P5 PRESENTATION - JULY 3RD

GRADUATION STUDIO 2013/14

SUSANNE HOFER 4246977

SUSTAINABLE SEAWEED FARM

FOR SUSTAINABLE FOOD PRODUCTION IN THE NETHERLANDS

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SUSTAINABLE SEAWEED FARM

FOR FOOD PRODUCTION IN THE NETHERLANDS

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NATURE

AS INSPIRATION AND SOLUTION

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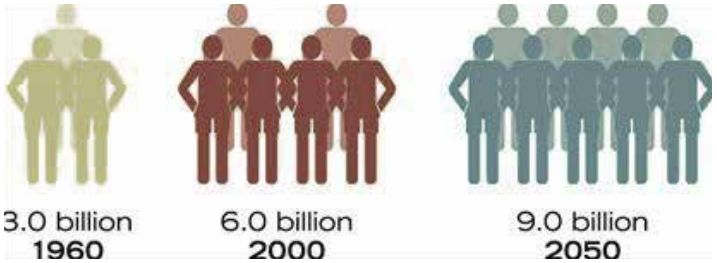
this project is...

concerned with ....



a growing population demands

MORE SPACE FOR FOOD PRODUCTION

negative environmental impact through

BUILDING RELATED CO2 EMISSION

- PROCESSING
- TRANSPORTATION
- OPERATING
- DISPOSAL (WASTE)

CLIMATE CHANGE

CAUSED BY POLLUTION OF A GROWING POPULATION

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TECHNICAL RESEARCH

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SUSTAINABLE SEAWEED FARM

FOR FOOD PRODUCTION IN THE NETHERLANDS

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MAKE USE OF THE SEA FOR AGRICULTURE .

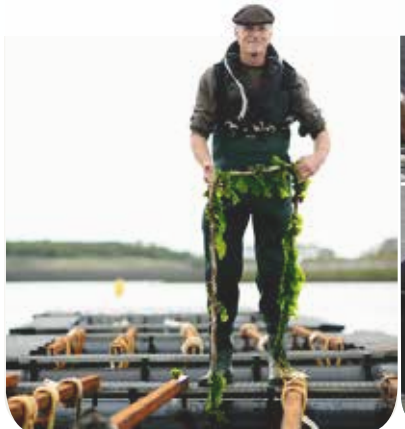
SHIFT TO A MORE PLANT BASED DIET .

MORE SUSTAINABLE WAY OF FOOD PRODUCTION +
NO WASTE of DRINKING WATER for GROWING FOOD +
NEW VAST EXTRA SPACE FOR FOOD PRODUCTION +
PURIFICATION OF WATER +

SUSTAINABLE SEAWEED FARMING

JACOBAHAVEN - OOSTERSCHELDE - ZEELAND

Zeewaar



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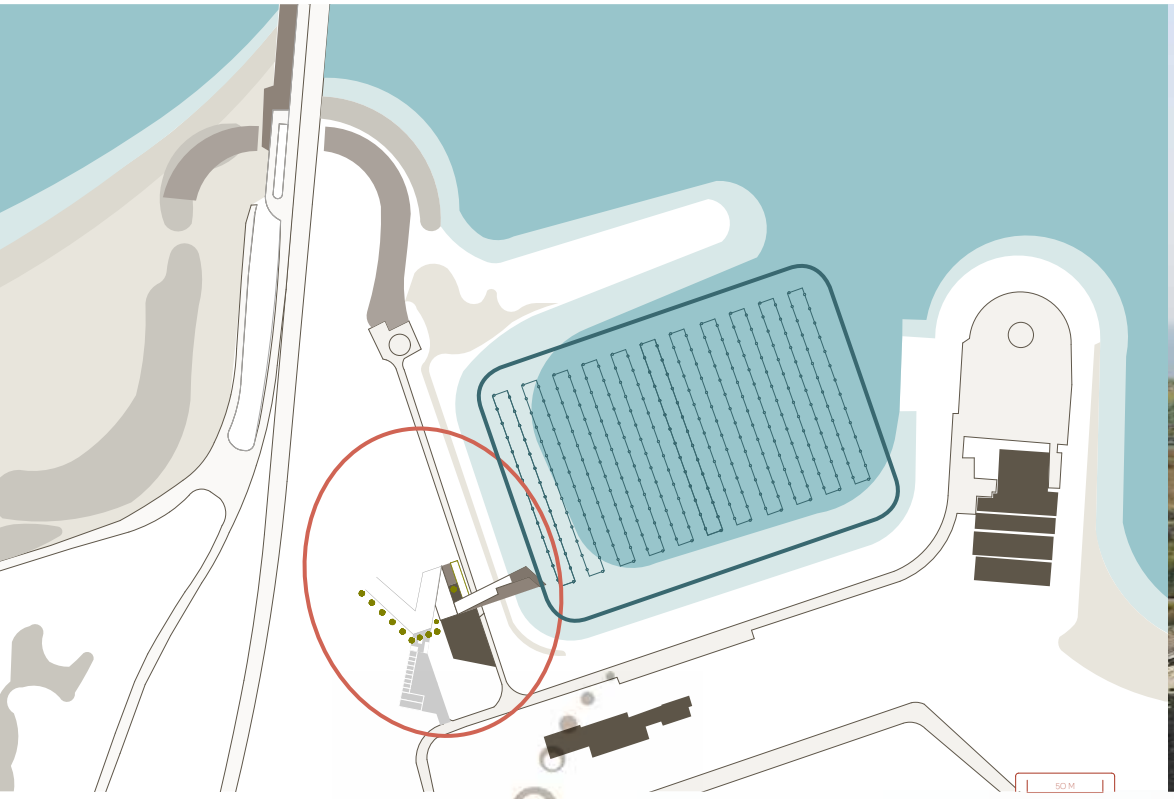
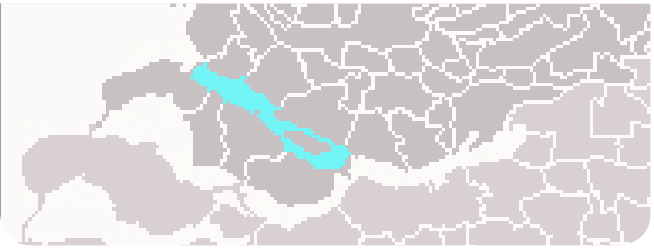
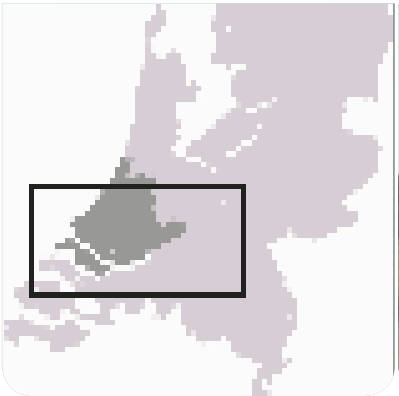
THE NETHERLANDS - ZEELAND - JACOBAHAVEN



Zeewaar

JACOBAHAVEN - ZEELAND - THE NETHERLANDS





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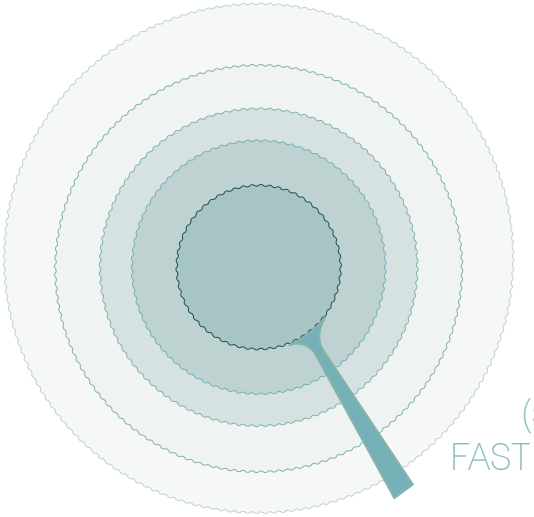
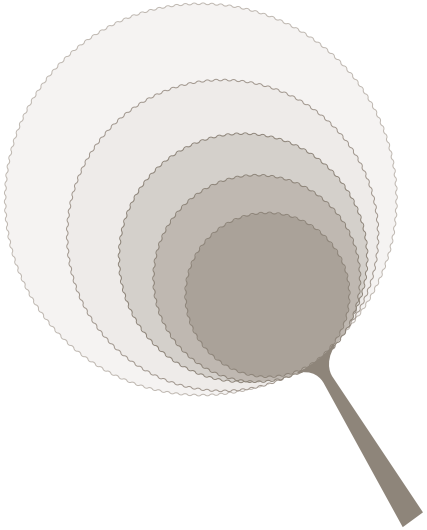


growing process
green algae

SUMMER
(spring > September)
FAST GROWING & LIGHT



growing process
brown algae

WINTER
SLOW GROWING

OAR WEED
Laminaria Digitata
large brown algae

SEA BELT
Saccharina Latissima
brown algae

WINTER

SEA LETTUCE
Ulva Lactuca
green algae

SUMMER

CULTIVATED SEAWEED

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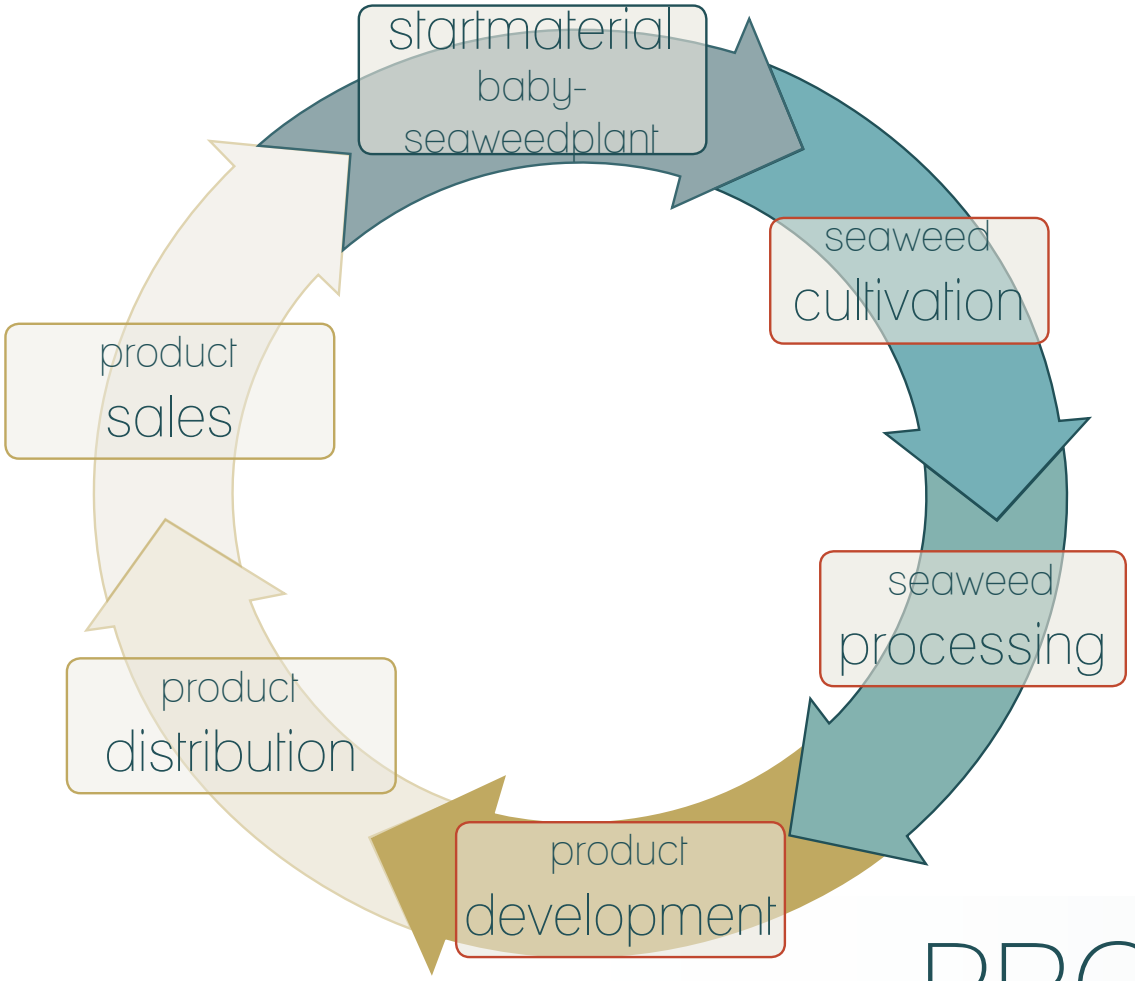


