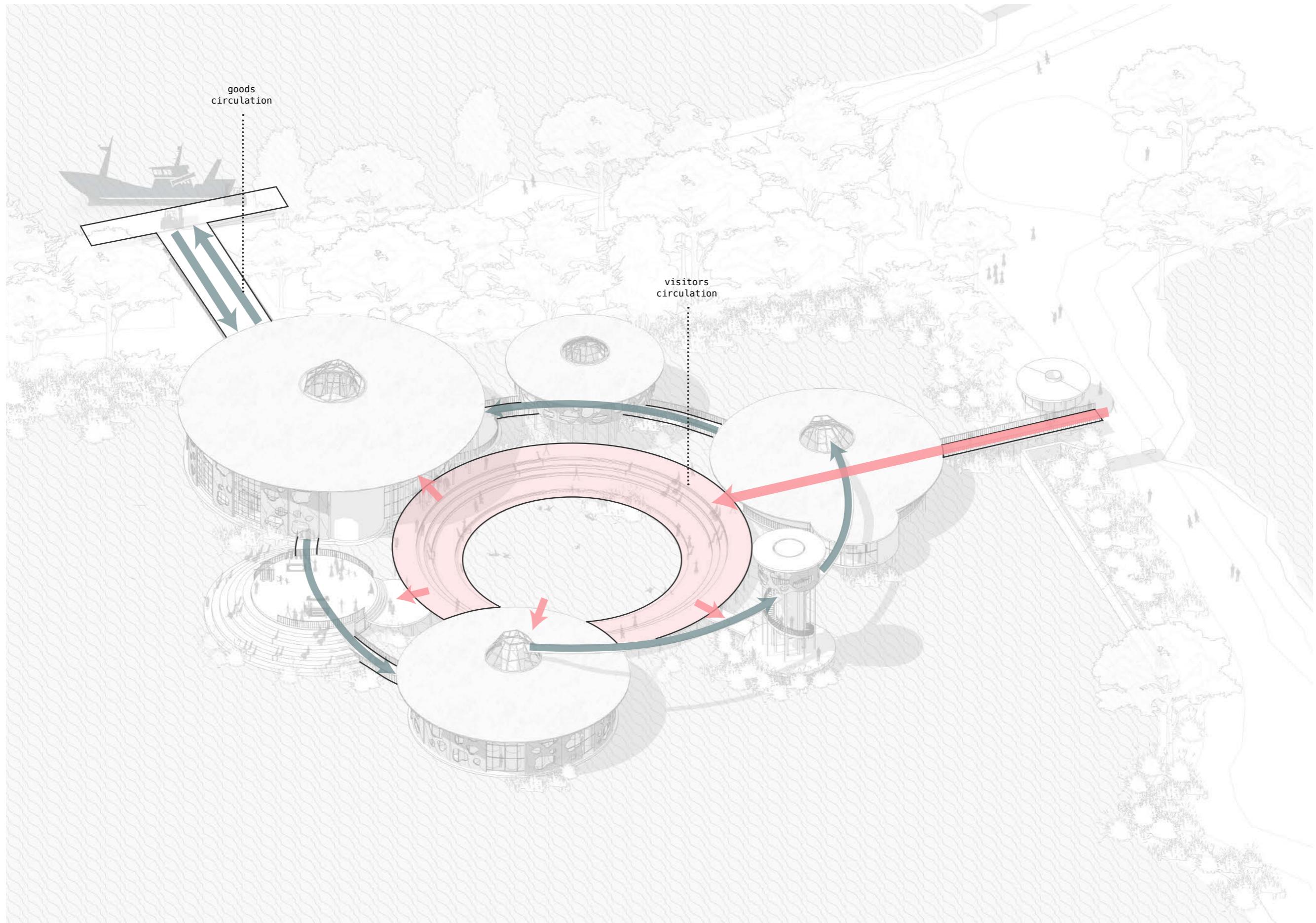
the central courtyard | leisure activities