SEAWEED **CULTIVATION**

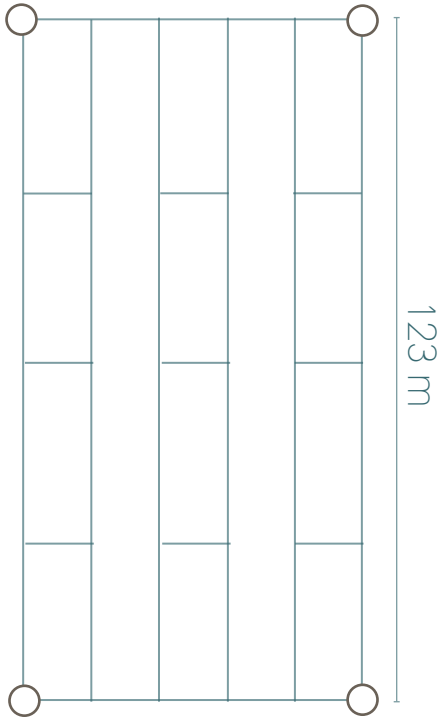
SEAWEED **PROCESSING**

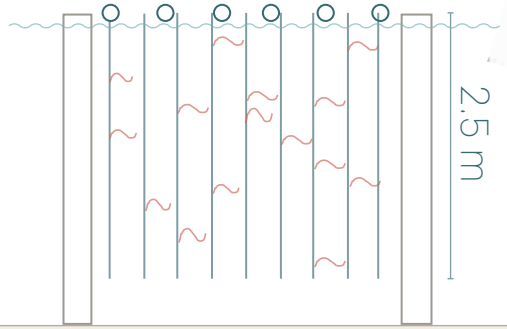
SEAWEED **DEVELOPMENT**

PRODUCTION PHASES









CURRENT HARVEST

tausends of kilos of fresh seaweed

summer: 7 plants per rope (vertical - 2,5 m under water)

winter: 200 plants per meter (horizontal - 1m under water)

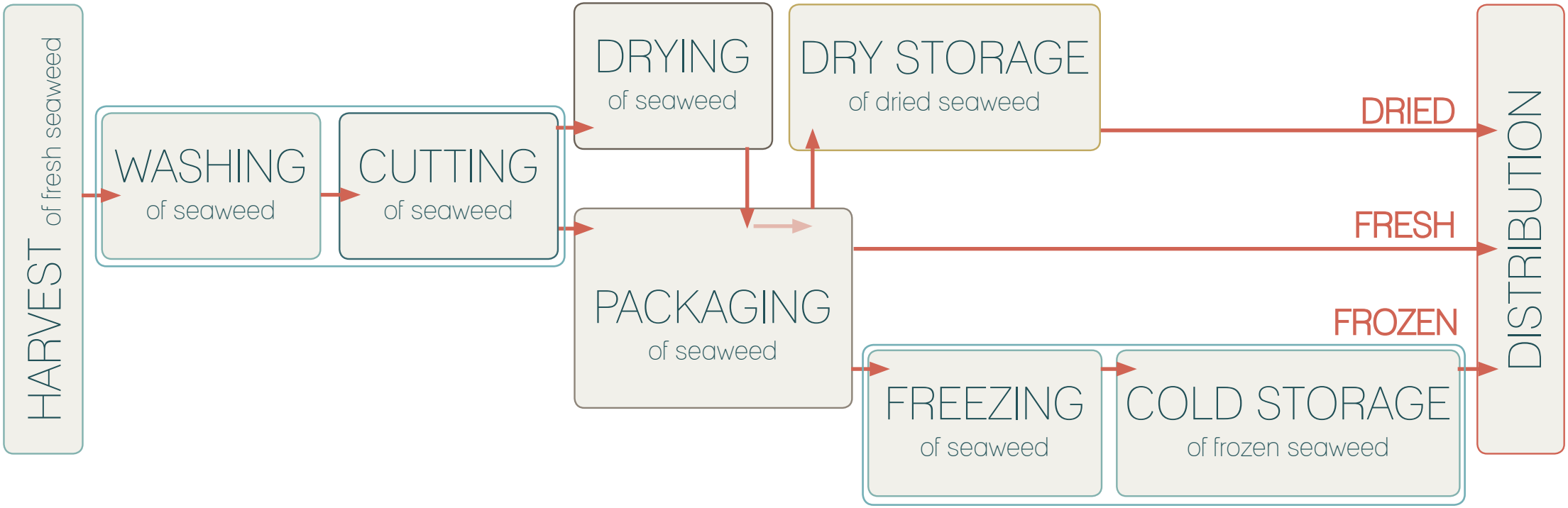
FUTURE EXPANSION

to maximum **2ha** = **205.000 kg fresh seaweed**

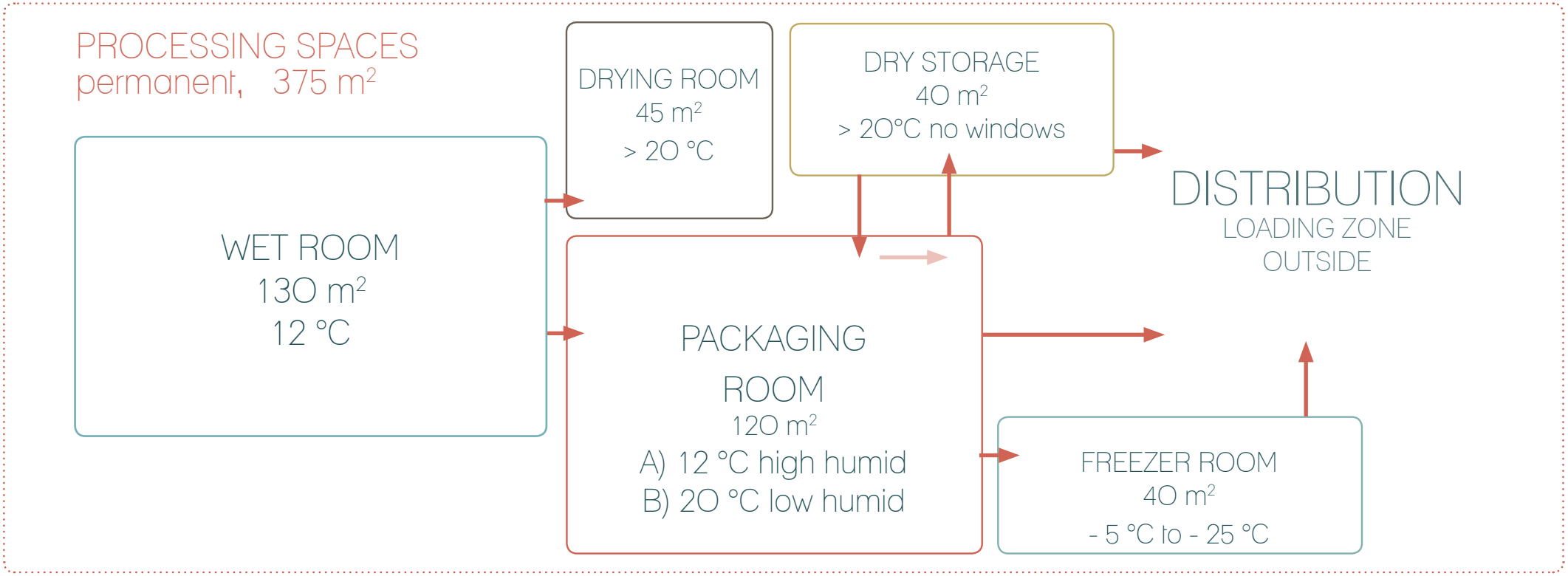
processing facility is planned for about 500.000 kg

SEAWEED
PRODUCTION CAPACITY

Zeewaar



SEAWEED - PROCESSING PHASES



SEAWEED PROCESSING SPACES

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DEVELOPMENT
- WORKSHOPS
- BAR/RESTAURANT
- SALE

ORGANIZATION
- EXHIBITION
- SALE

STORAGE

DEVELOPING SPACE
230 m²

OFFICE
290 m²

BOATHOUSE
100 m²

SEAWEED FARM ON WATER

washing changing

PROCESSING SPACES
375 m²

WASHING / CUTING
DRYING
- FREEZING
- PACKAGING
- STORAGE

CULTIVATION

PROGRAMME SEAWEED FARM

PROCESSING FARM
TOTAL 1000 m²

+ 2 ha CULTIVATION
+ OUTDOOR SPACES

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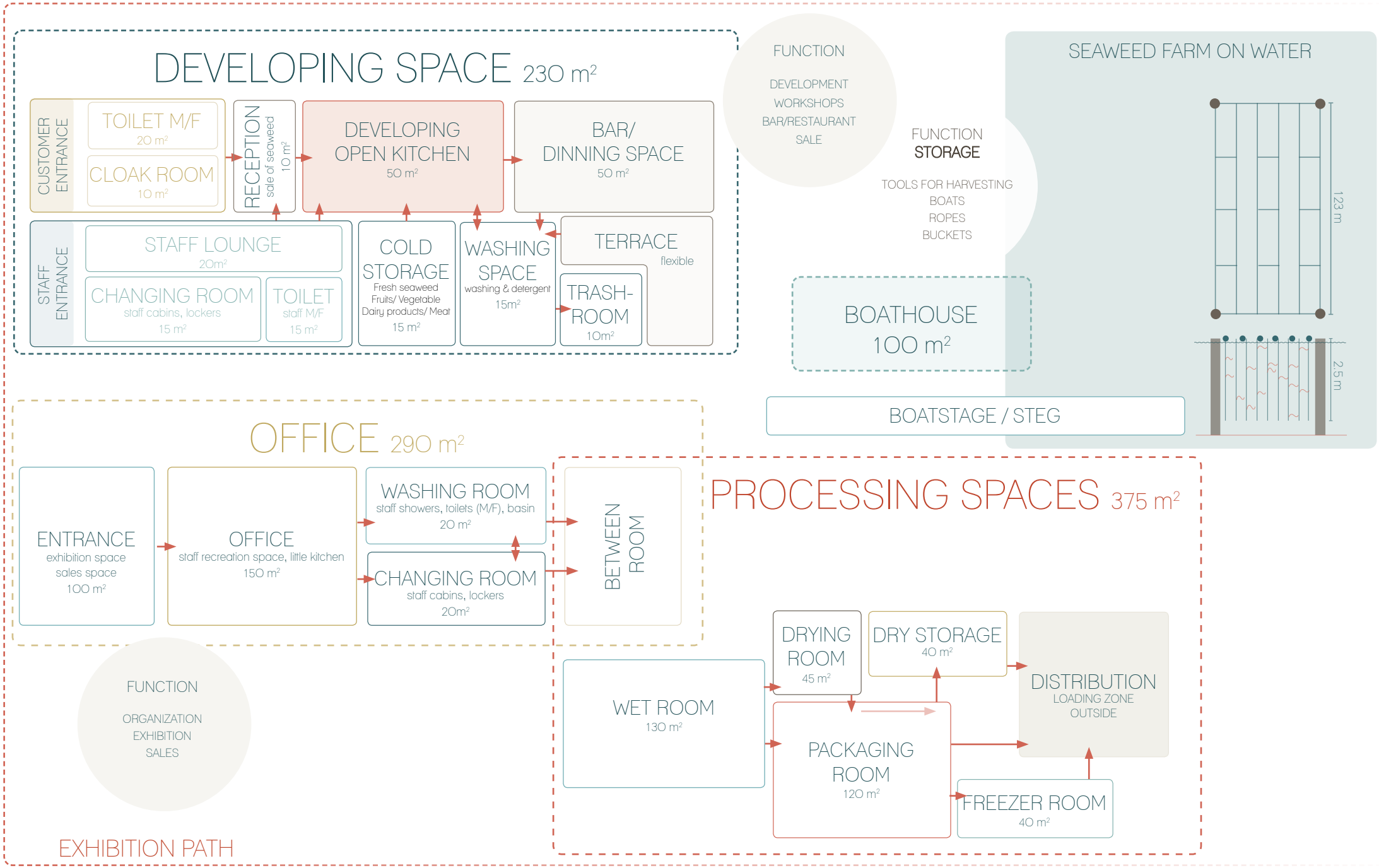
DEVELOPING SPACE 230 m²
CUSTOMER ENTRANCE
TOILET M/F
20 m²
CLOAK ROOM
10 m²
RECEPTION
sale of seaweed
10 m²
DEVELOPING OPEN KITCHEN
50 m²
BAR/ DINNING SPACE
50 m²
STAFF ENTRANCE
STAFF LOUNGE
20m²
CHANGING ROOM
staff cabins, lockers
15 m²
TOILET
staff M/F
15 m²
COLD STORAGE
Fresh seaweed
Fruits/ Vegetable
Dairy products/ Meat
15 m²
WASHING SPACE
washing & detergent
15m²
TRASH-ROOM
10m²
TERRACE
flexible
FUNCTION
DEVELOPMENT
WORKSHOPS
BAR/RESTAURANT
SALE
FUNCTION
STORAGE
TOOLS FOR HARVESTING
BOATS
ROPES
BUCKETS
SEAWEED FARM ON WATER
123 m
2.5 m
BOATHOUSE
100 m²
BOATSTAGE / STEG
OFFICE 290 m²
ENTRANCE
exhibition space
sales space
100 m²
OFFICE
staff recreation space, little kitchen
150 m²
WASHING ROOM
staff showers, toilets (M/F), basin
20 m²
CHANGING ROOM
staff cabins, lockers
20m²
BETWEEN ROOM
PROCESSING SPACES 375 m²
DRYING ROOM
45 m²
DRY STORAGE
40 m²
DISTRIBUTION
LOADING ZONE
OUTSIDE
WET ROOM
130 m²
PACKAGING ROOM
120 m²
FREEZER ROOM
40 m²
FUNCTION
ORGANIZATION
EXHIBITION
SALES
EXHIBITION PATH

SUSTAINABLE SEAWEED FARM

FOR FOOD PRODUCTION IN THE NETHERLANDS

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FORM CONCEPT

USER EXPERIENCE

ARCHITECTURAL EXPERIENCE

DESIGN CONCEPT

CONCEPT - FLOWING STRUCTURE

INSPIRATION SEAWEED LAMINARIA

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FLOWING STRUCTURE

INSPIRATION SEAWEED LAMINARIA

20

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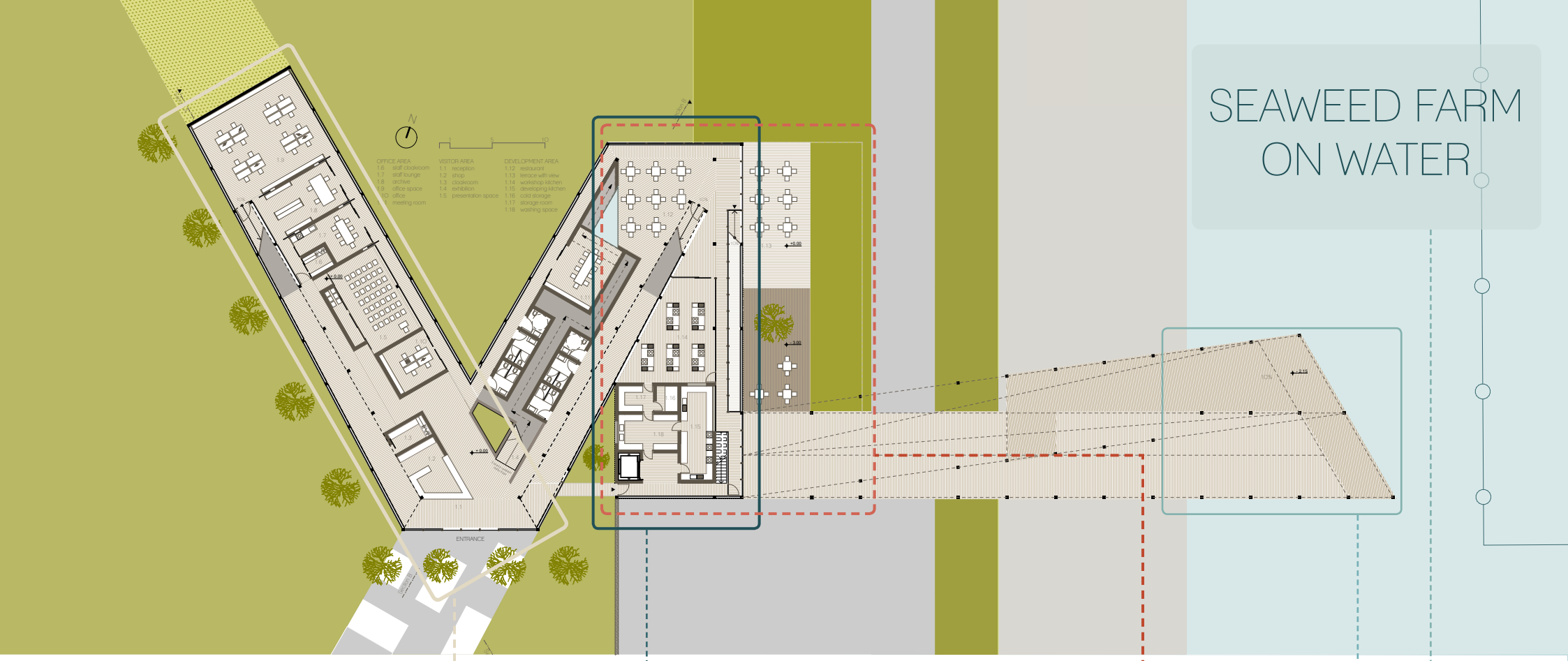

PROGRAMME

DEVELOPING SPACE
230 m²

OFFICE
290 m²

washing changing

PROCESSING SPACES
375 m²

BOATHOUSE
100 m²

SEAWEED FARM ON WATER

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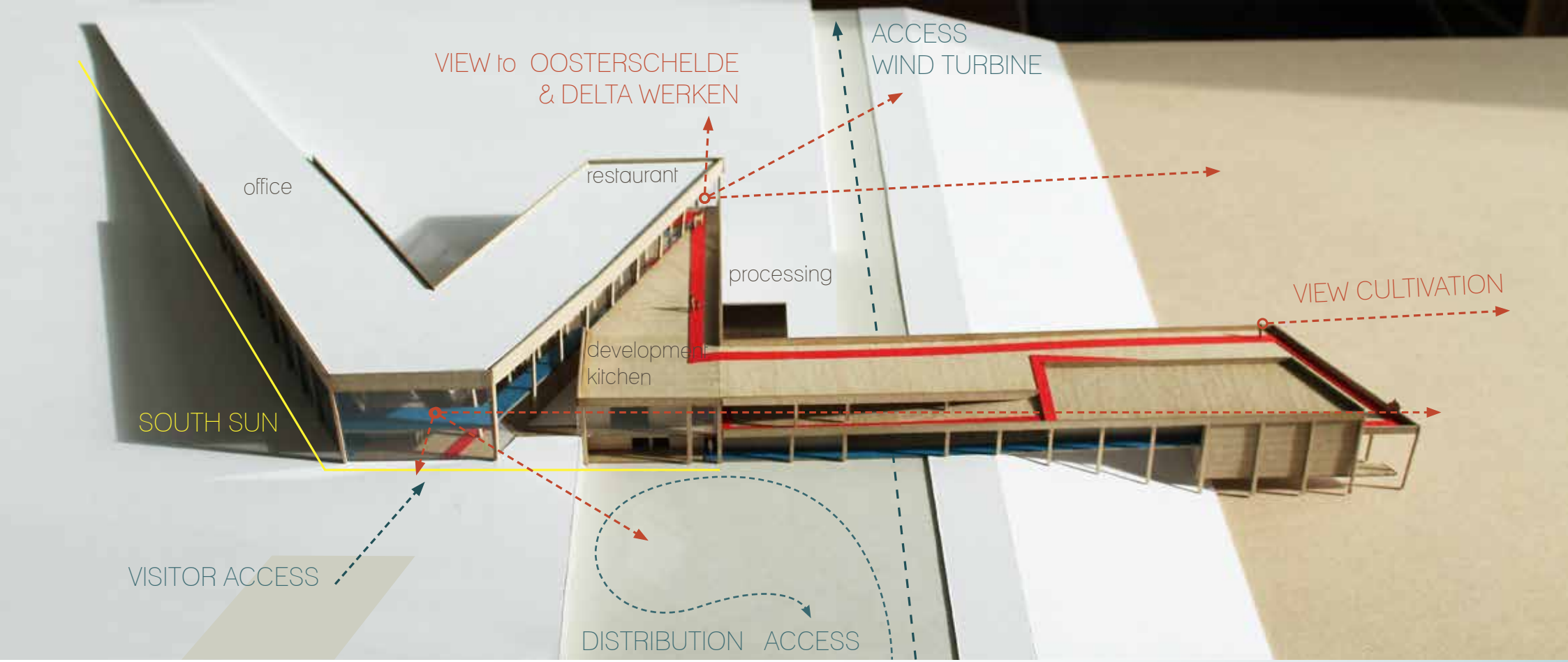
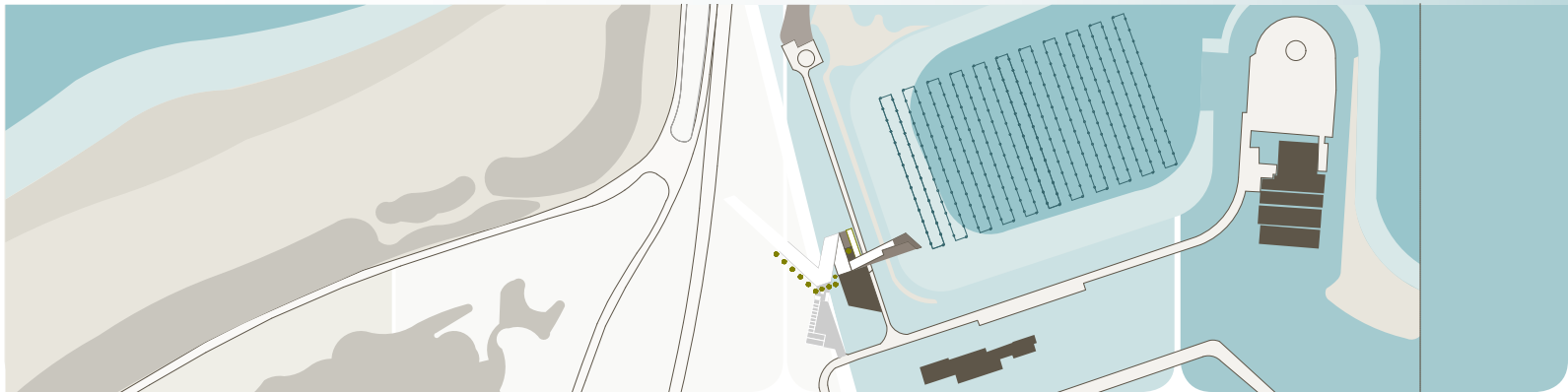


ORIENTATION

SOUTH SUN- VIEW - ACCESS



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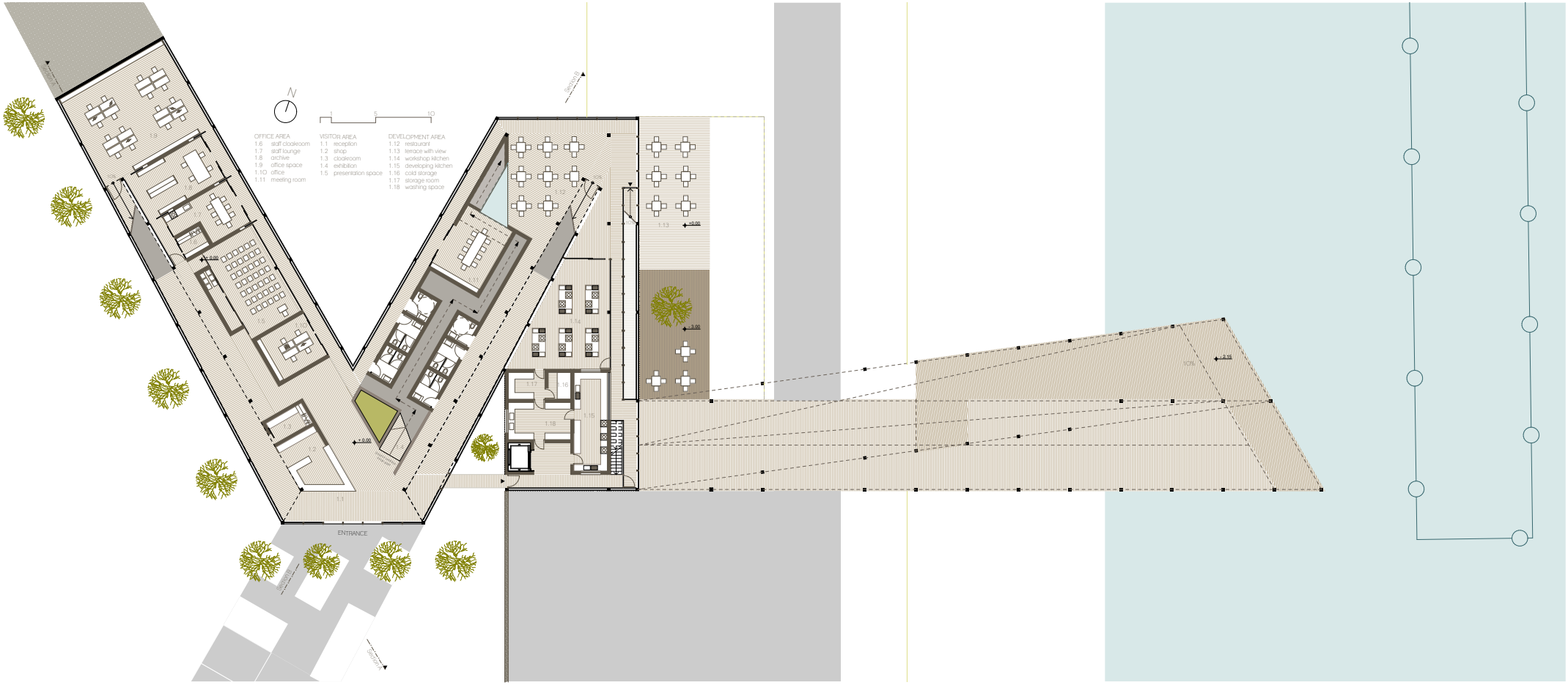
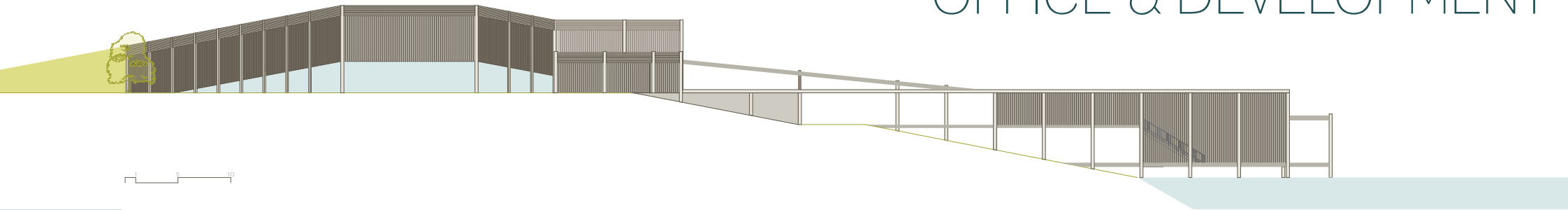
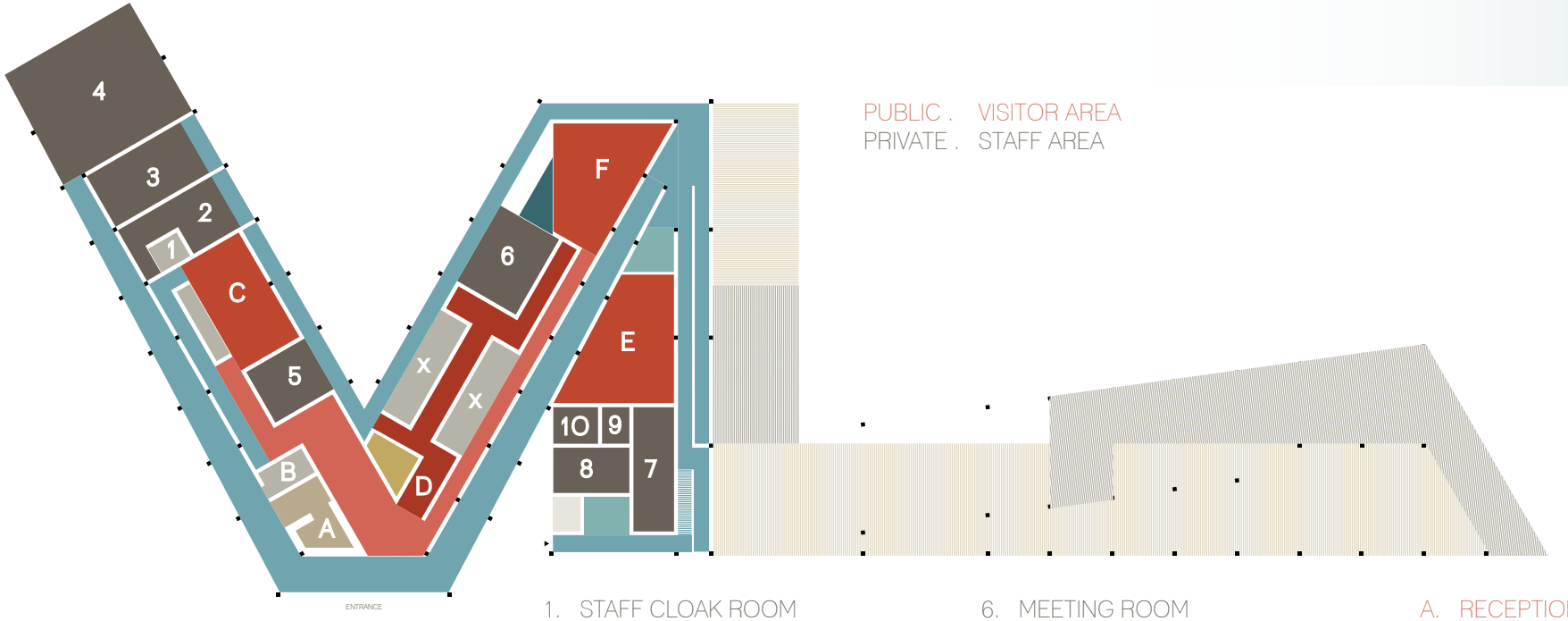