The central courtyard | climate adaptatiom

Routings & Flows:
efficiency and safety

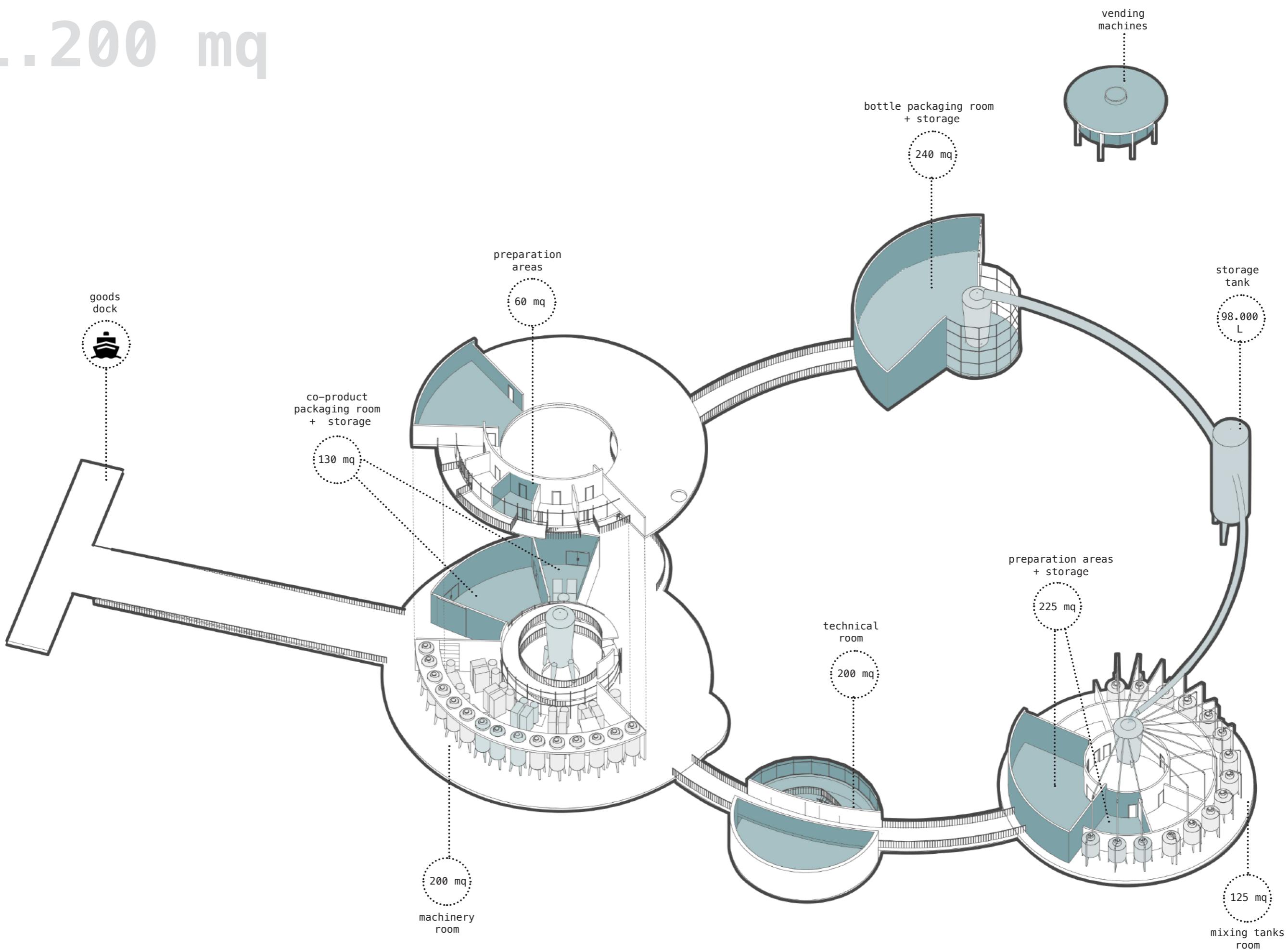




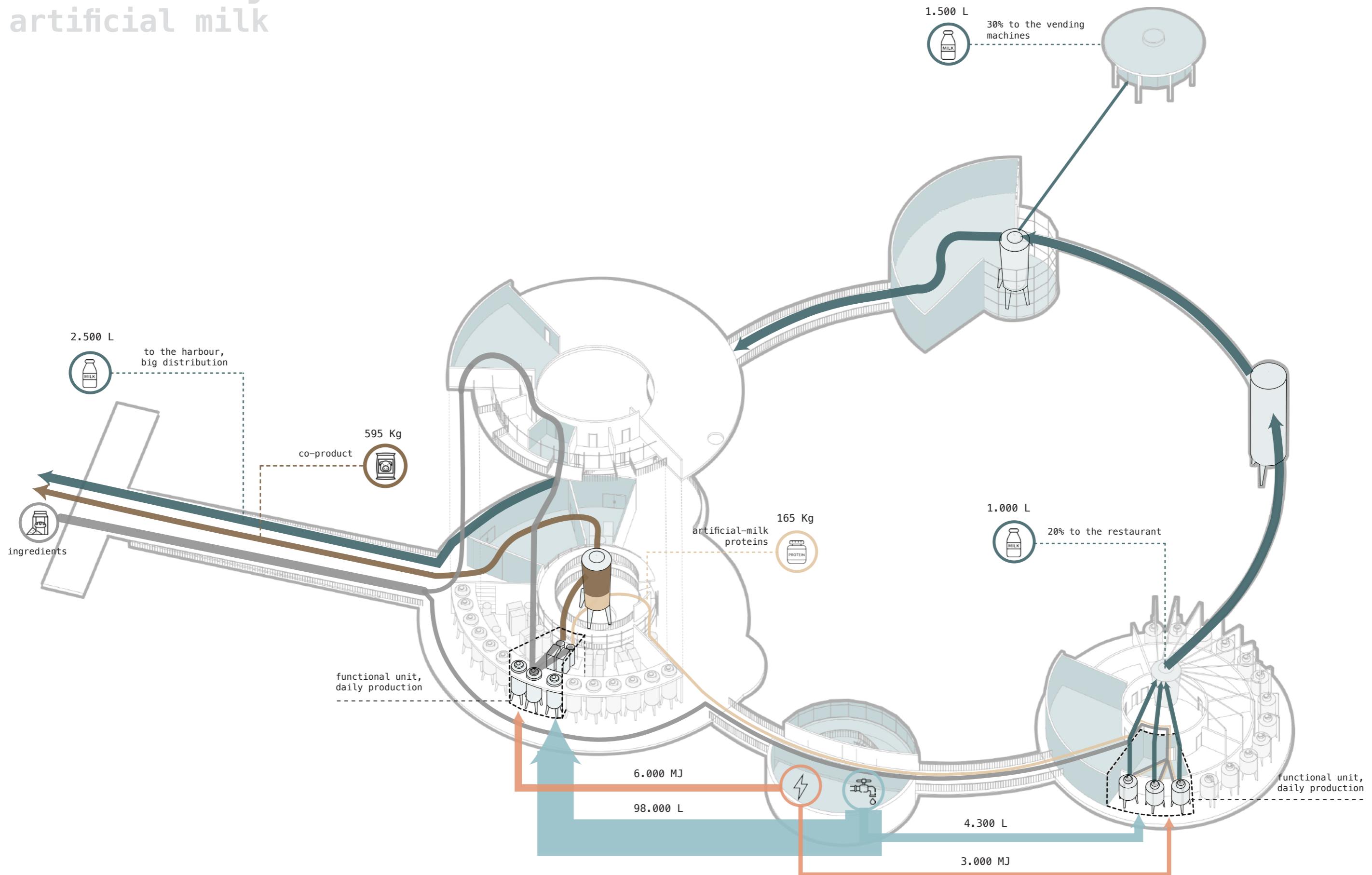
Milk farm 2.0 routings and safety

Research + design

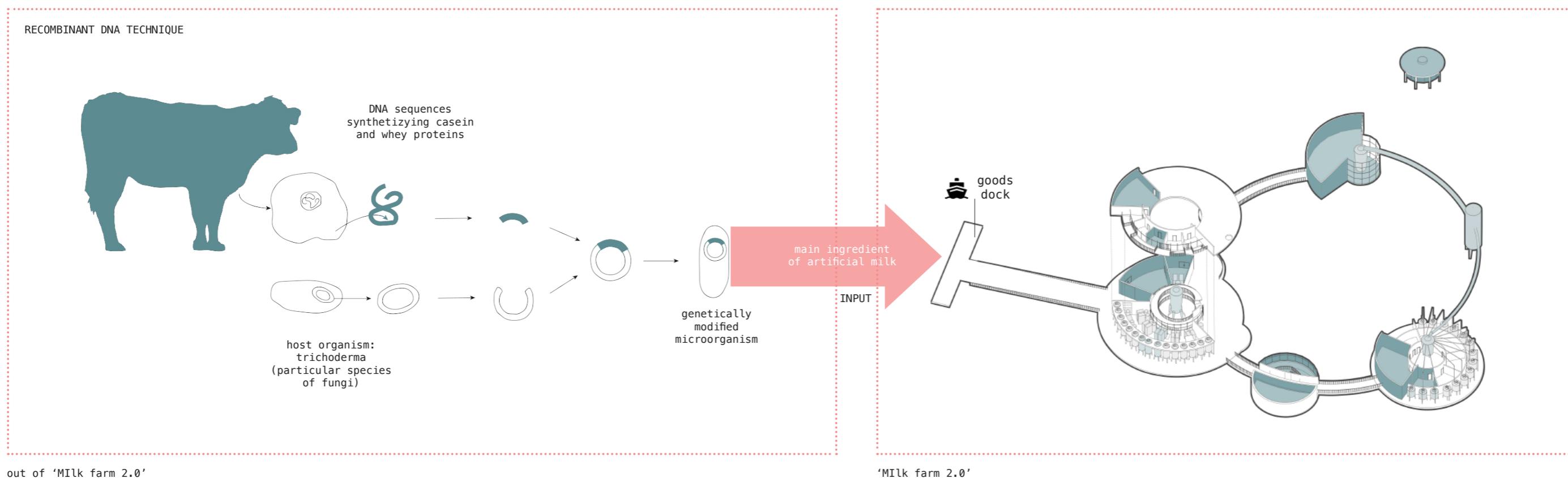
1.200 mq



5.000L/day artificial milk

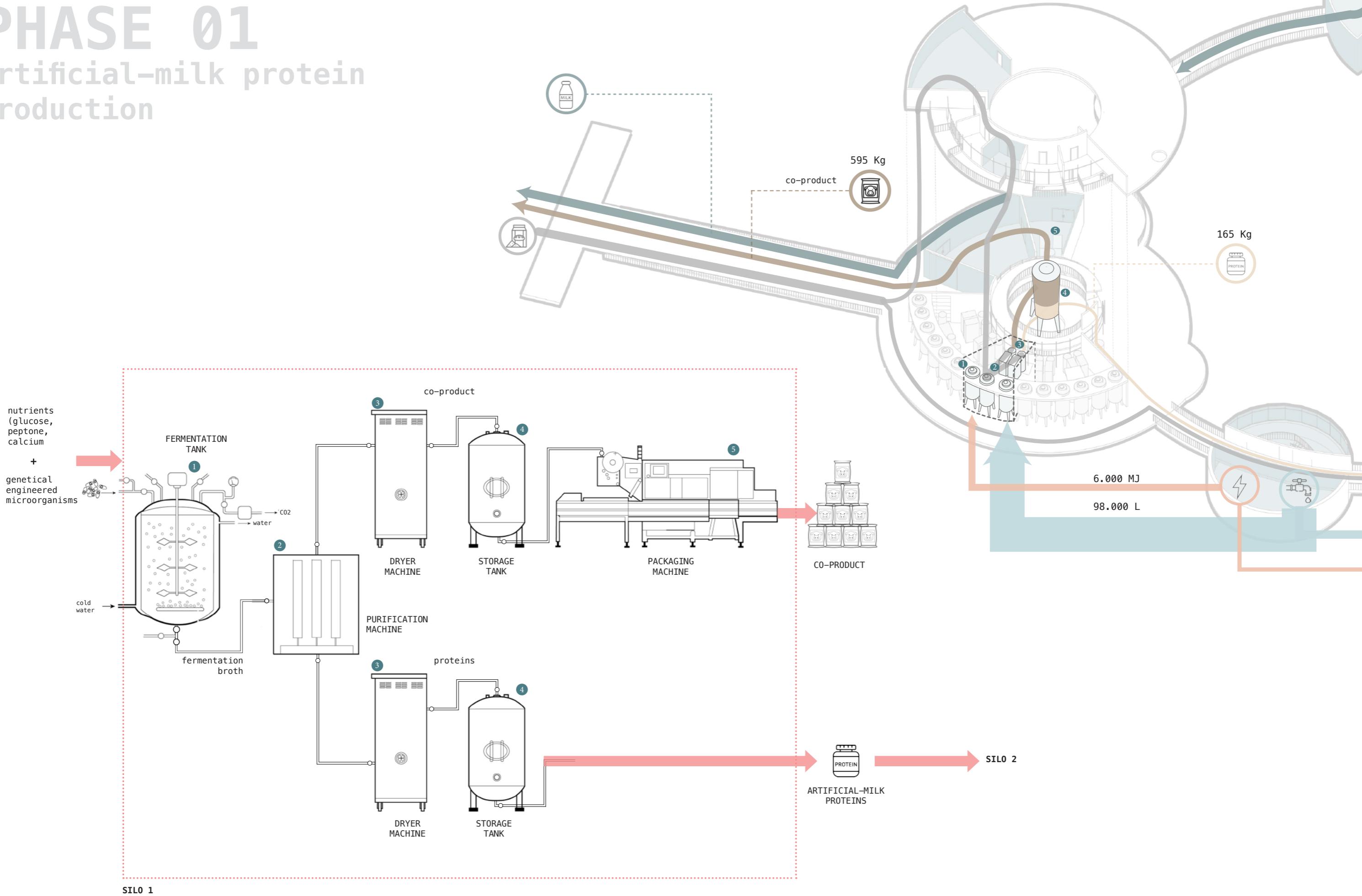


PHASE 00



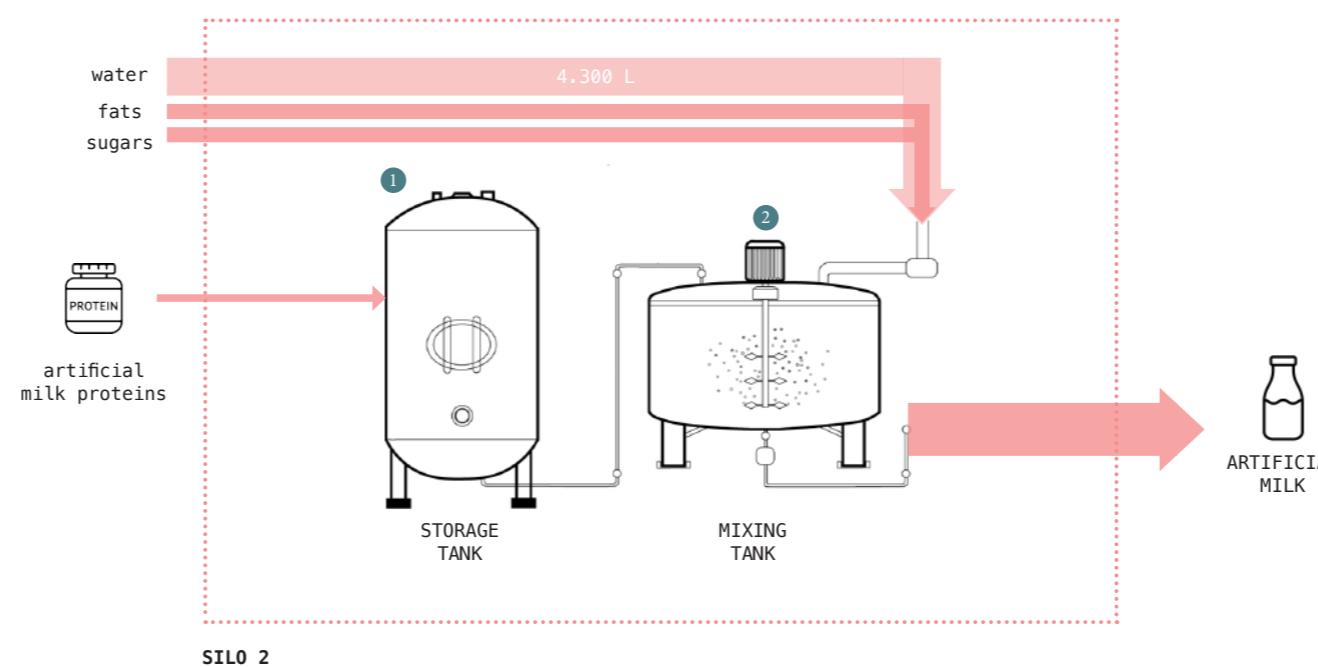
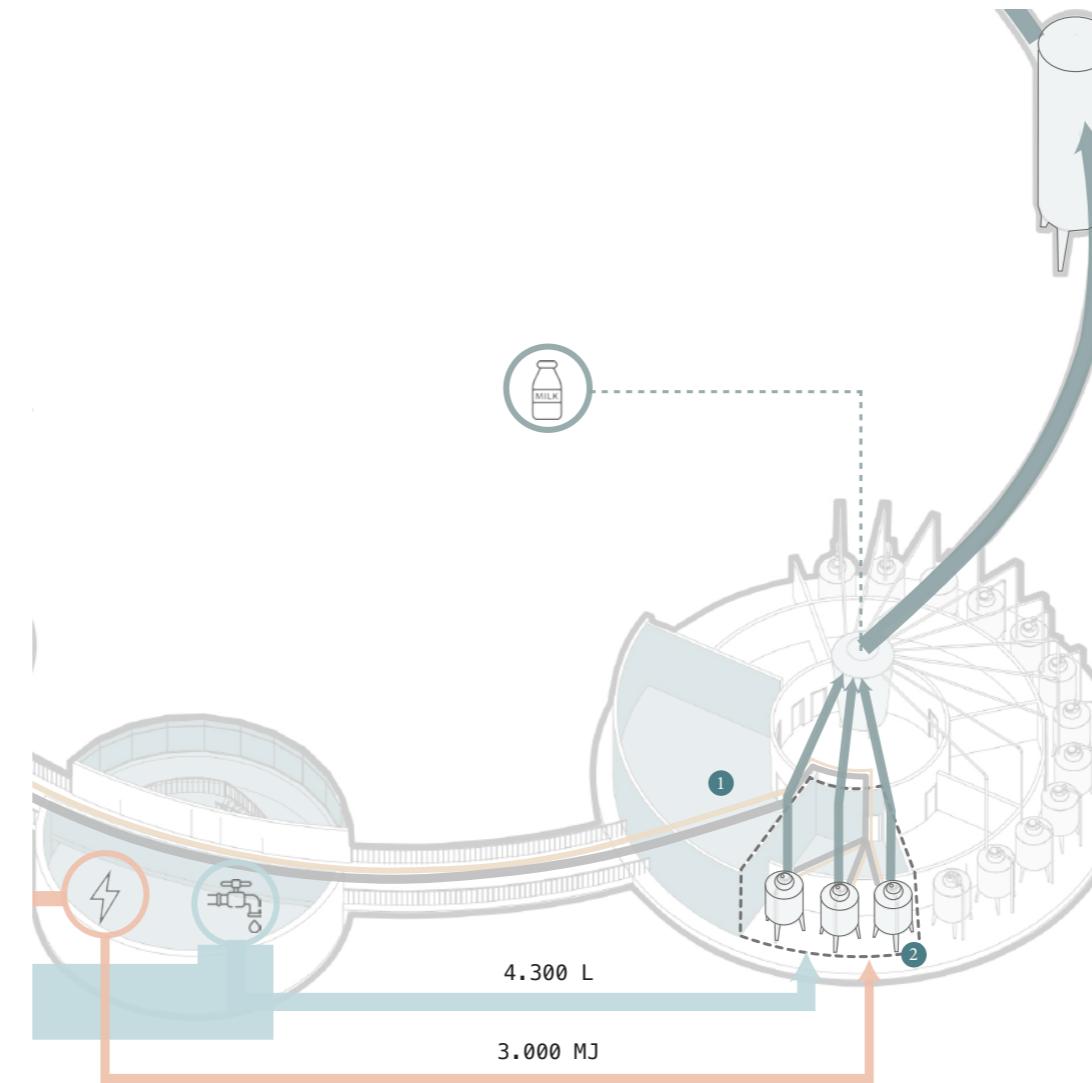
PHASE 01