LEVEL 0

OFFICE & DEVELOPMENT



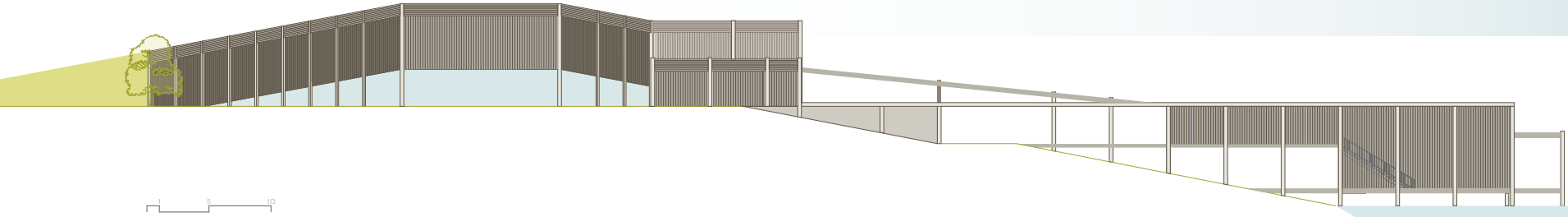


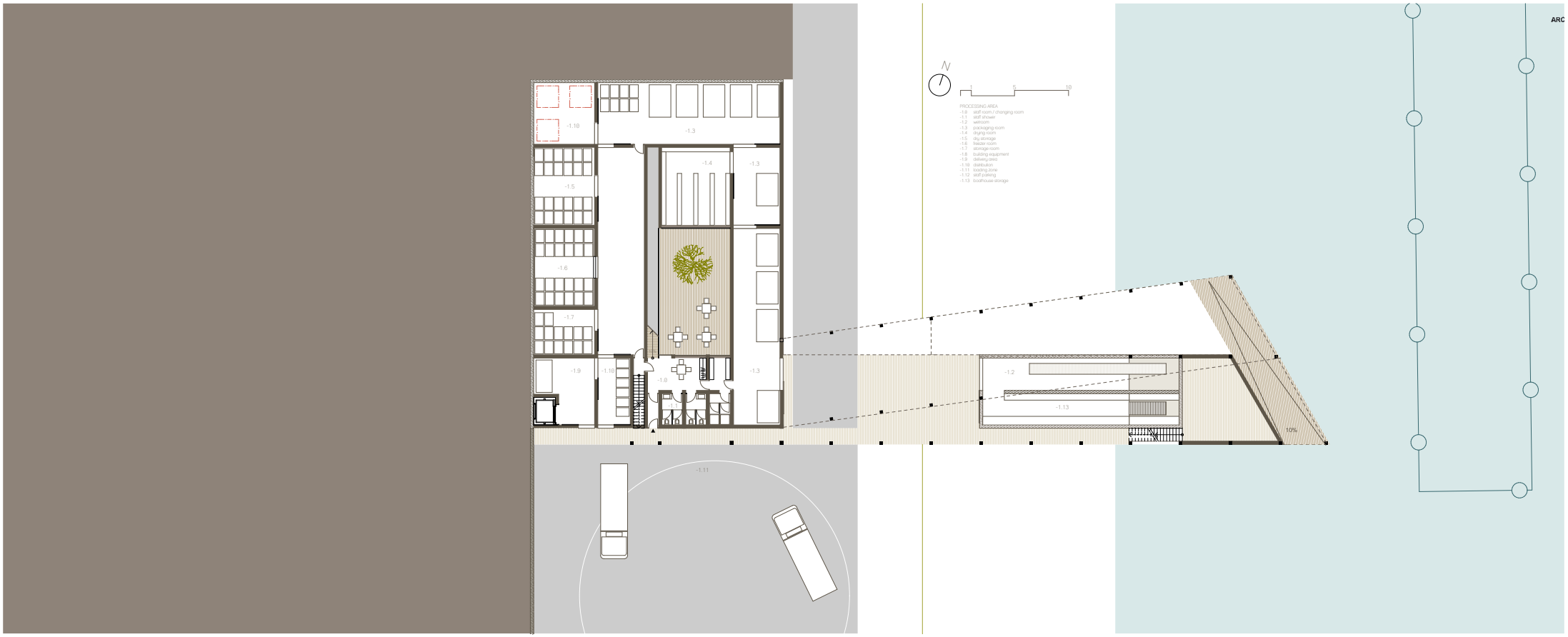
PUBLIC . VISITOR AREA
PRIVATE . STAFF AREA

1. STAFF CLOAK ROOM
2. STAFF LOUNGE
3. ARCHIVE
4. OFFICE SPACE
5. OFFICE
6. MEETING ROOM
7. DEVELOPMENT KITCHEN
8. WASHING SPACE
9. COLD STORAGE
10. STORAGE
x. BATHROOM

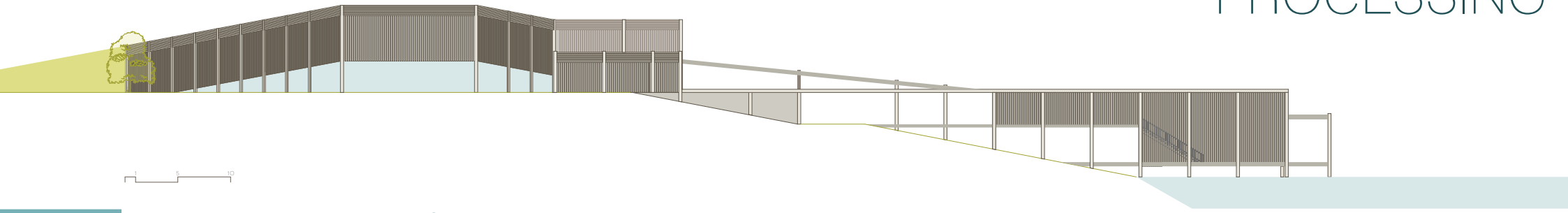
A. RECEPTION & SHOP
B. CLOAKROOM
C. PRESENTATION SPACE
D. EXHIBITION
E. WORKSHOP KITCHEN
F. RESTAURANT WITH TERRACE

LEVEL 0
OFFICE & DEVELOPMENT





LEVEL -1
PROCESSING



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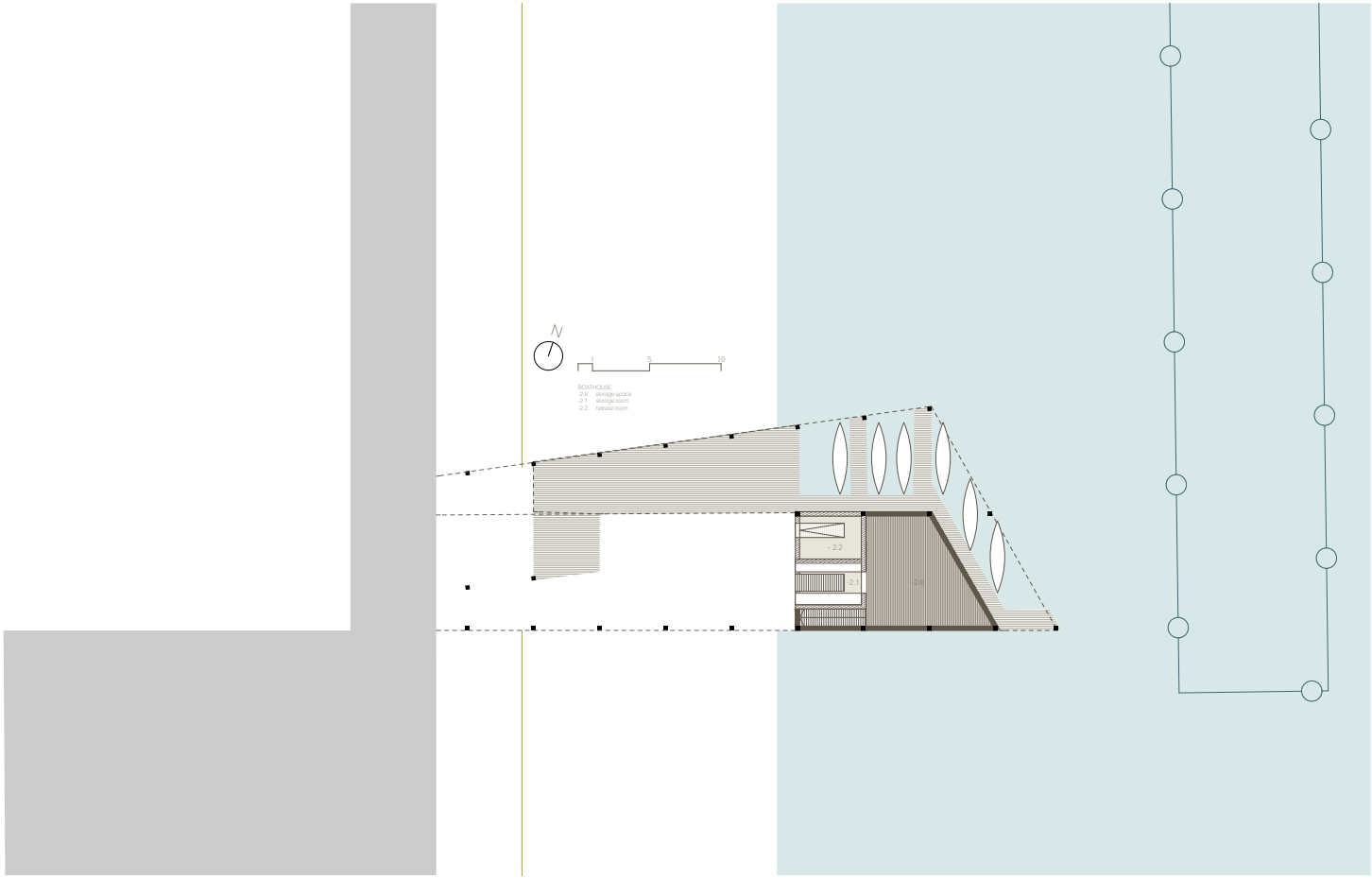
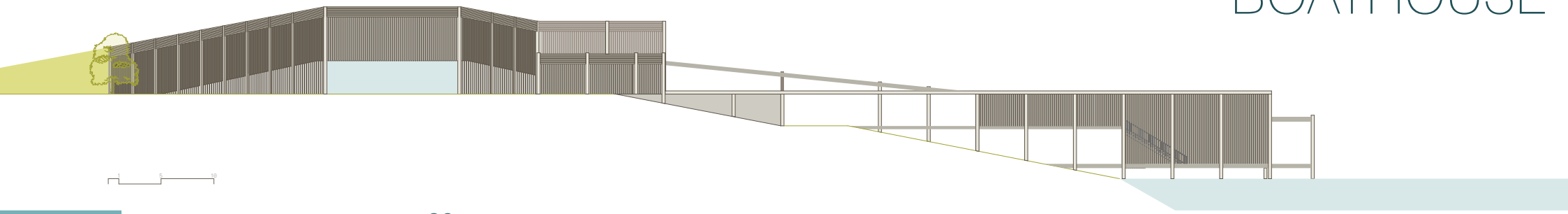
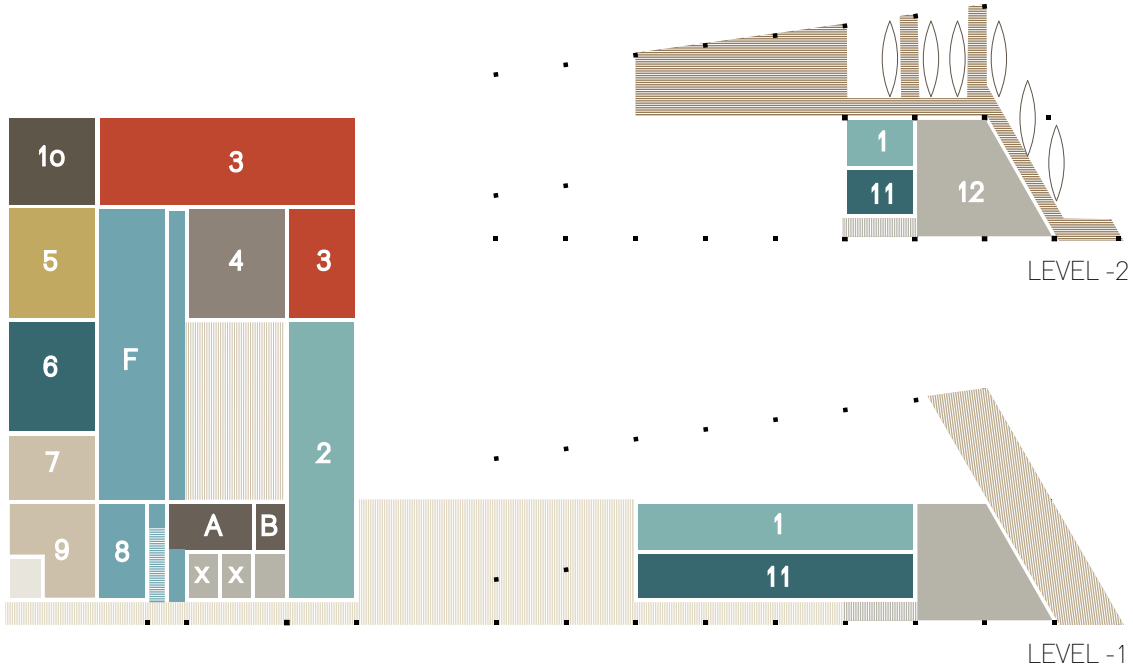