artificial-milk protein production

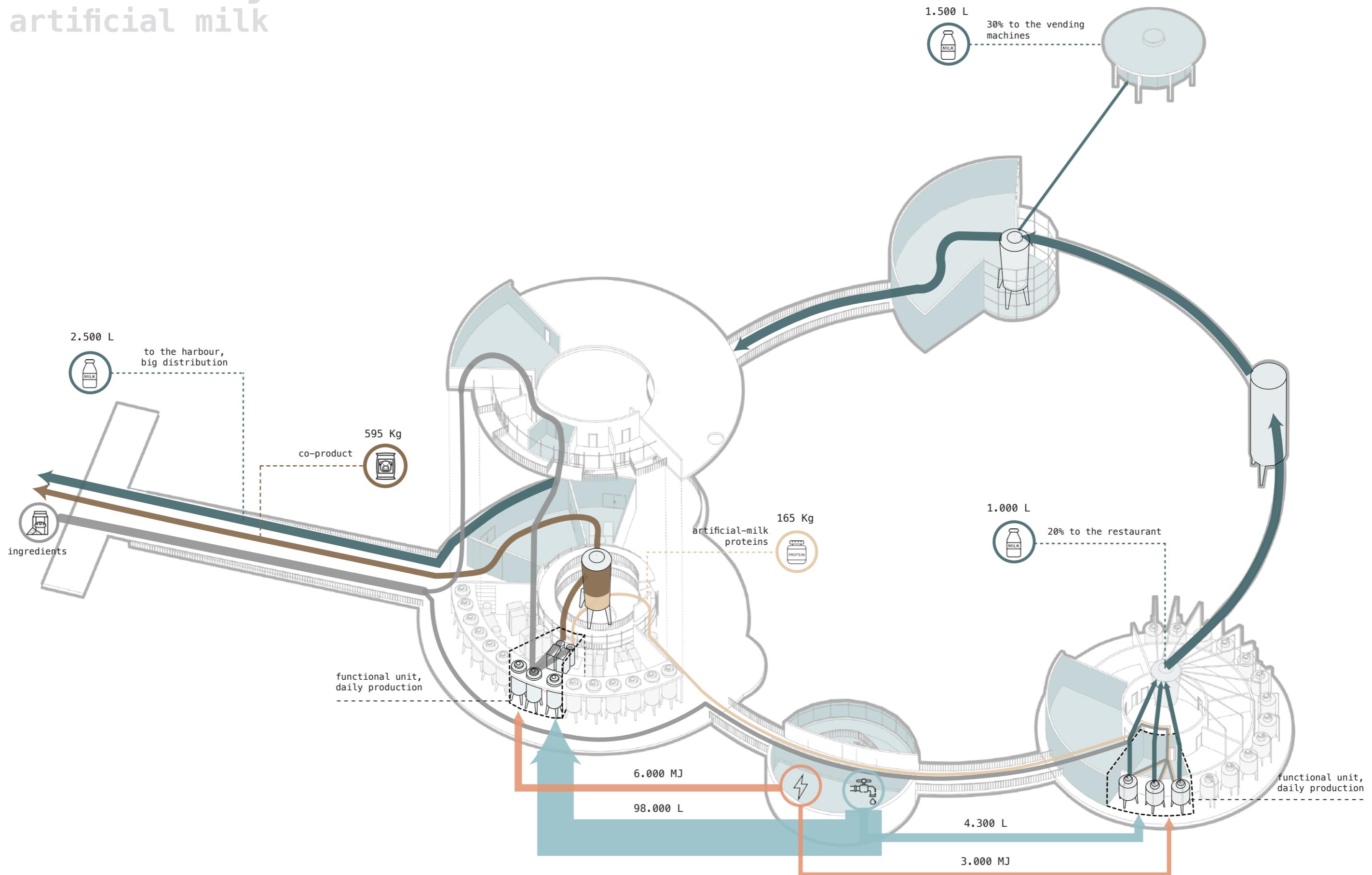


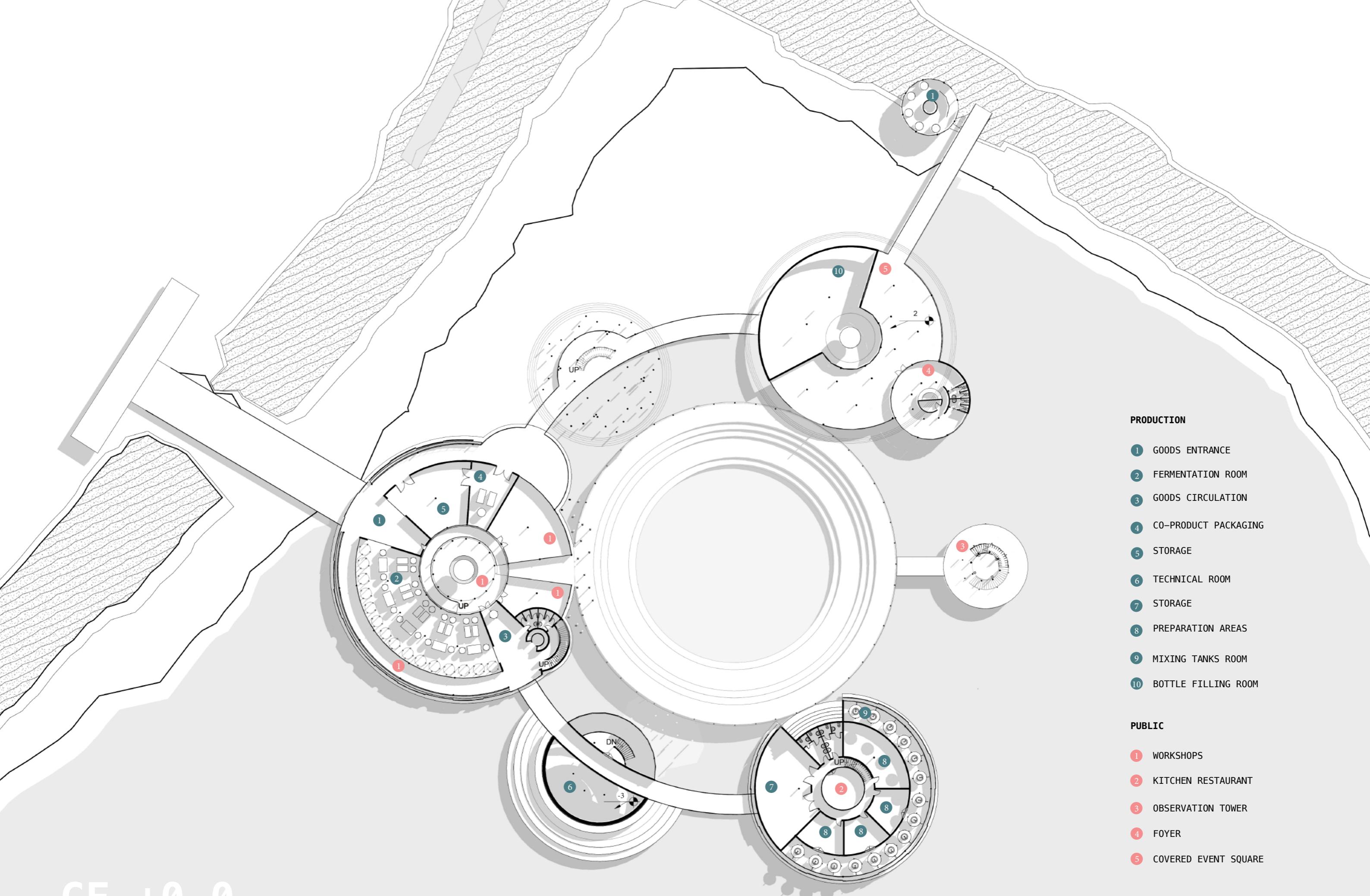
PHASE 02

milk production



5.000L/day artificial milk



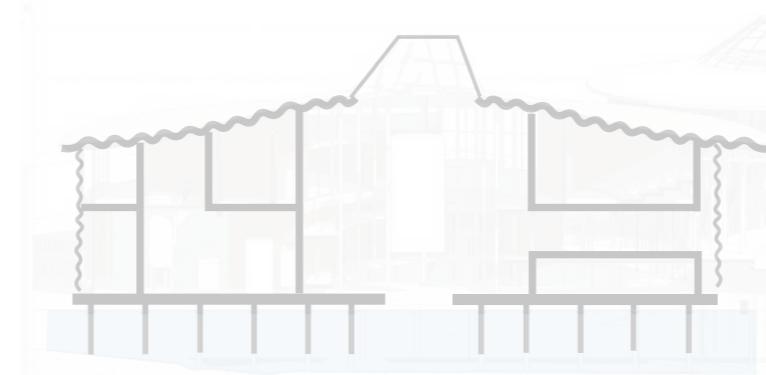


GF +0.0

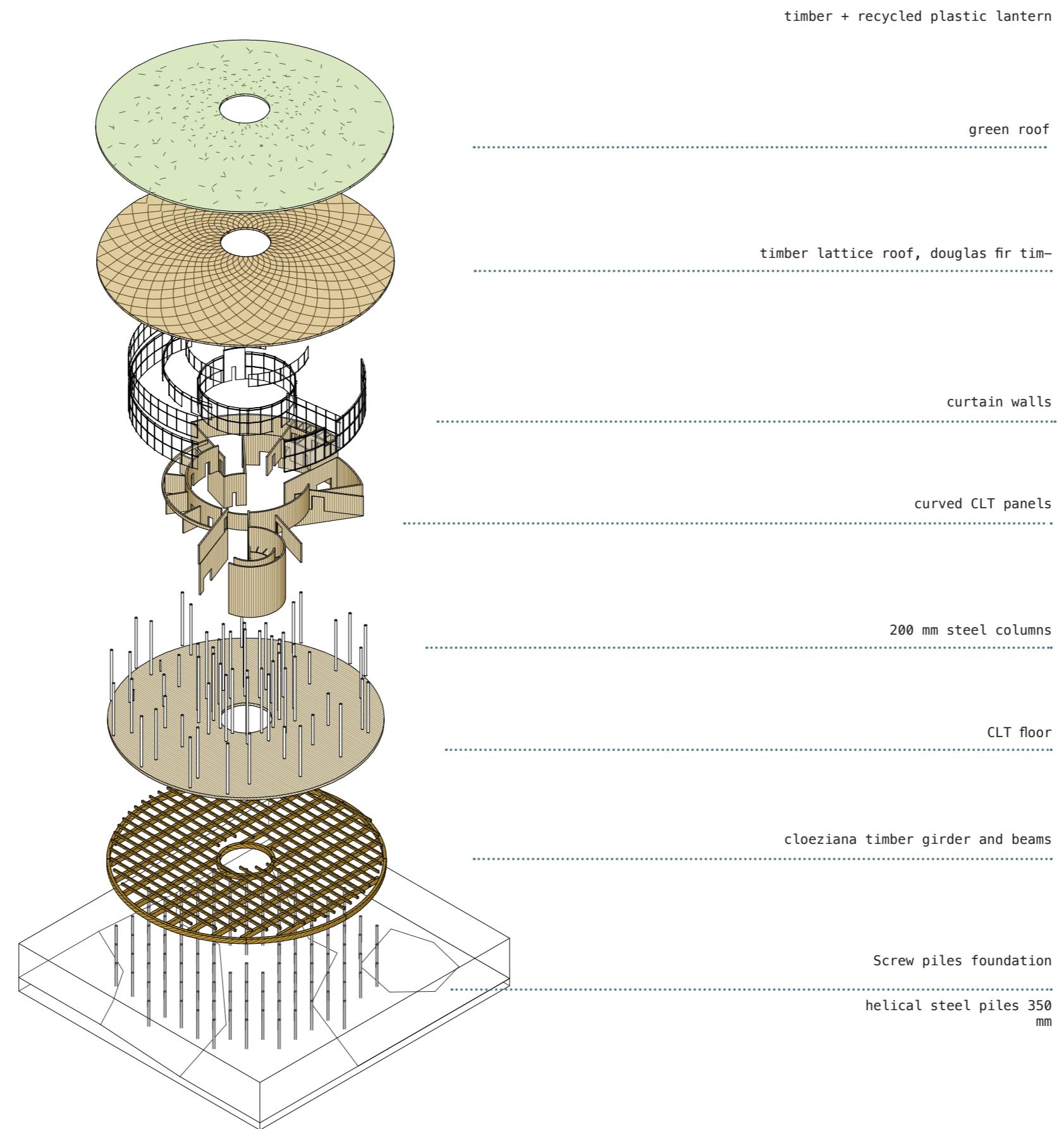


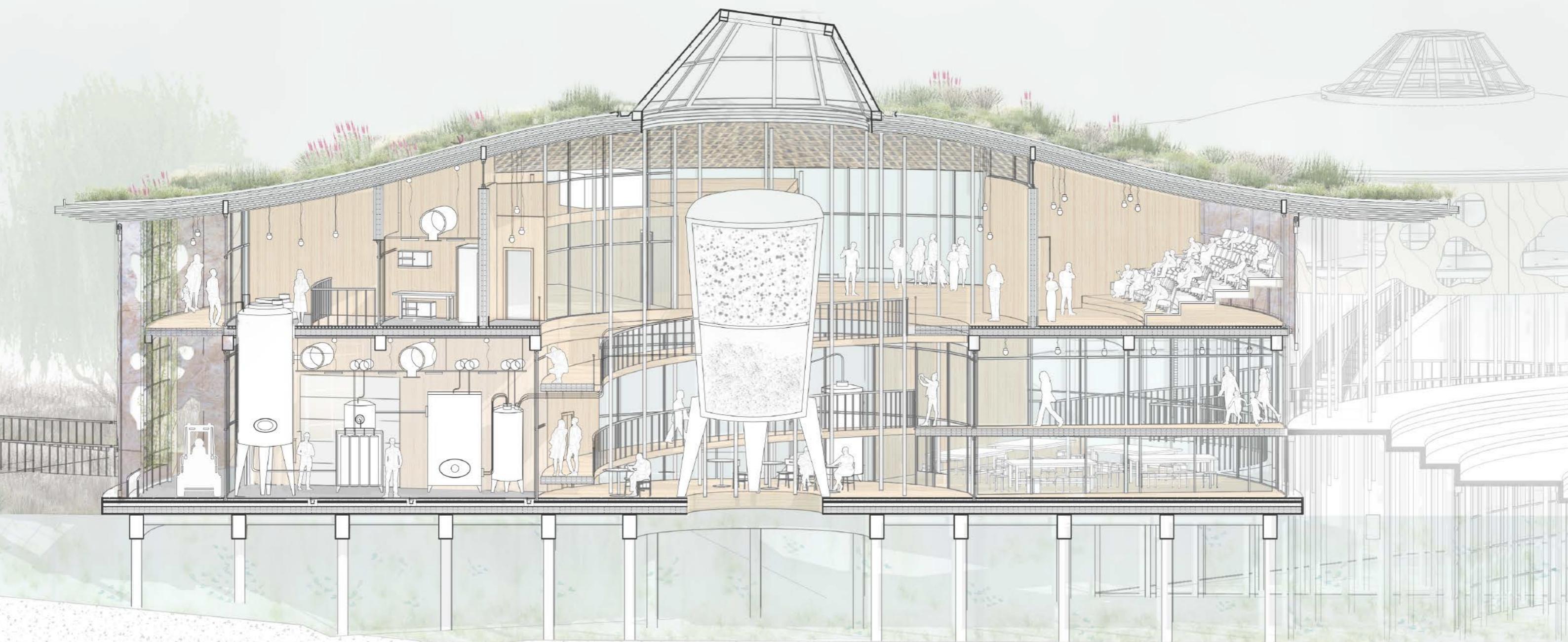
Milk farm 2.0 | sectional perspective





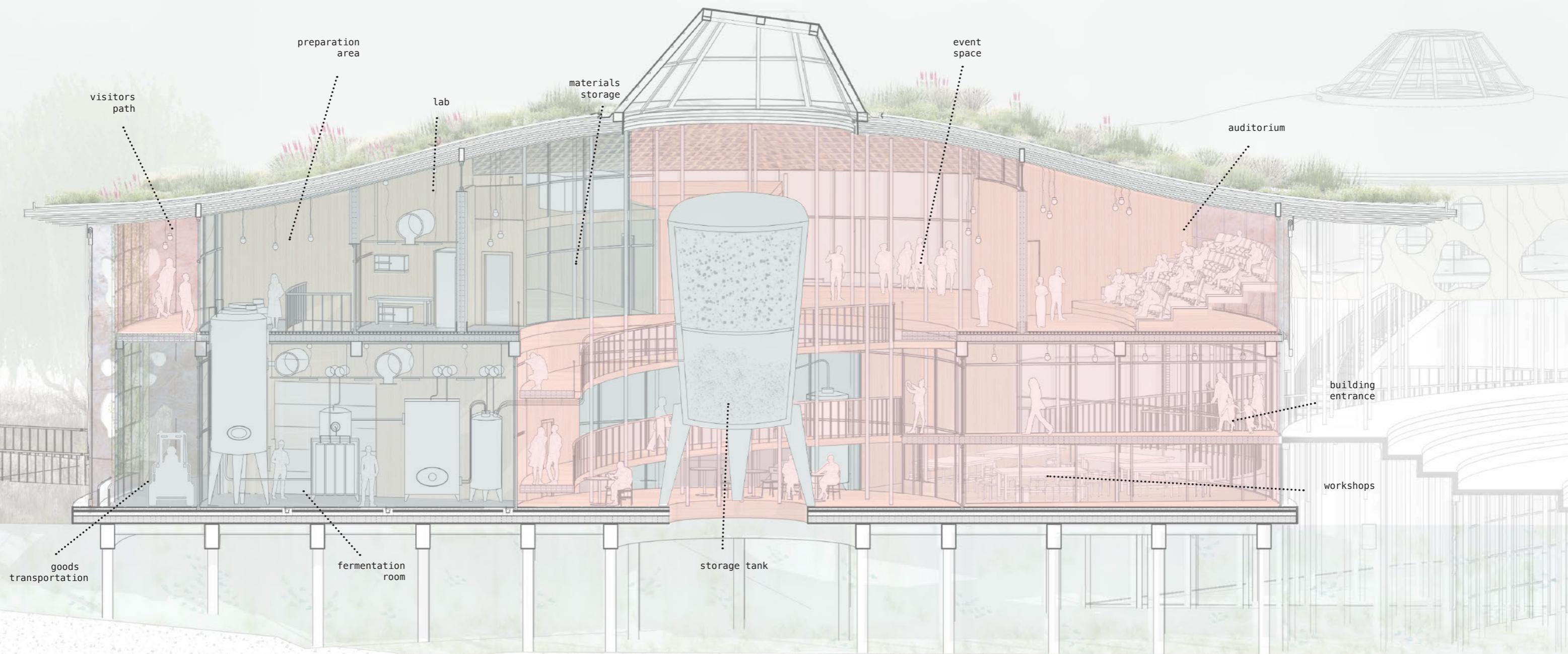
THE STRUCTURE





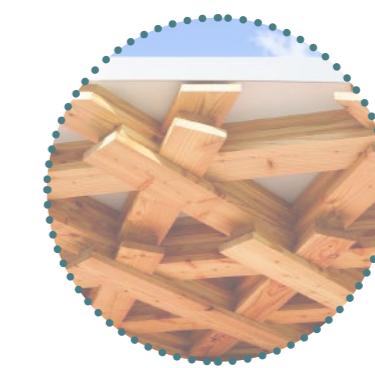
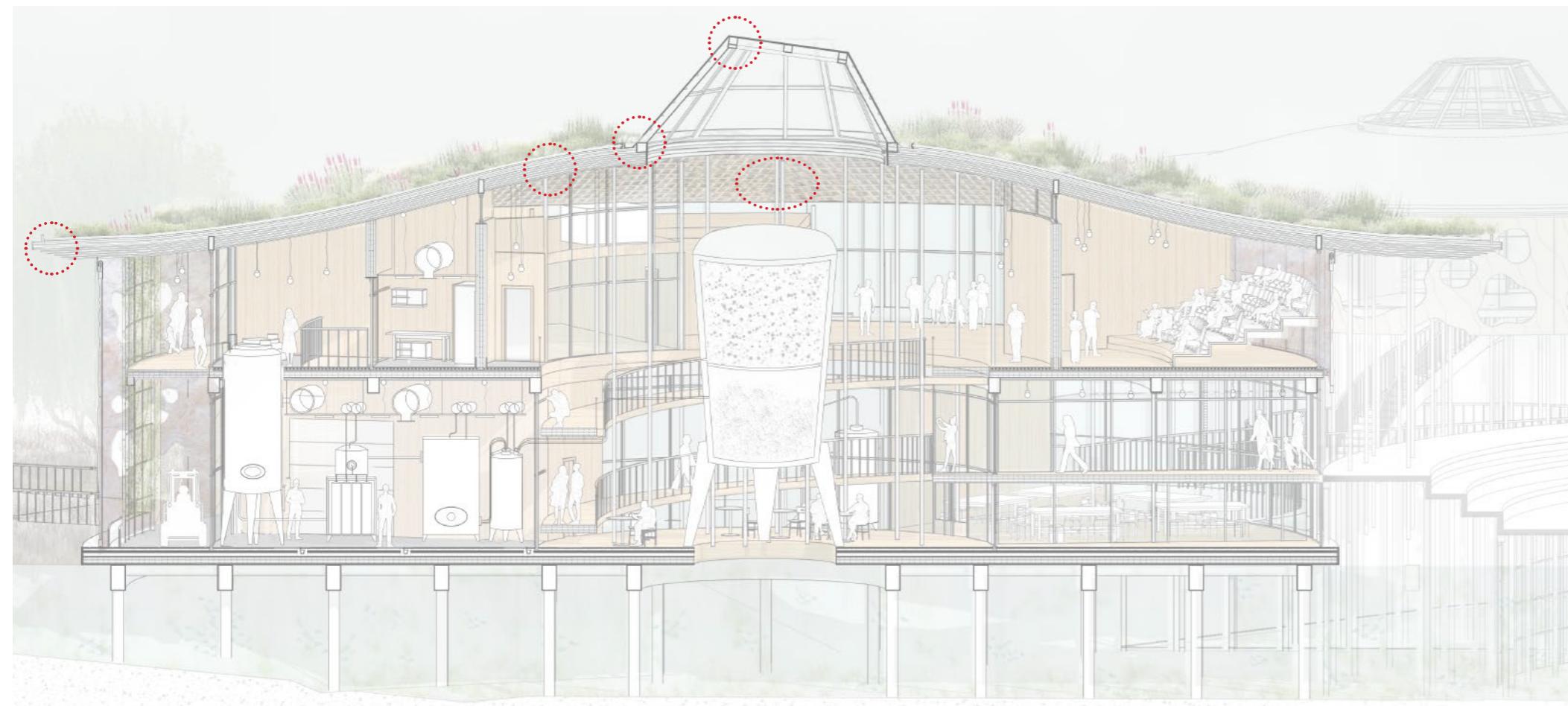
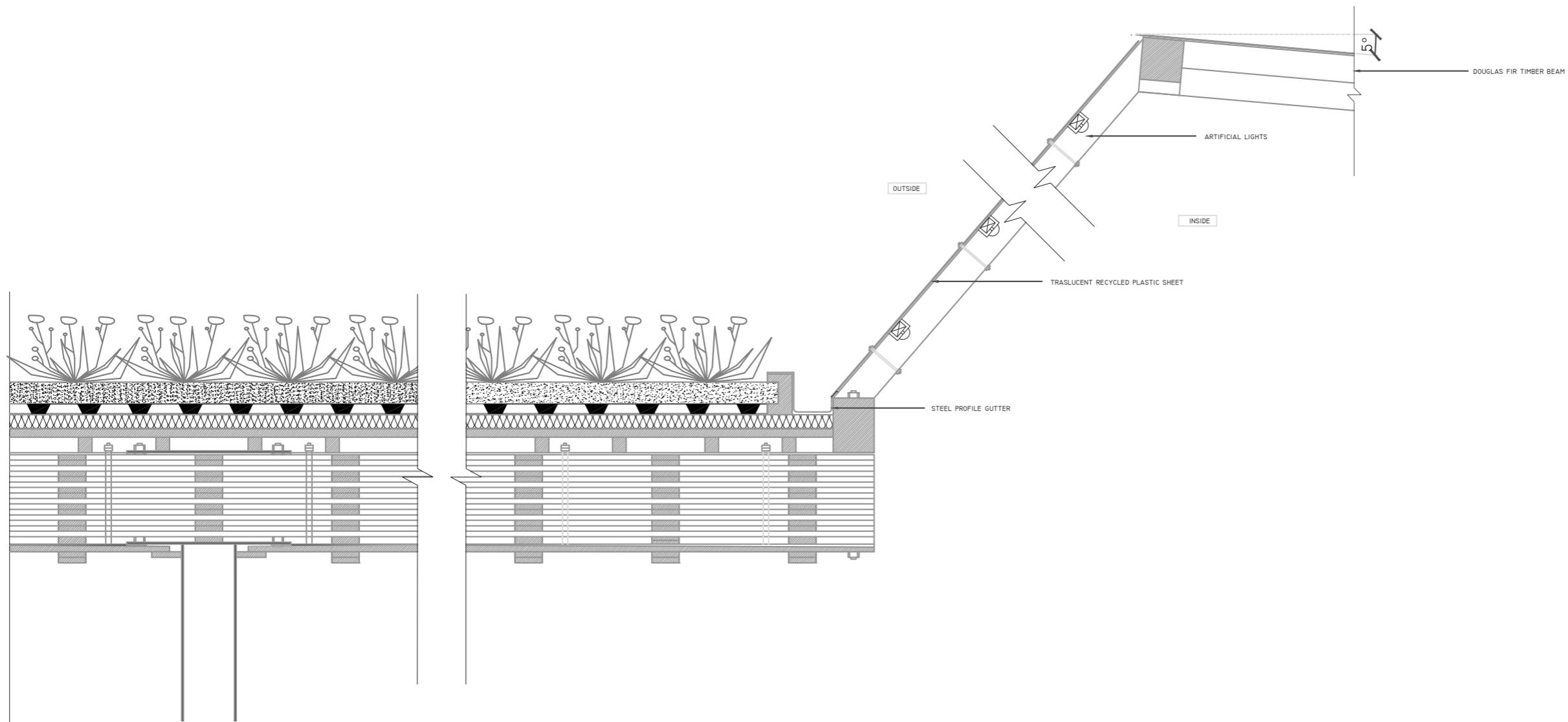
structure