LEVEL -2
BOATHOUSE

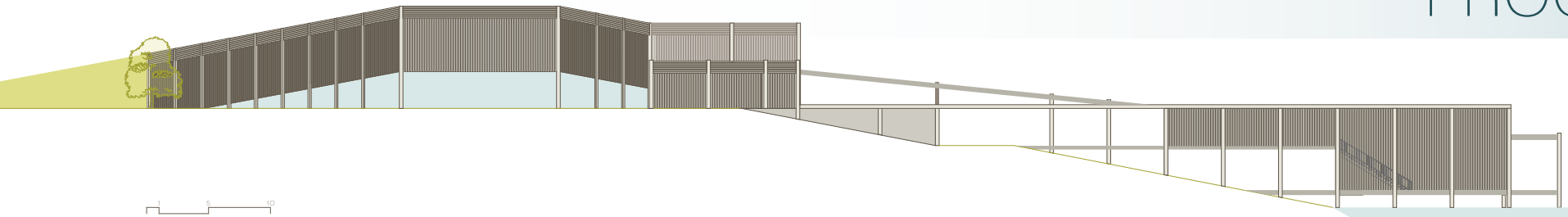


1. WET ROOM . WASHING
2. WET ROOM . CUTTING
3. PACKAGING ROOM
4. DRYING ROOM
5. DRY STORAGE
6. FREEZER ROOM
7. STORAGE SPACE
8. DISTRIBUTION
9. DELIVERY AREA
1O. BUILDING EQUIPMENT

11. BOATHOUSE STORAGE
12. BOATHOUSE HARVEST
A. STAFF ROOM
B. CHANGING ROOM
x. BATHROOM



LEVEL -1 & LEVEL -2
PROCESSING



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FORM CONCEPT

USER EXPERIENCE

ARCHITECTURAL EXPERIENCE

VISITOR EXPERIENCE

FLOWING STRUCTURE - OUTSIDE

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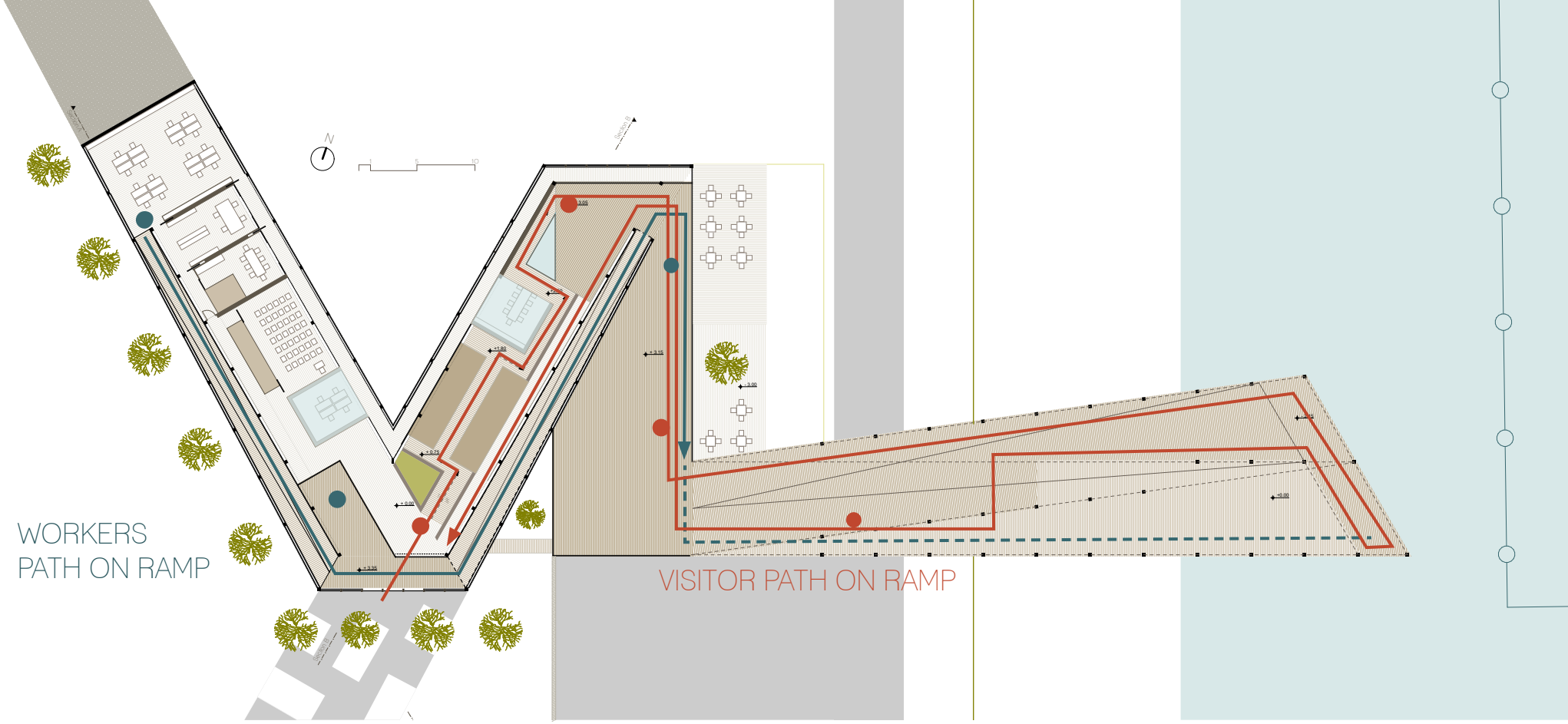
FLOWING STRUCTURE - INSIDE