detailed section



structure

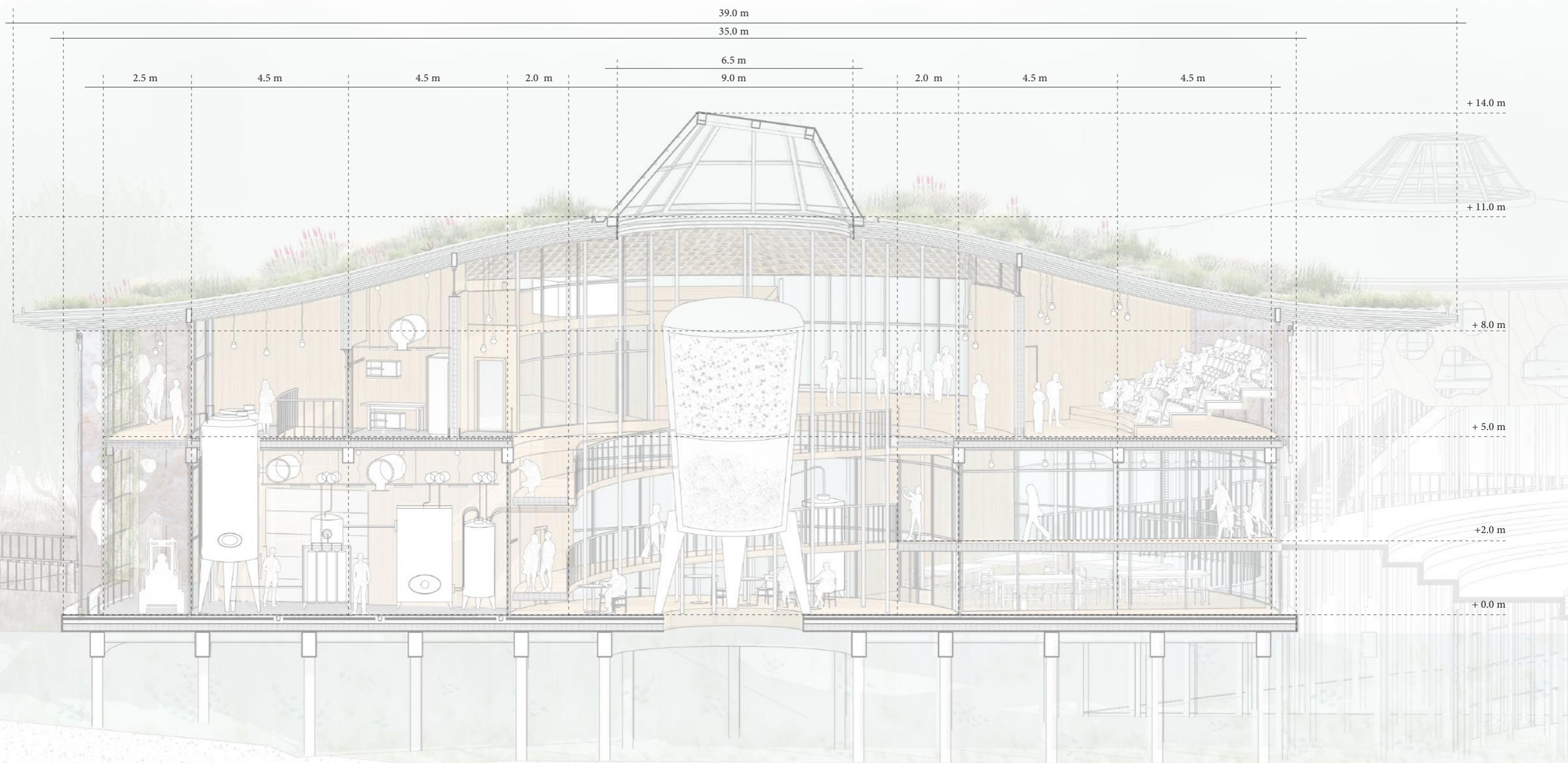
detailed section



The structure

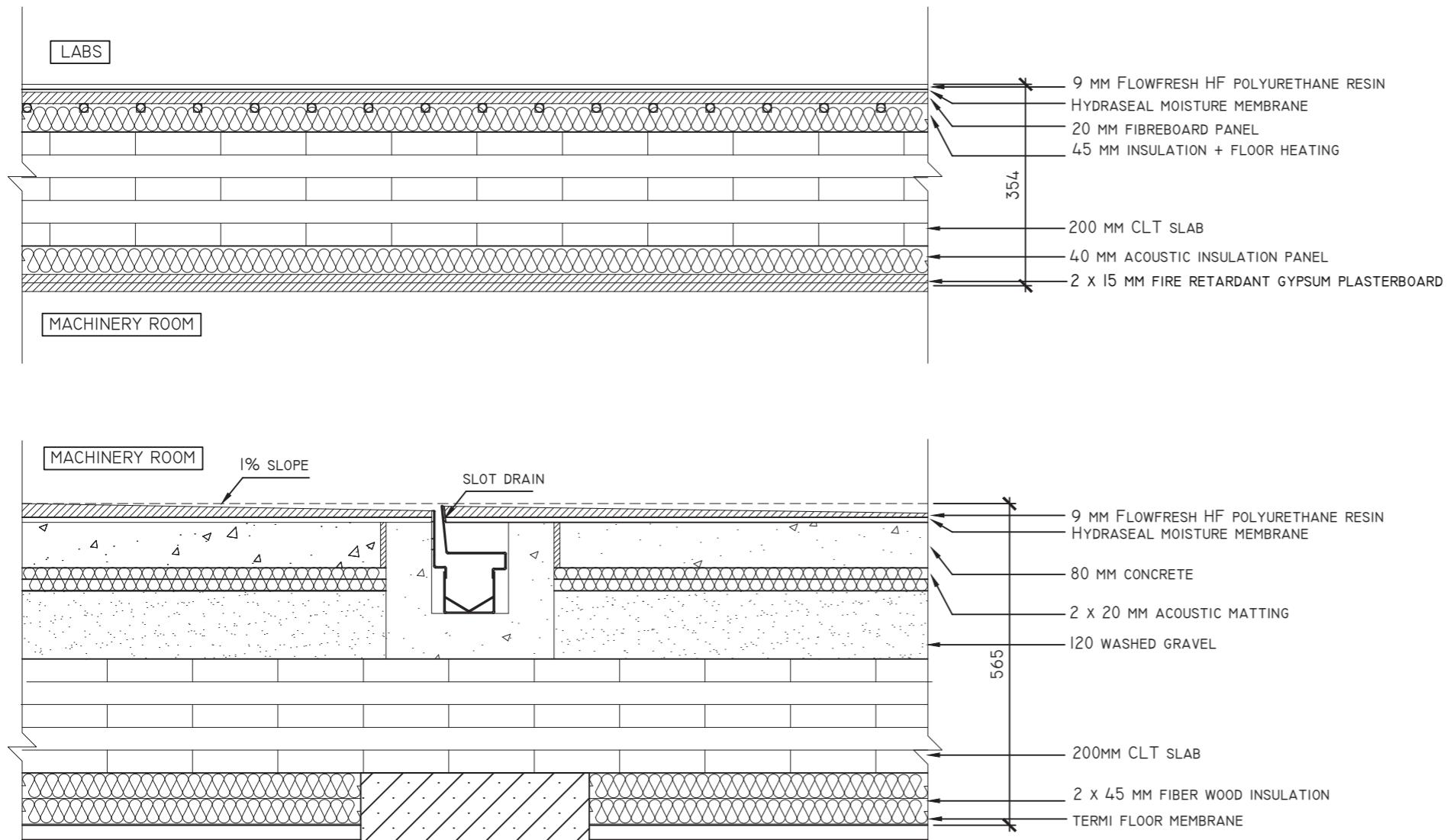


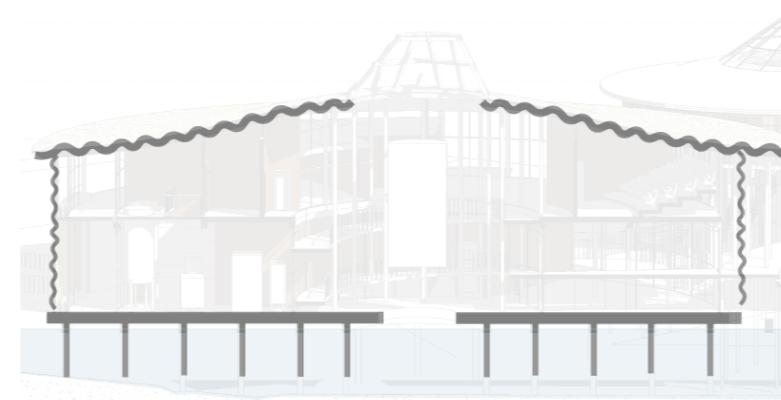
the timber lattice roof



structure

detailed section





A NATURE INCLUSIVE BUILDING



The external envelope | blending with the context



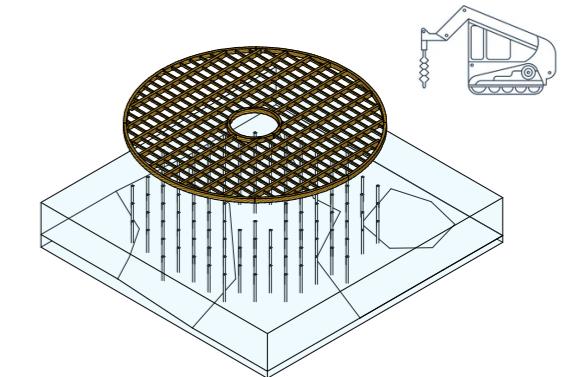
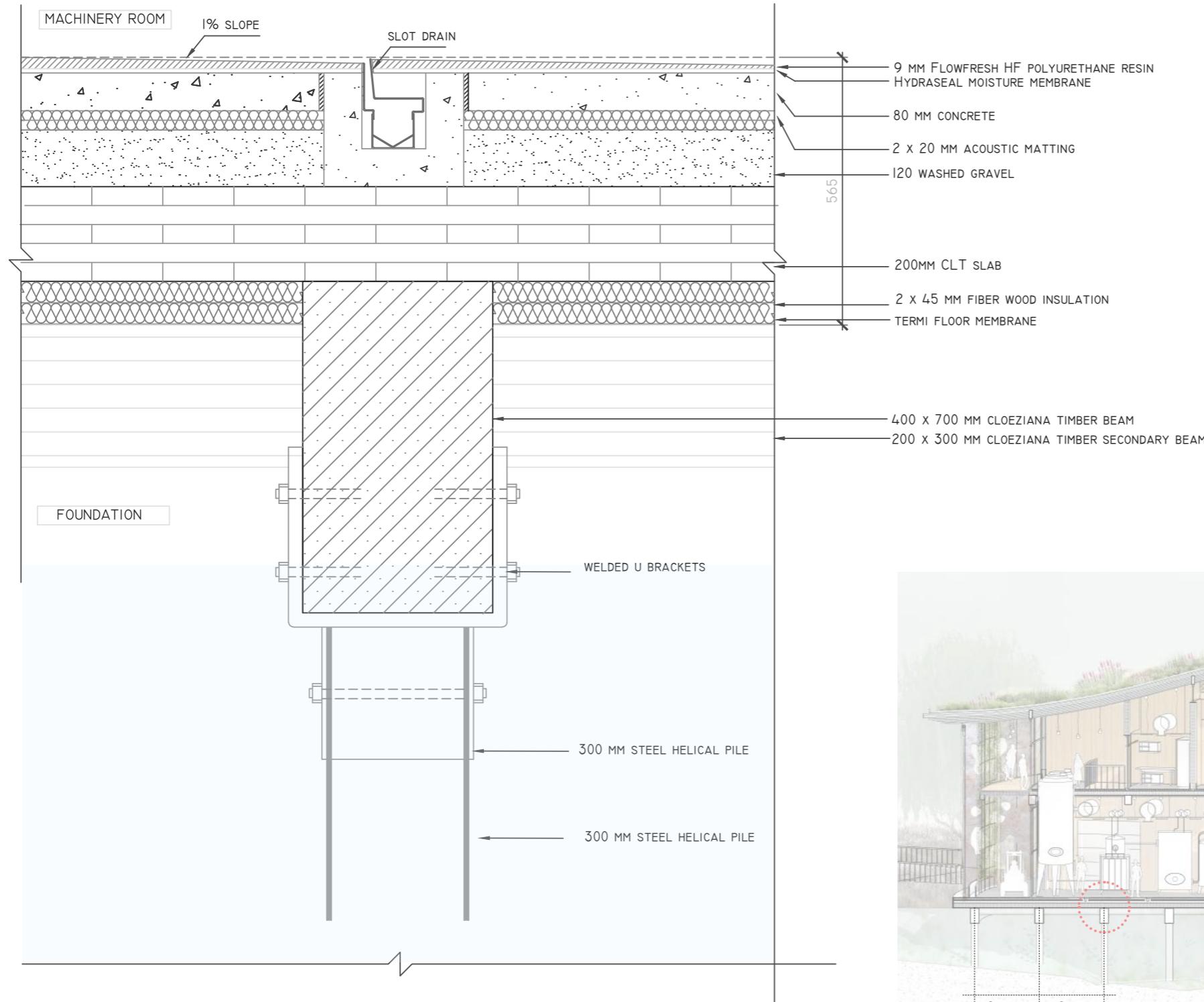
The artificial milk farm lies on helical screw piles, suspended from the natural landscape to represent how the industrial process is physically detached from the biosphere.



examples of underwater footage with aquatic life under houses built on water in Lelystad (NL)



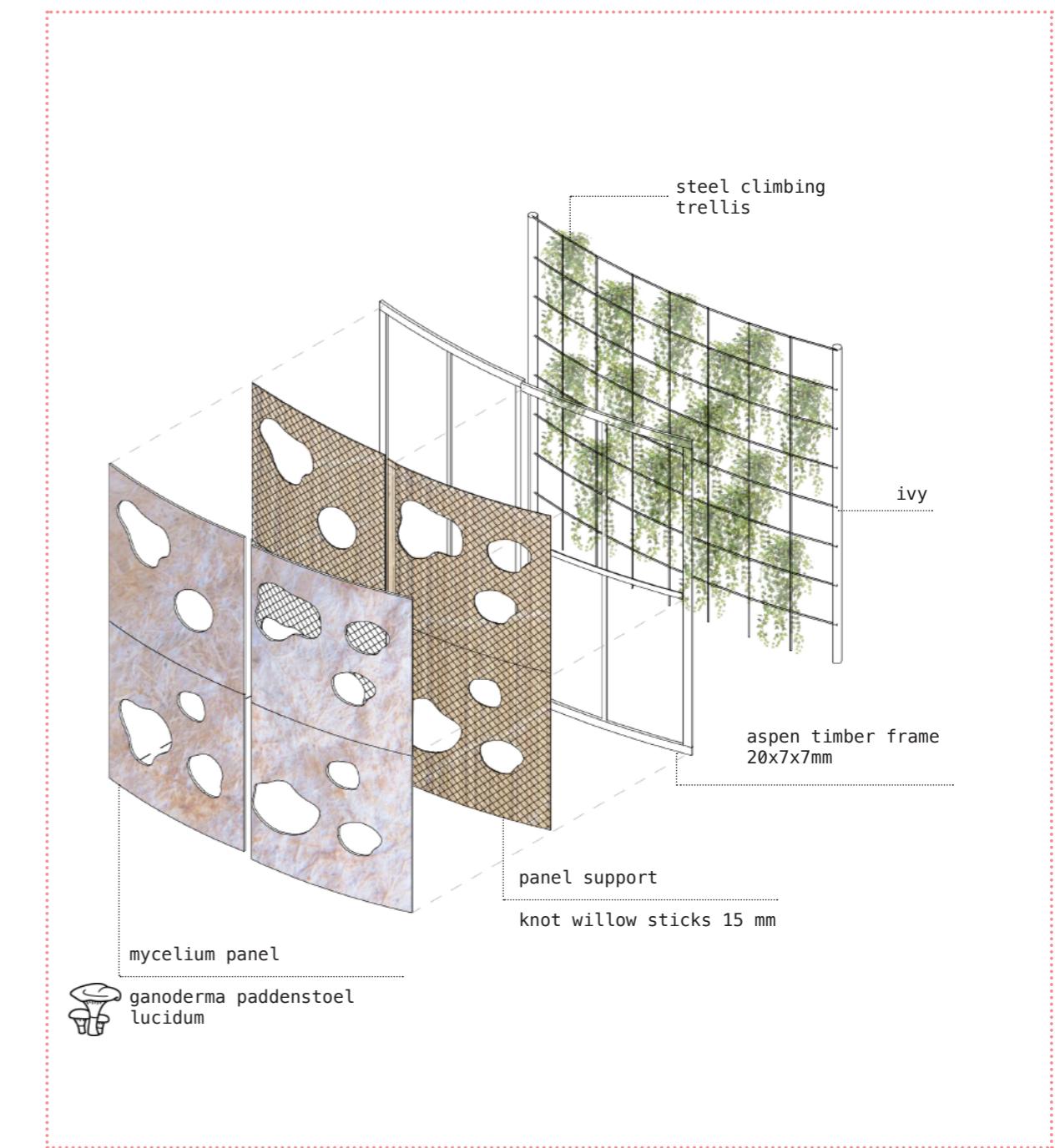
helical steel screw piles



Advantages:

- _ screw piles are installed by hidraulic augers with the minimal vibration and construction noise and they don't require excavation
- _ fast installation and disinstallation
- _ re-usable in other projects
- _ they benefit the local biodiversity providing a support to develop nature further





the facade | materiality

Double skin facade

Layer 1: external envelope
mycelium panels + green facade

Layer 2: curtain wall
transparency of the process

Public
visitors path

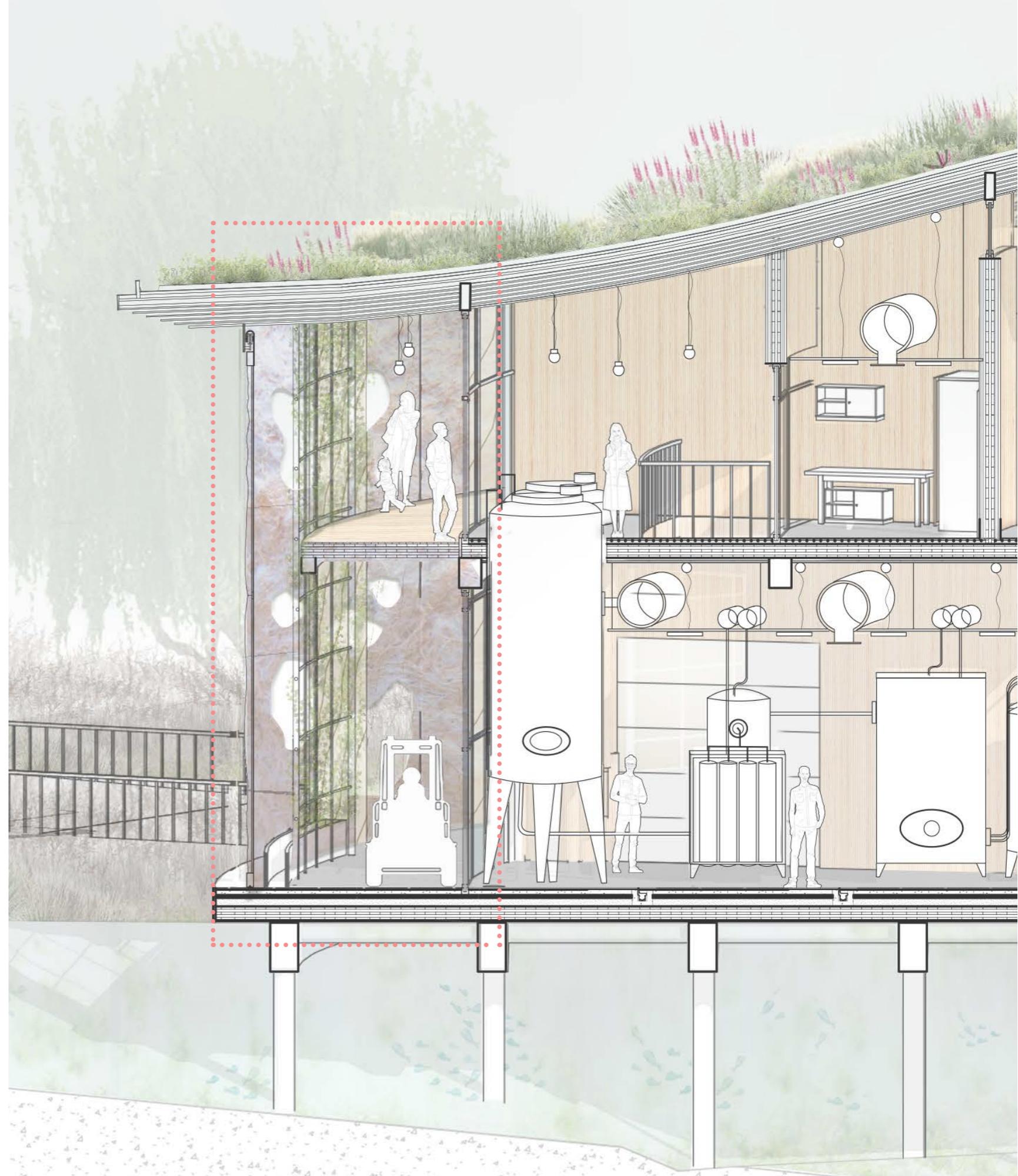
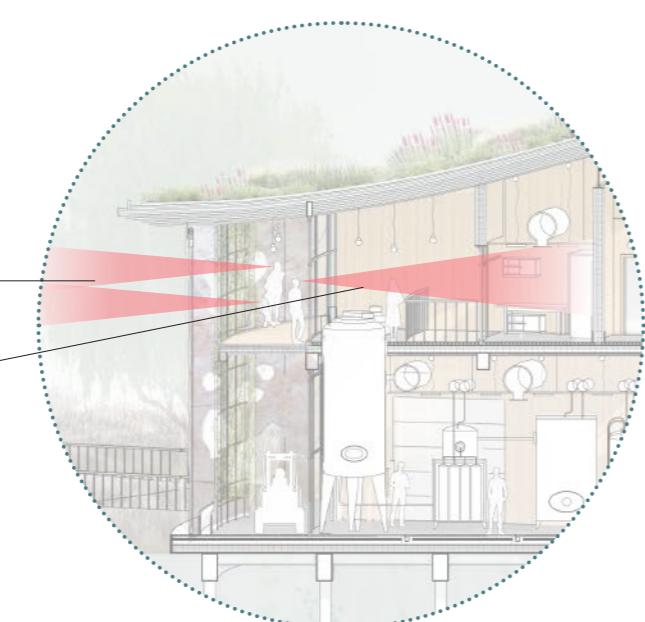
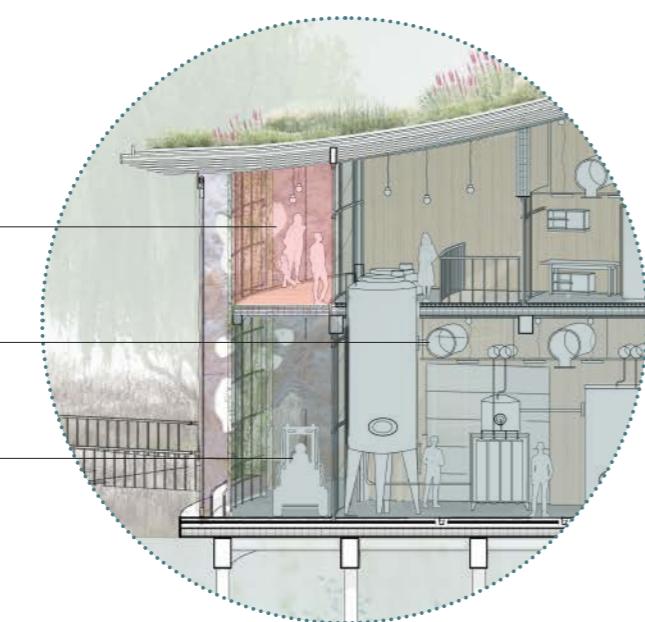
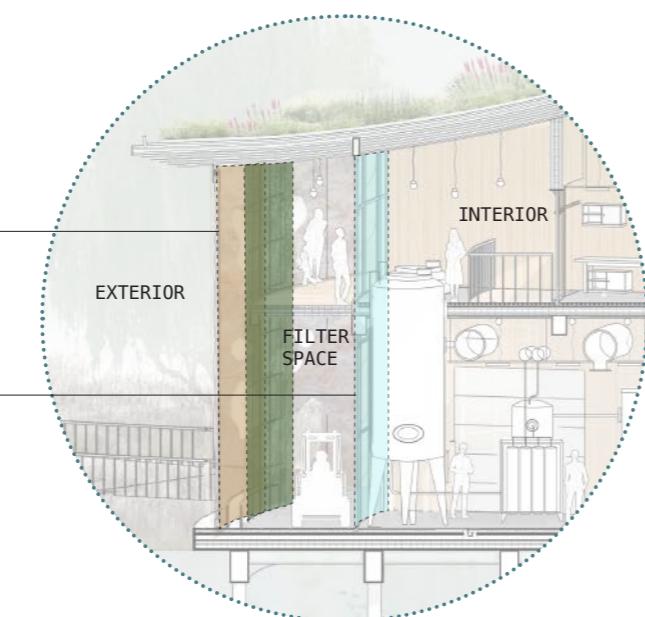
Private
fermentation room