FLOWING STRUCTURE - RAMPSYSTEM

EXHIBITION

STEG

CULTIVATION

WORKSHOP KITCHEN

RESTAURANT
DEVELOPMENT

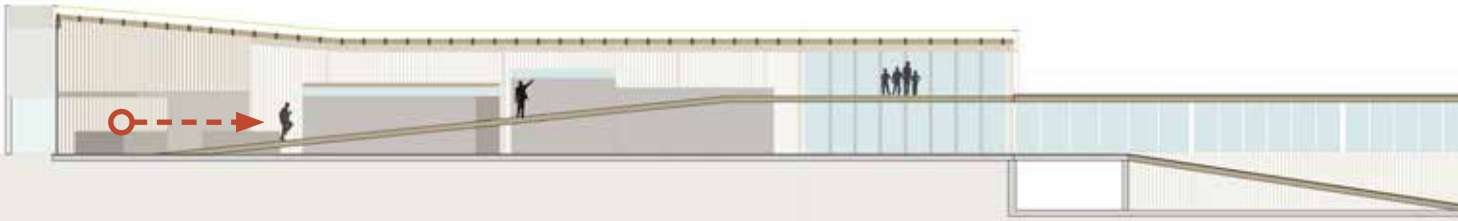
LEARN

SEE

TOUCH

TASTE

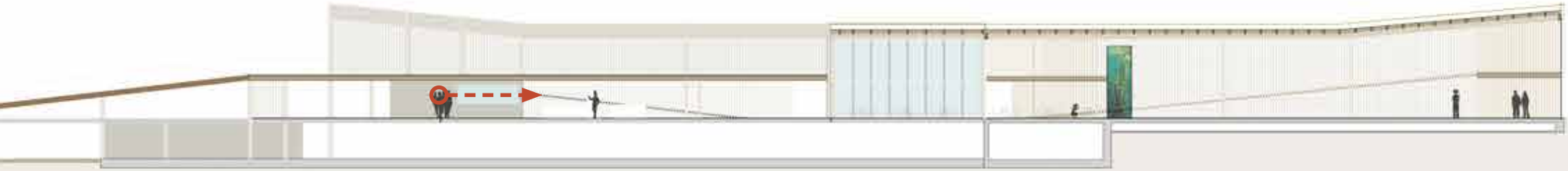
EDUCATIONAL ADVERTISING



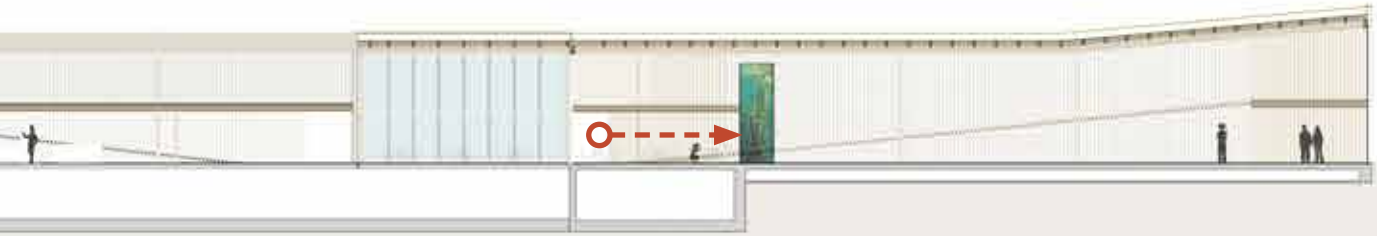
VISITOR EXPERIENCE - ENTRANCE

VISITOR EXPERIENCE - START OF EDUCATIONAL PATH

VISITOR EXPERIENCE - VIEWPOINT ON CULTIVATION



VISITOR EXPERIENCE - WORKSHOP KITCHEN



VISITOR EXPERIENCE - RESTAURANT

OFFICE SPACE

RECIPE DEVELOPMENT

SEAWEED PROCESSING

SEAWEED HARVEST

OFFICE

OVERVIEW

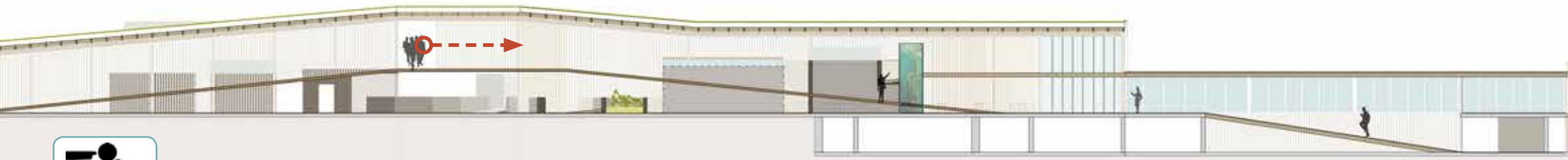
DEVELOPMENT KITCHEN

PROCESSING

CULTIVATION

WORKERS EXPERIENCE

WORKERS EXPERIENCE - OFFICE AREA



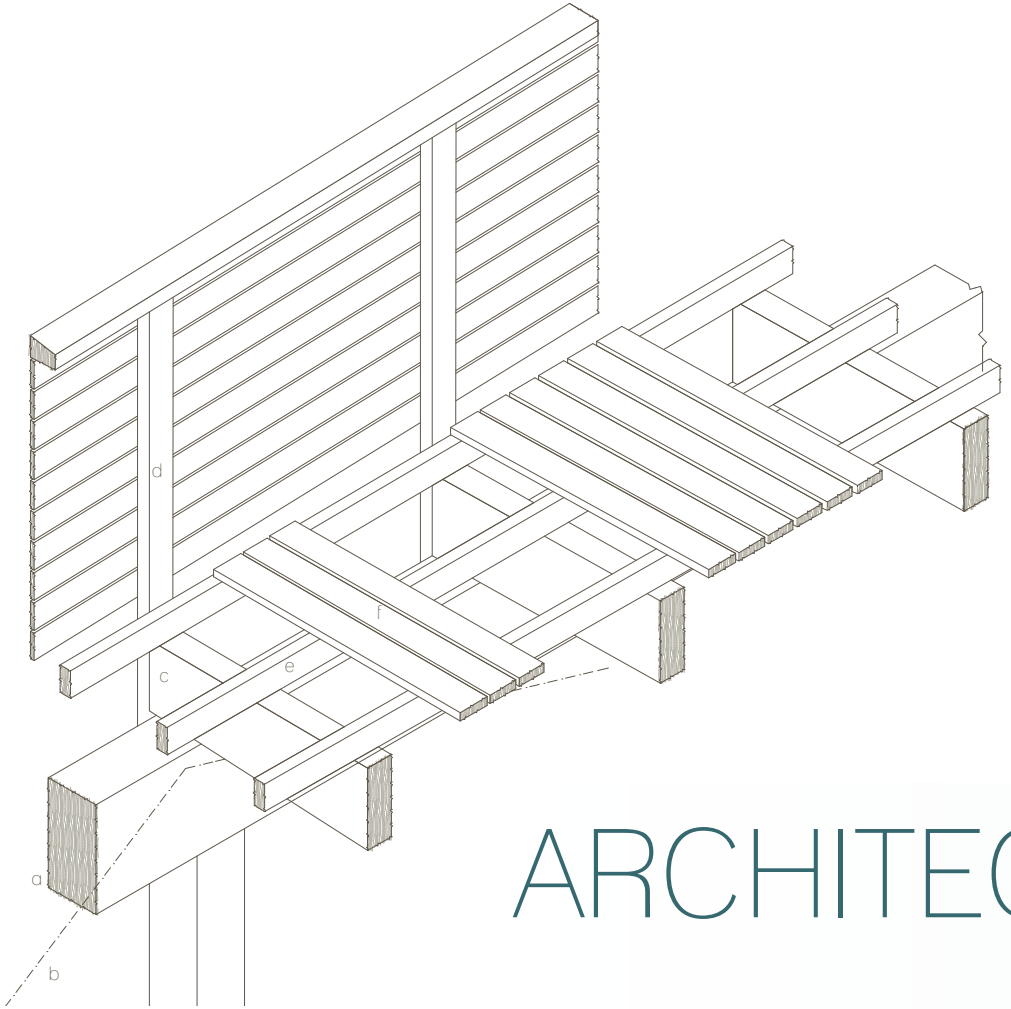
WORKERS EXPERIENCE - OVERVIEW PLATFORM

FORM CONCEPT

USER EXPERIENCE

ARCHITECTURAL EXPERIENCE

DESIGN CONCEPT



ARCHITECTURAL EXPERIENCE

INSPIRATION STEG

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SUSTAINABLE SEAWEED FARM

FOR FOOD PRODUCTION IN THE NETHERLANDS

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EMBODIED ENERGY OF A MATERIAL

MINIMALLY PROCESSED	processing - little energy & waste
LOCAL AVAILABLE	transportation - no CO2 emission
EASY AND SAFE	construction - little energy & waste
ADJUSTED TO PURPOSE	operation - good energy efficiency
RENEWABLE, REUSABLE or RECYCLABLE	disposal - little waste & energy

SUSTAINABLE MATERIALS

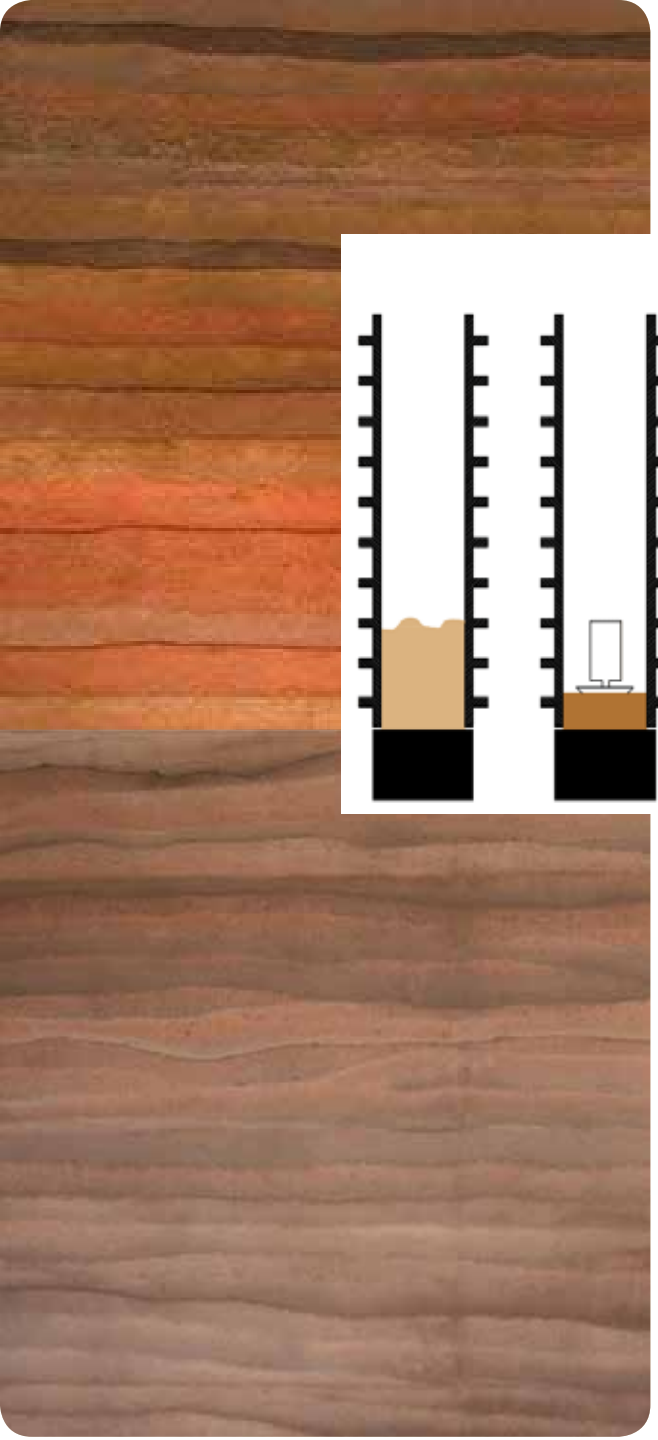
RAW NATURAL BUILDING MATERIAL

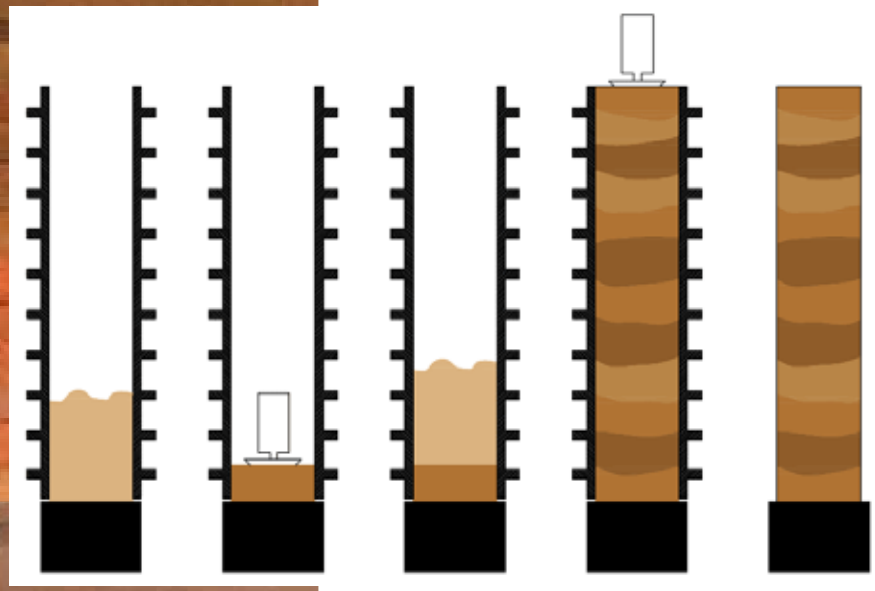




RAW NATURAL BUILDING MATERIALS

RAW NATURAL BUILDING MATERIALS

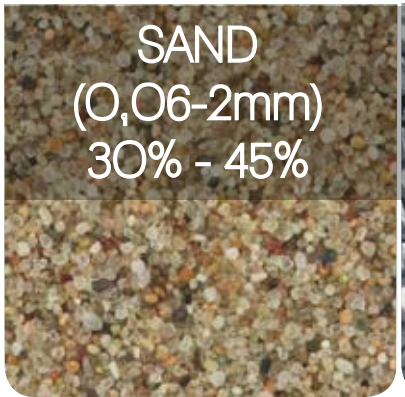


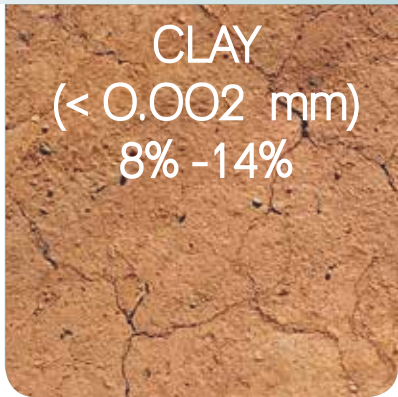


MIXTURE OF SAND, GRAVEL, SILT & CLAY IS COMPRESSED IN A FORMWORK

- LOADBEARING
- MINIMUM WALL THICKNESS of 20 cm
- PROTECTION FROM RAIN IS NECESSARY

RAMMED EARTH WALLS





QUALITIES

+ GOOD THERMAL MASS
+ GOOD SOUND INSULATOR
+ AESTHETICS
+ LOCAL AVAILABLE
+ LOW EMBODIED ENERGY (UNSTABILIZED 0.02 MJ/kg)
+ STABILIZES INDOOR HUMIDITY
+ LONG LASTING
+ BIODEGRADABLE
+ REUSABLE if not stabilized

RAMMED EARTH WALLS

STRUCTURAL FRAMING PRIMARY BUILDING STRUCTURE

CLADDING FACADE

INTERIOR FINISHING FLOORING

TIMBER FRAME CONSTRUCTION
LAMINATED TIMBER

QUALITIES

+ AESTHETICS
+ MOISTURE RESISTANT
+ LOCAL AVAILABLE
+ ORGANIC
+ LOW CARBON EMISSIONS
+ EASY TO WORK WITH
+ BIODEGRADABLE
+ RENEWABLE
+ REUSABLE & RECYCLABLE

TIMBER FRAME CONSTRUCTION
LAMINATED TIMBER

SUSTAINABLE SEAWEED FARM

FOR FOOD PRODUCTION IN THE NETHERLANDS

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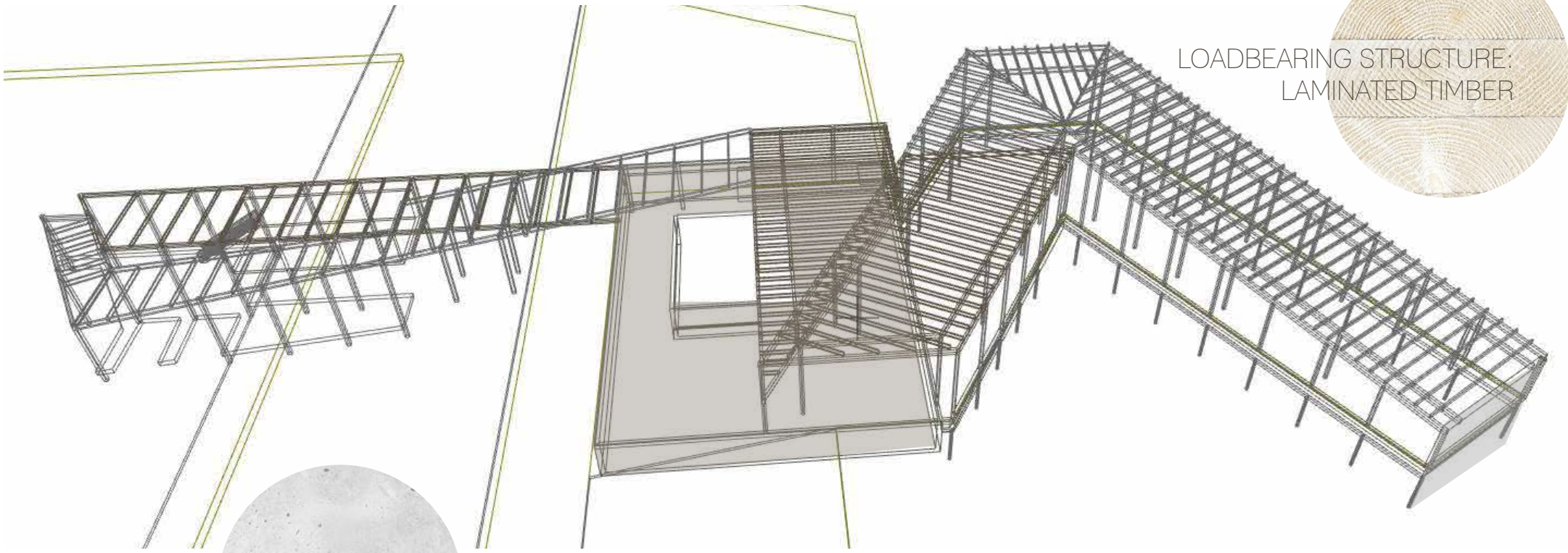