Private
goods transportation

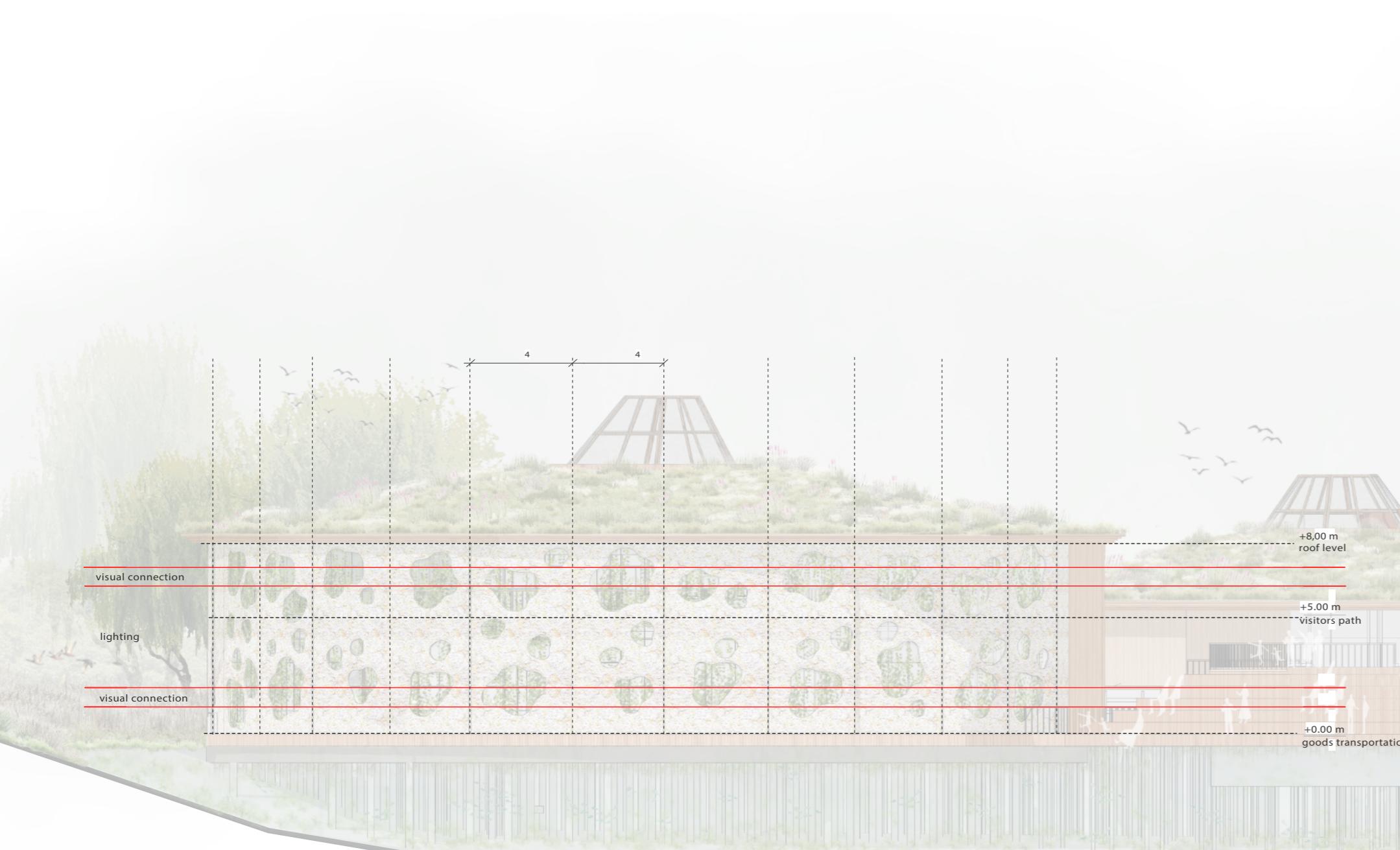
Visual connection

to the nature

to the production
of artificial milk



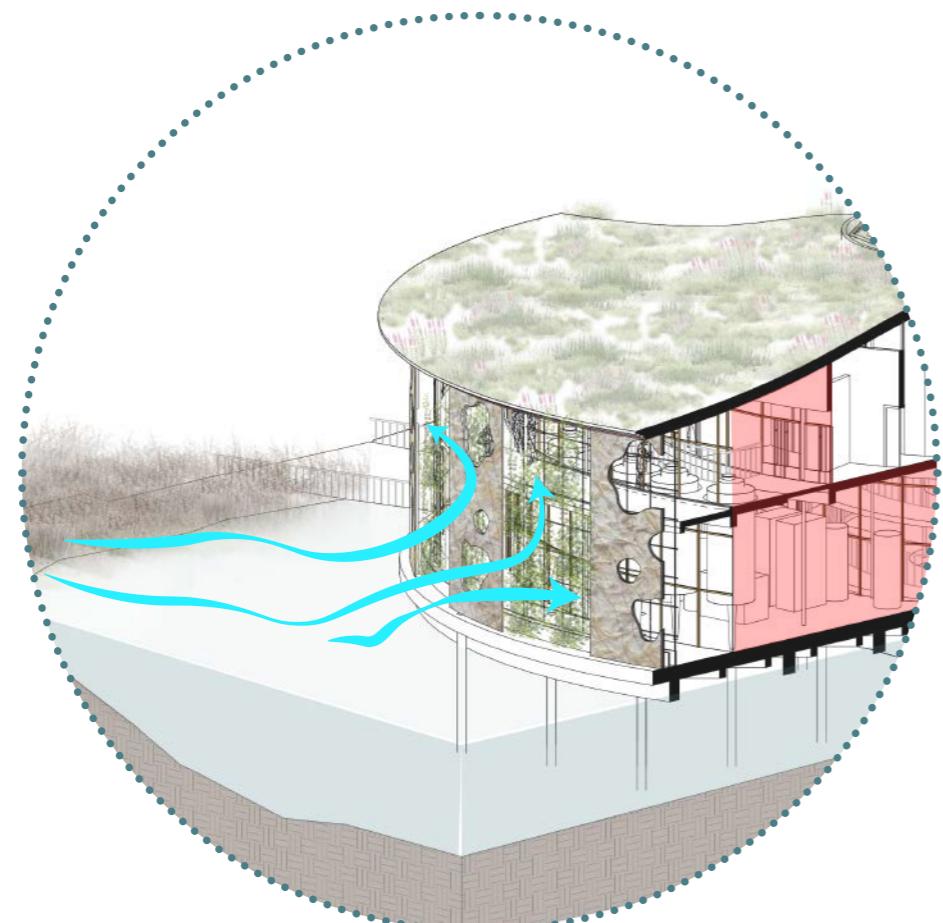




shoji panels

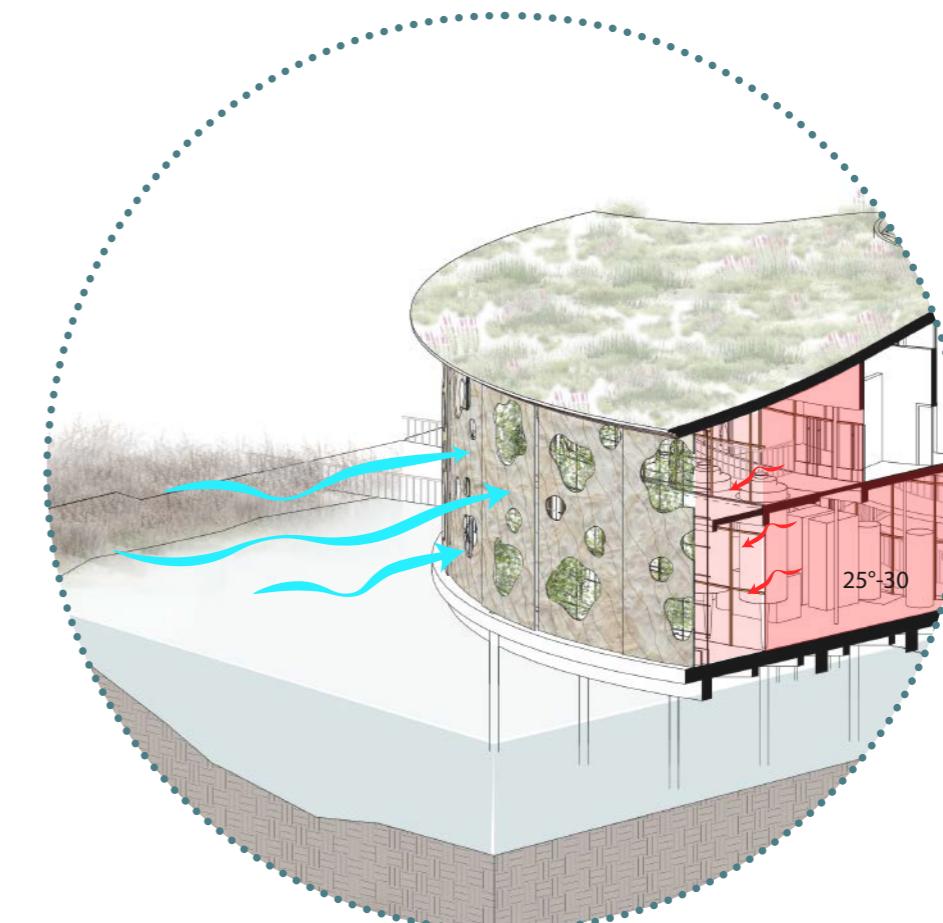


industrial
sliding doors



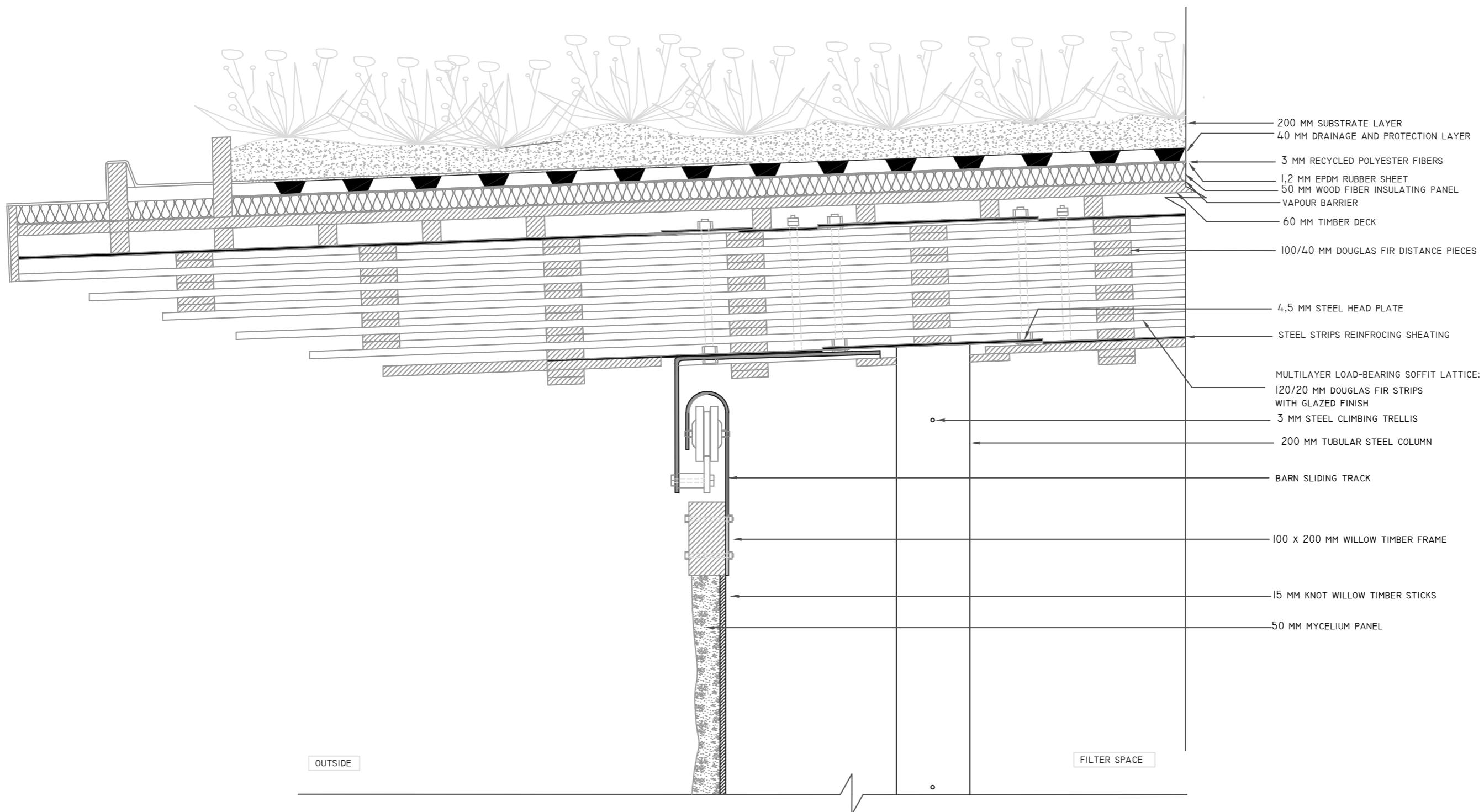
Summer

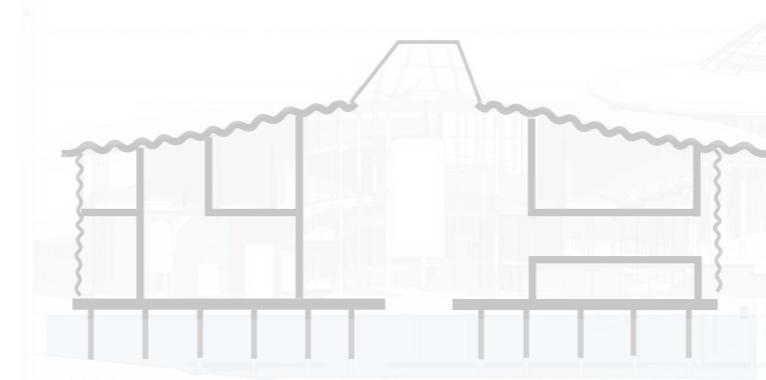
The sliding mycelium panels open up and allow the natural ventilation of the filter space, constantly heated by the fermentation room. The presence of the water of the polder helps further to mitigate the climate, cooling up the wind during the summer season. Moreover the green facade creates a sun screen and prevents the heat to enter the filter space while allows light to filter.



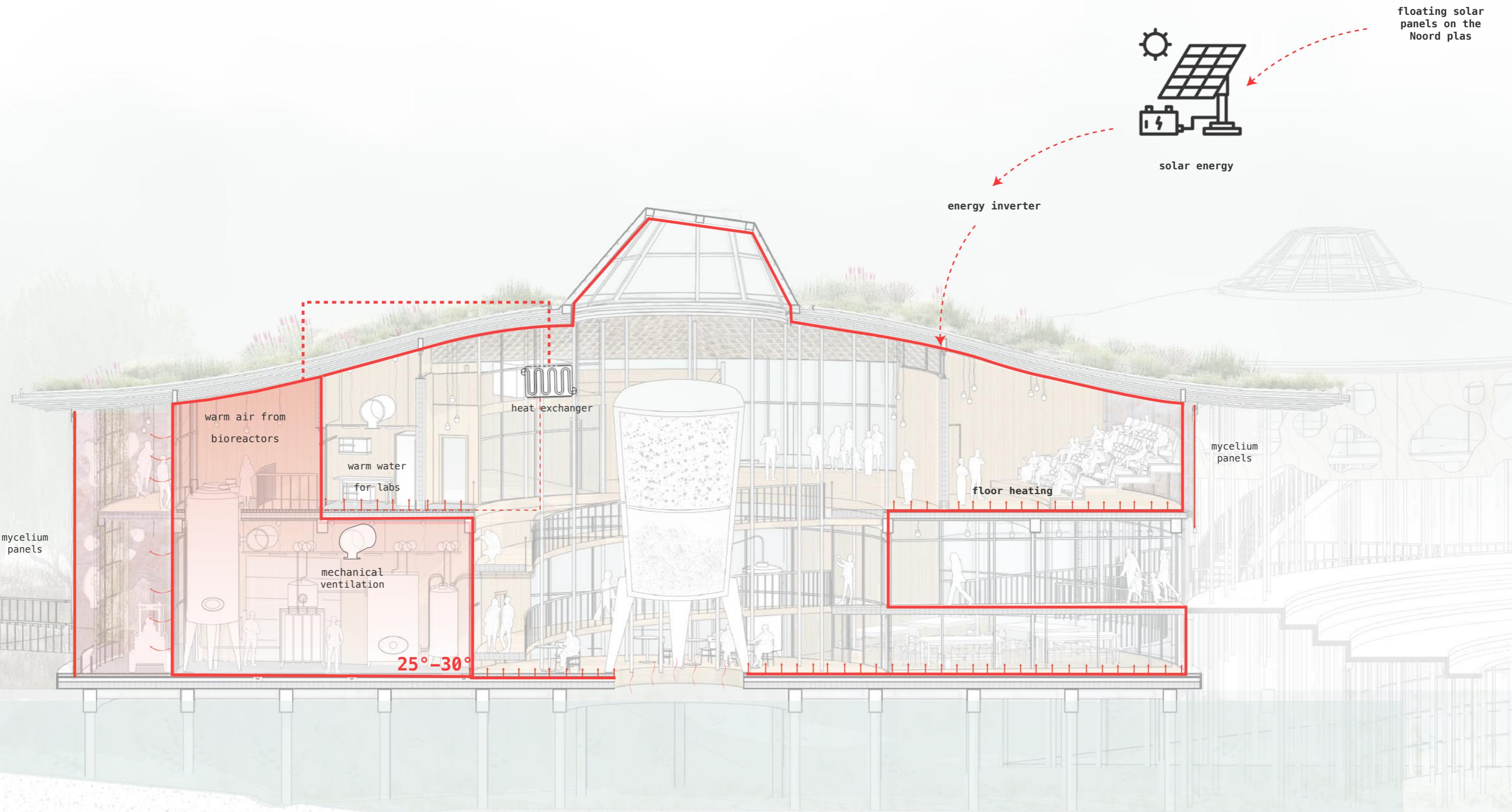
Winter

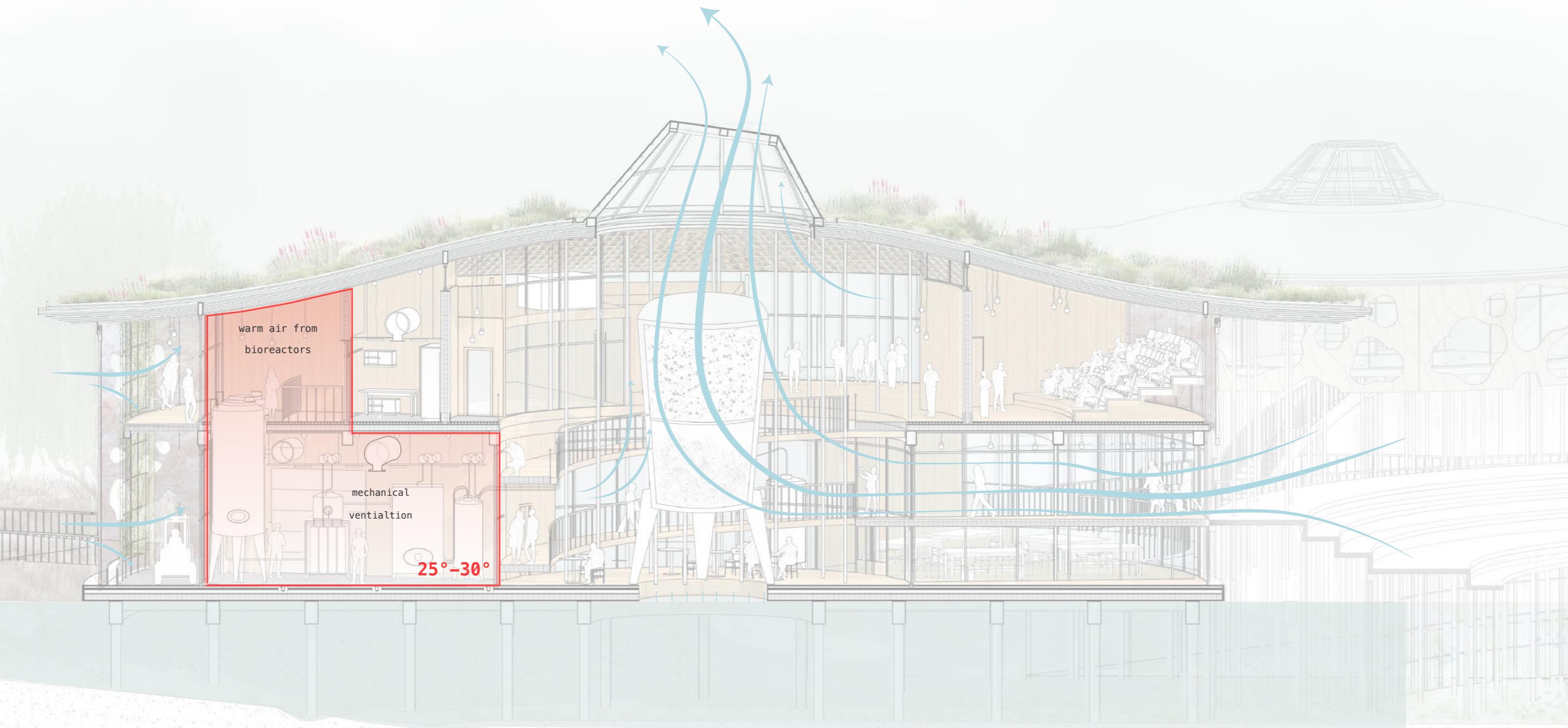
The mycelium panels act like wind shields during the winter season although the proximity of water helps to mitigate the climate, reducing the thermal excursion between day/night. Moreover the mycelium panels, thanks to their insulation properties, help to keep the heating produced by the fermentation room inside of the filter space that is passively heated. The latter becomes a climate comfortable space for the visitors of Milk farm 2.0. The porous facade allows the light to filter also during the winter season.

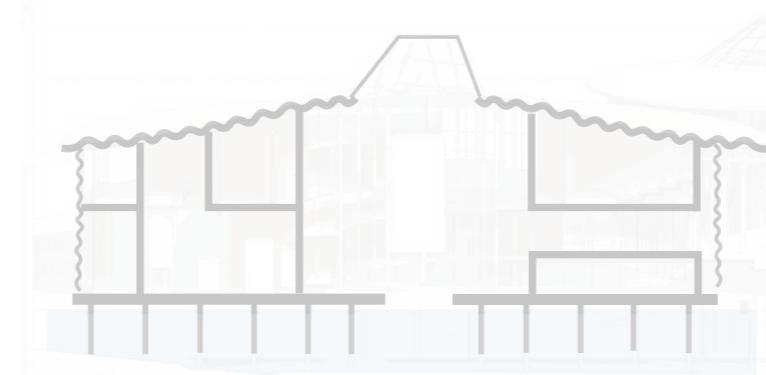




CLIMATIC ADAPTATION

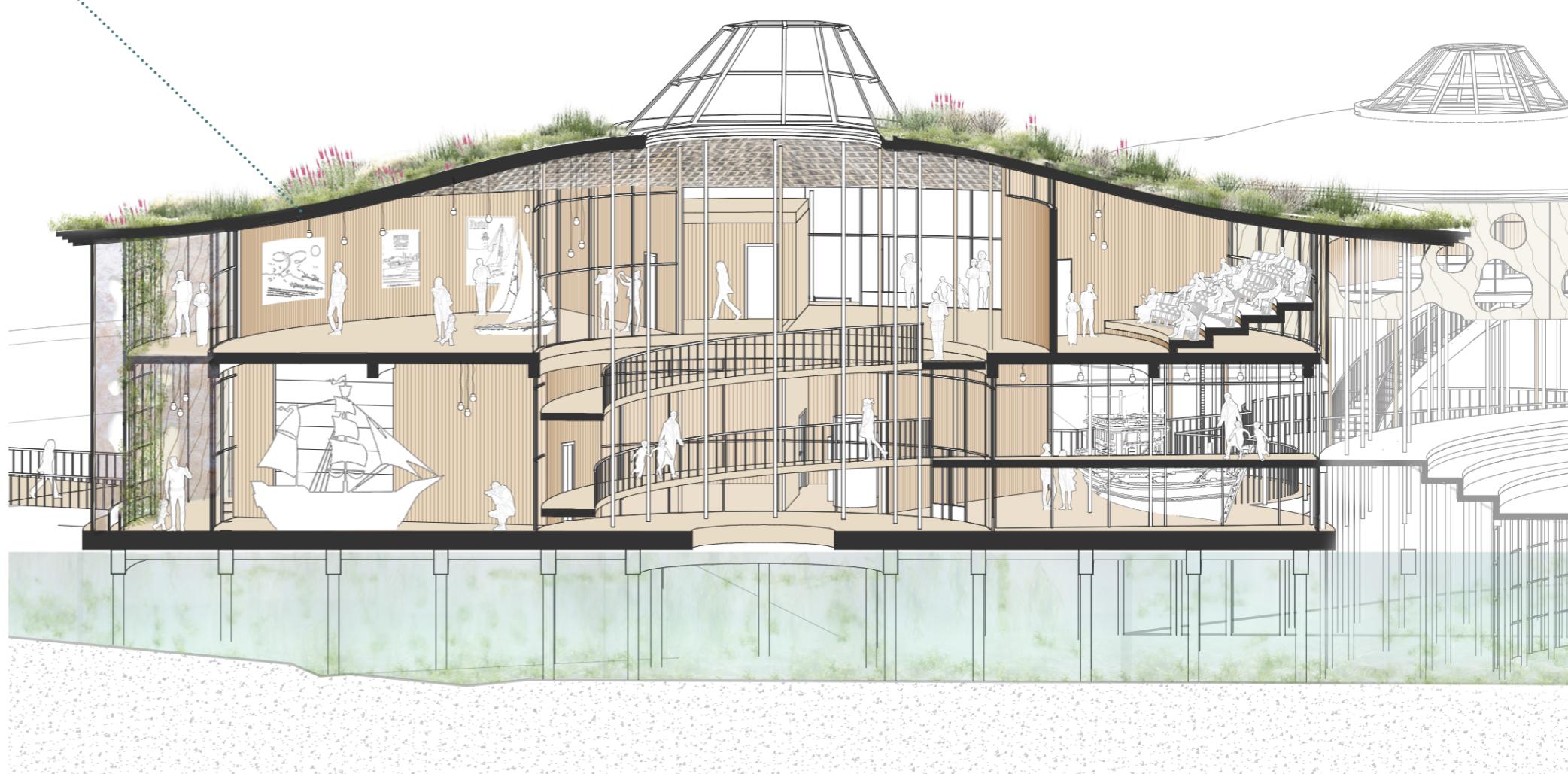
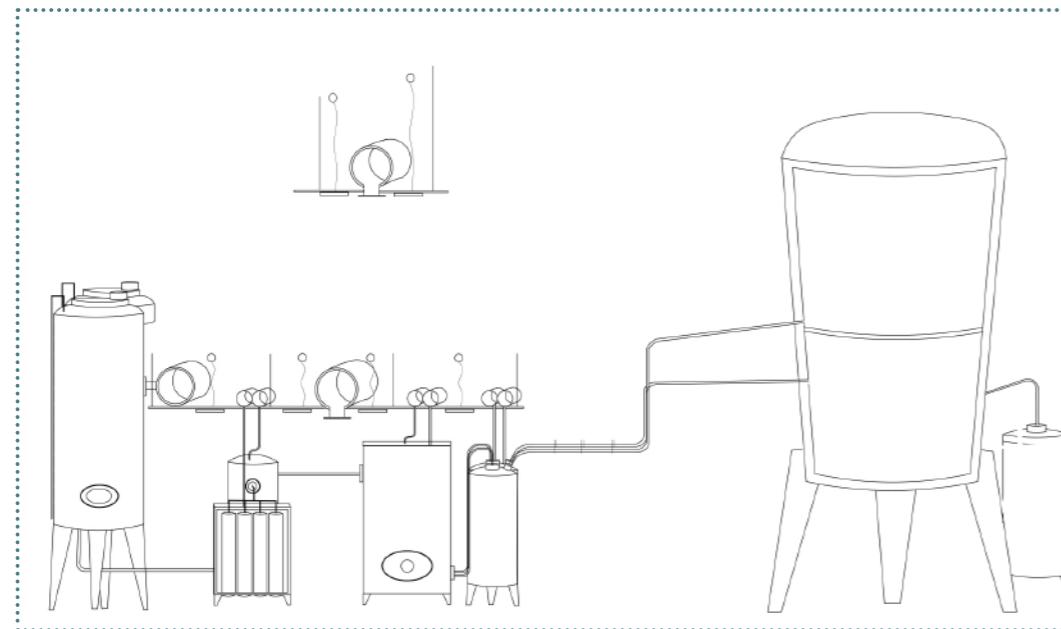






FUTURE SCENARIOS

installations + machines



The structure allows a future change in the programme of the building. Installations and machines might be easily removed from the building and re-used in another artificial milk refinery, while the clt internal partitions can be moved according to the new programme.



Perfect Day foods, 2020

Since artificial-milk is becoming a disruptive and in continuous development technology, we can imagine how Milk farm 2.0 might expand over time and in 10 years new buildings for cheese or other dairies processing might be added to the existing intervention.