LOADBEARING STRUCTURE:
LAMINATED TIMBER

GROUND TOUCHING ELEMENTS:
CONCRETE

LOADBEARING STRUCTURE

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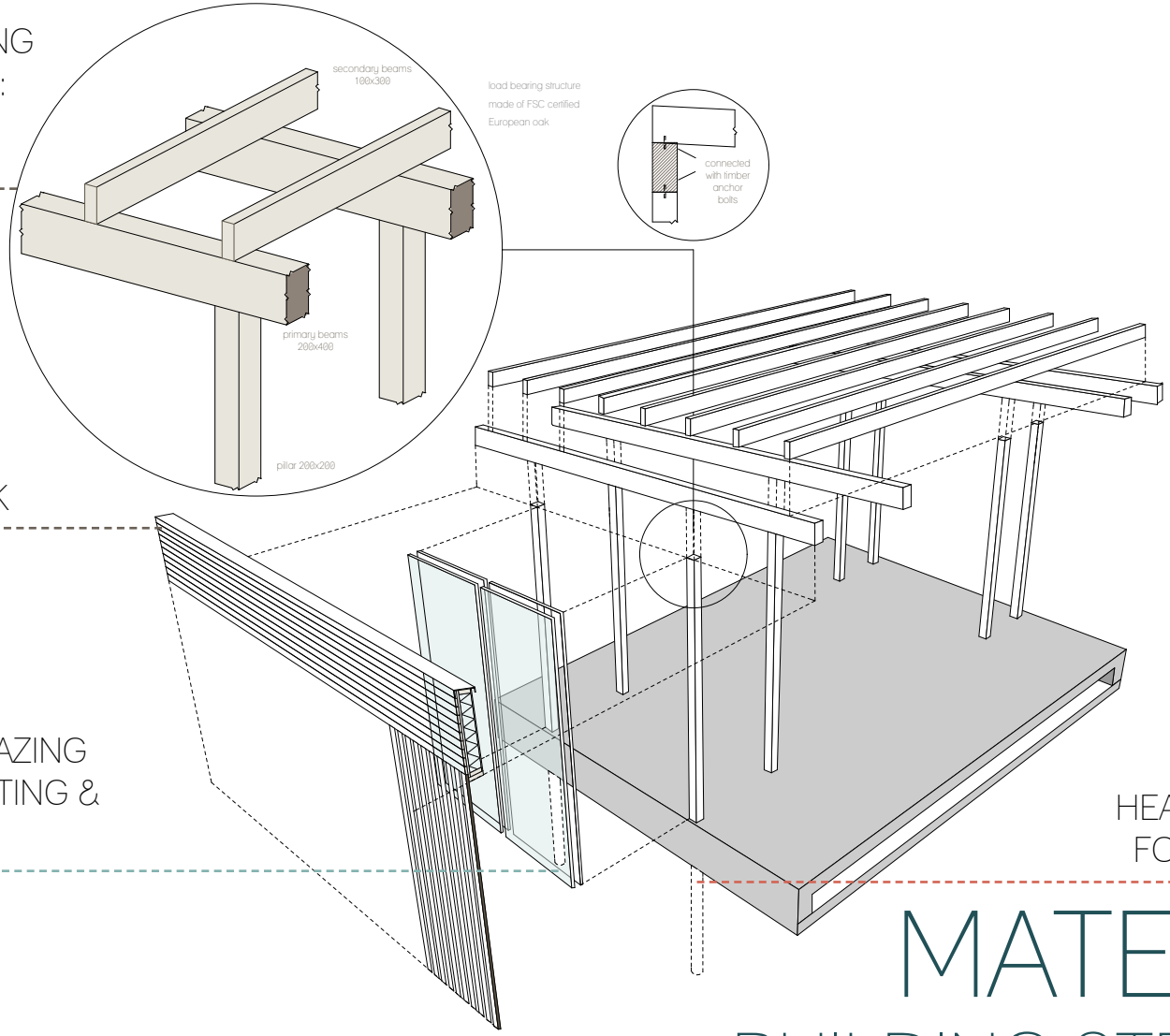
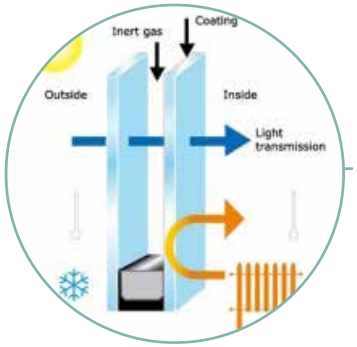
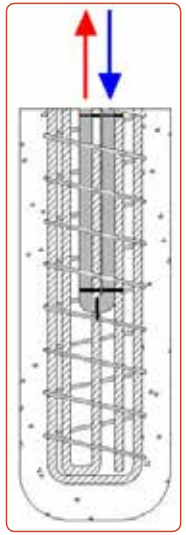
LOADBEARING STRUCTURE: LAMINATED TIMBER



FACADE: TIMBER, OAK



DOUBLE GLAZING WITH E-COATING & ARGON GAS



HOLLOW HEAT - EXCHANGING FOUNDATION PILES

MATERIALS

BUILDING STRUCTURE

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BUILDING ENVELOPE - TIMBER FACADE

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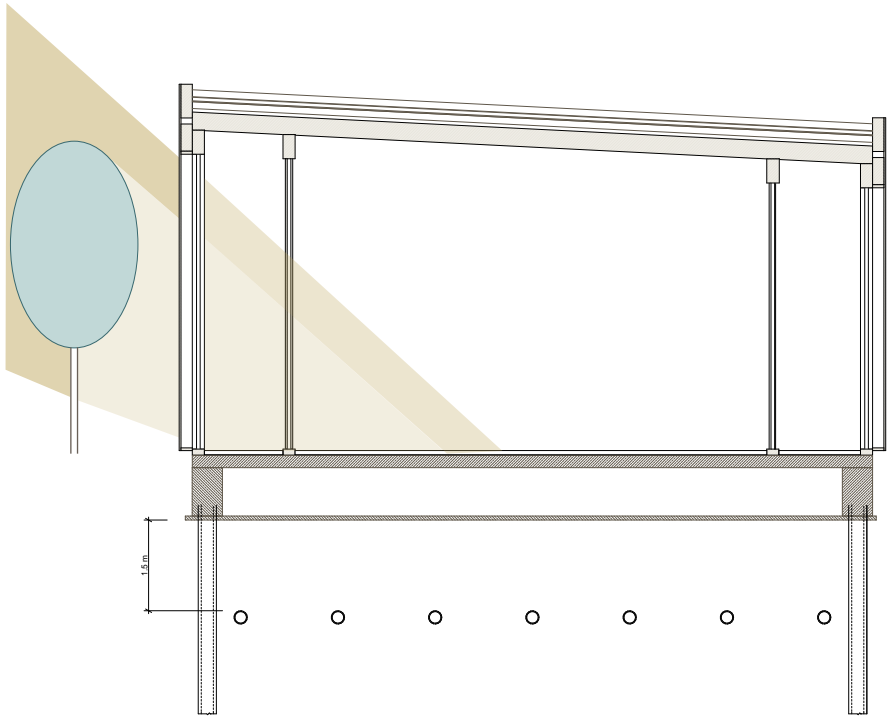
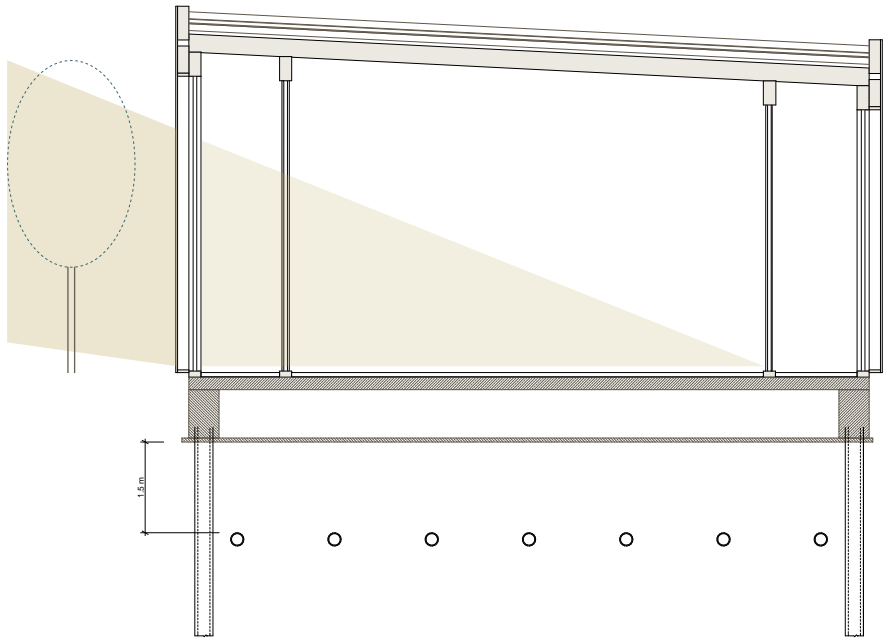


SUMMER



WINTER

SOLAR RADIATION

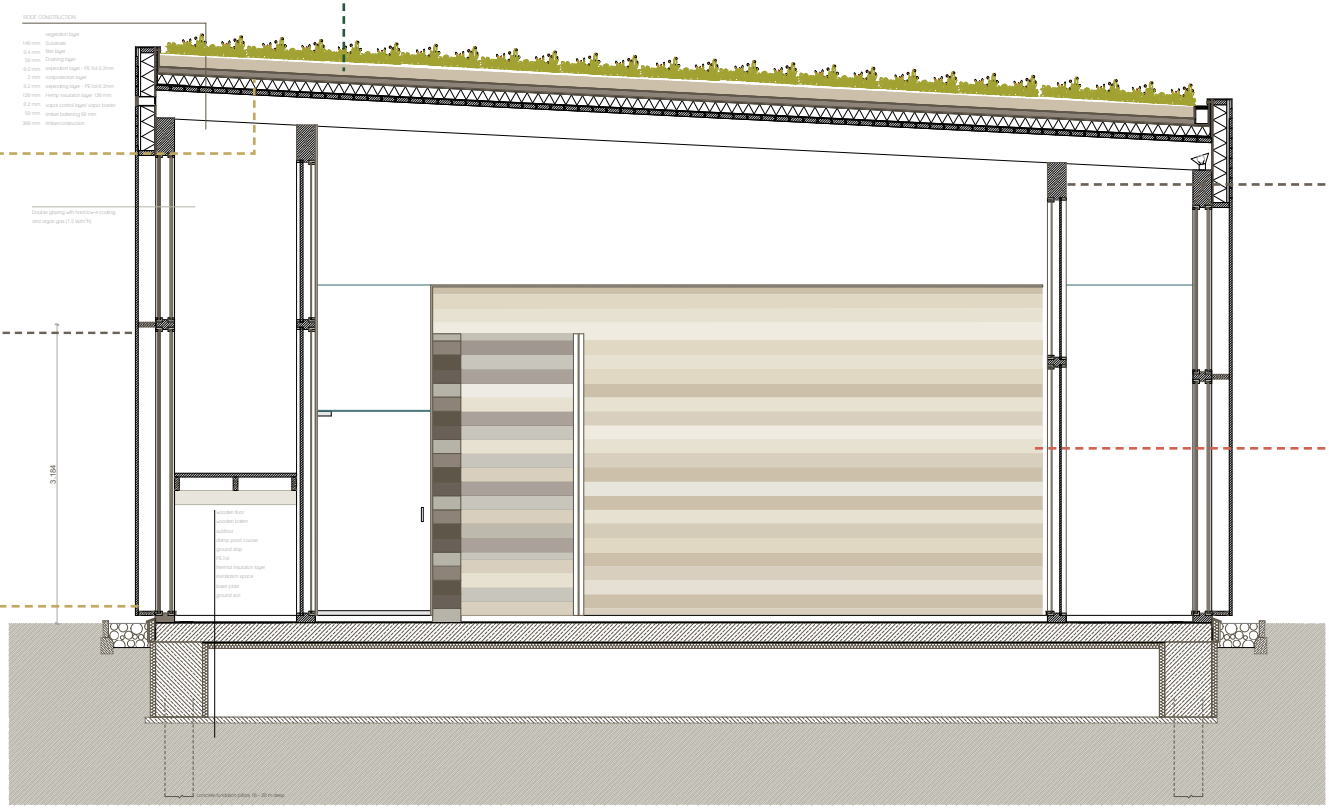
SUNSHADING

GREEN ROOF

1. HEMP ROOF INSULATION

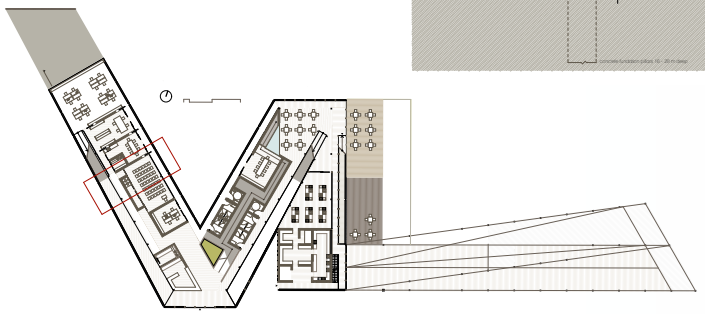
2. TIMBER SUNSHADING FACADE

3. TIMBER FLOORING

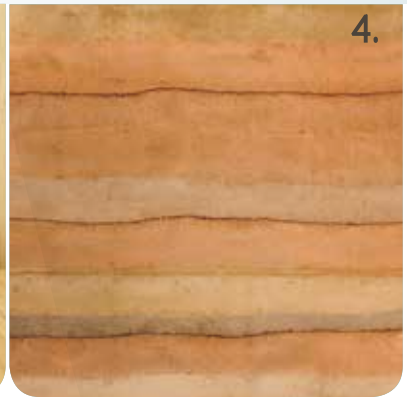


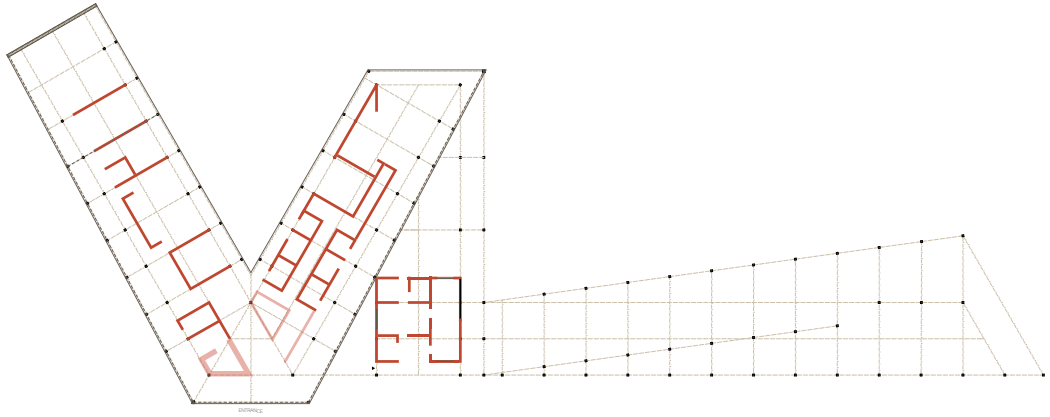
4. OPEN STRUCTURE LAMINATED TIMBER

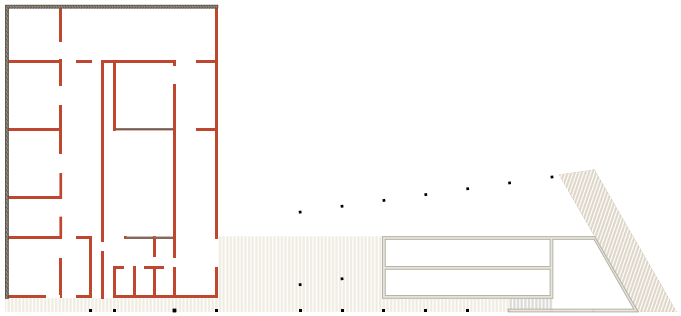
5. INTERIOR RAMMED EARTH WALLS



MATERIALIZATION







BENEFIT CALCULATIONS

RAMMED EARTH VERSUS CONCRETE

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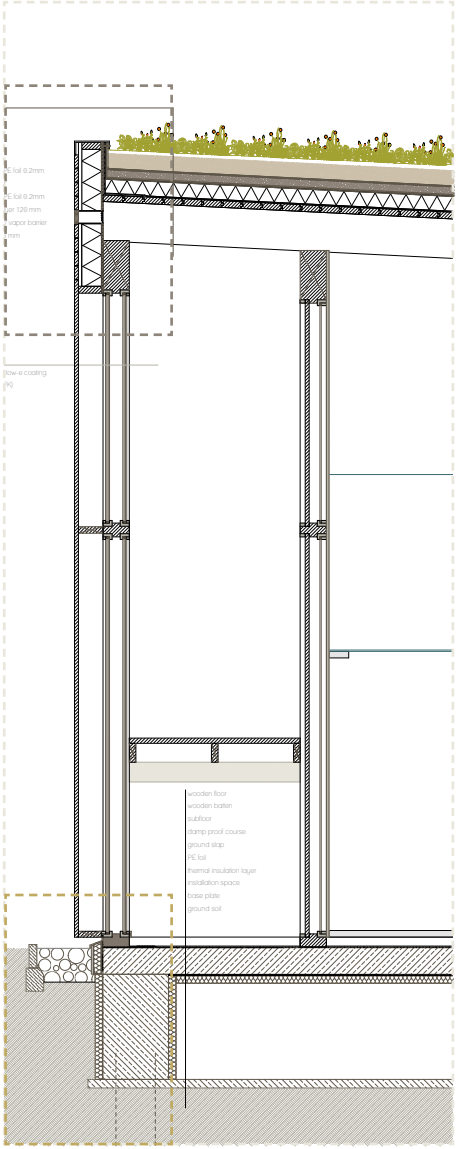
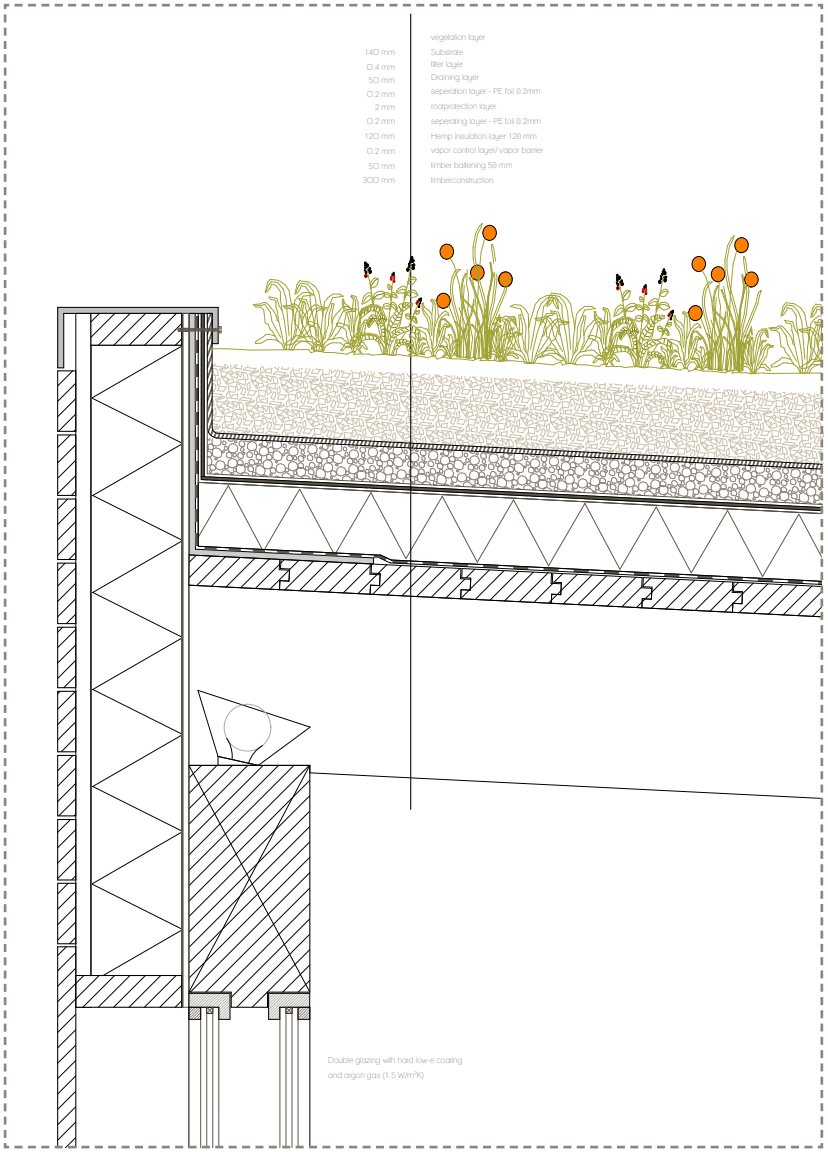
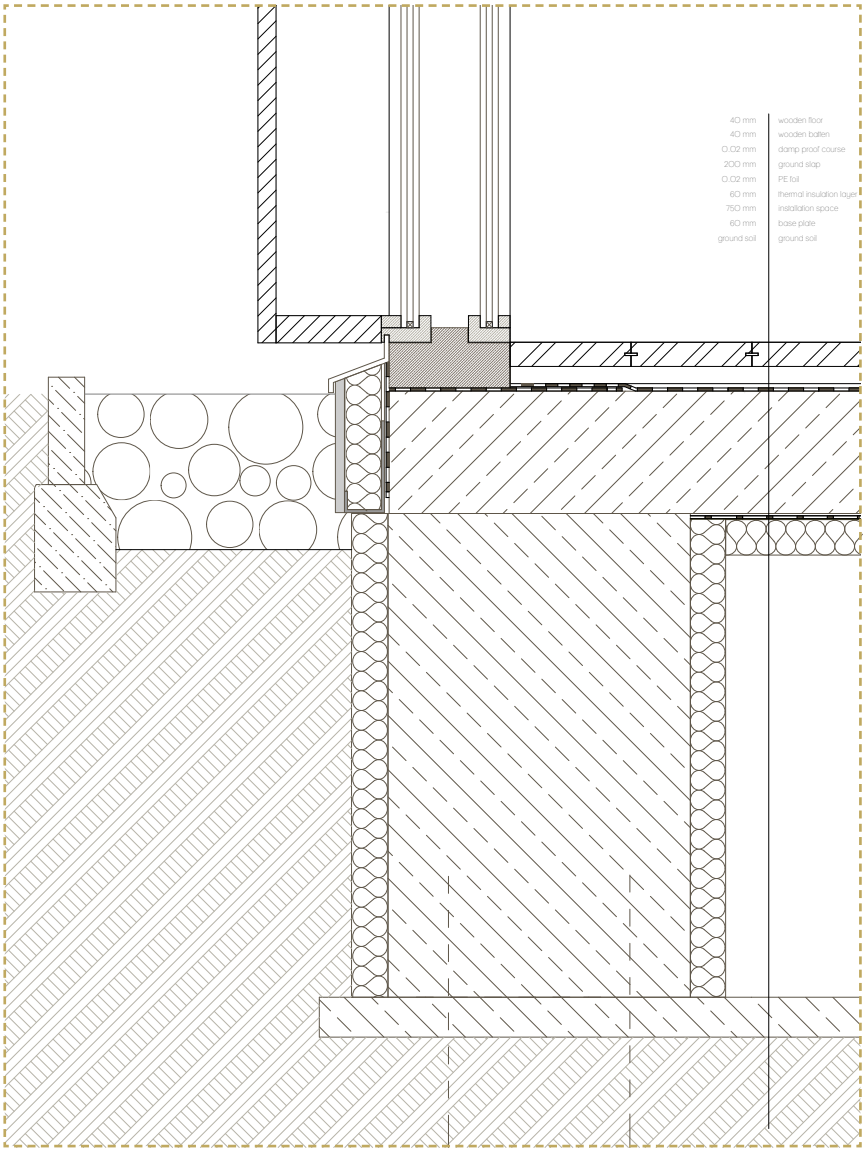
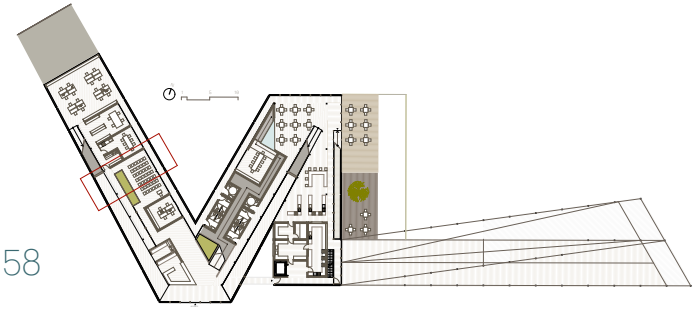






1:5 DETAILS



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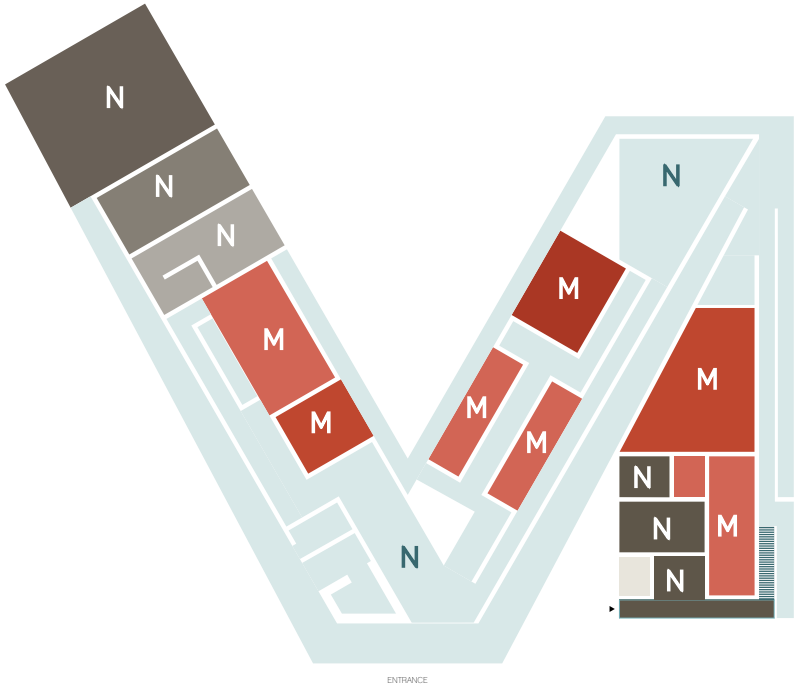

N NATURAL VENTILATION M MECHANICAL VENTILATION

CLIMATE COMPARTMENTS

GROUNDLEVEL

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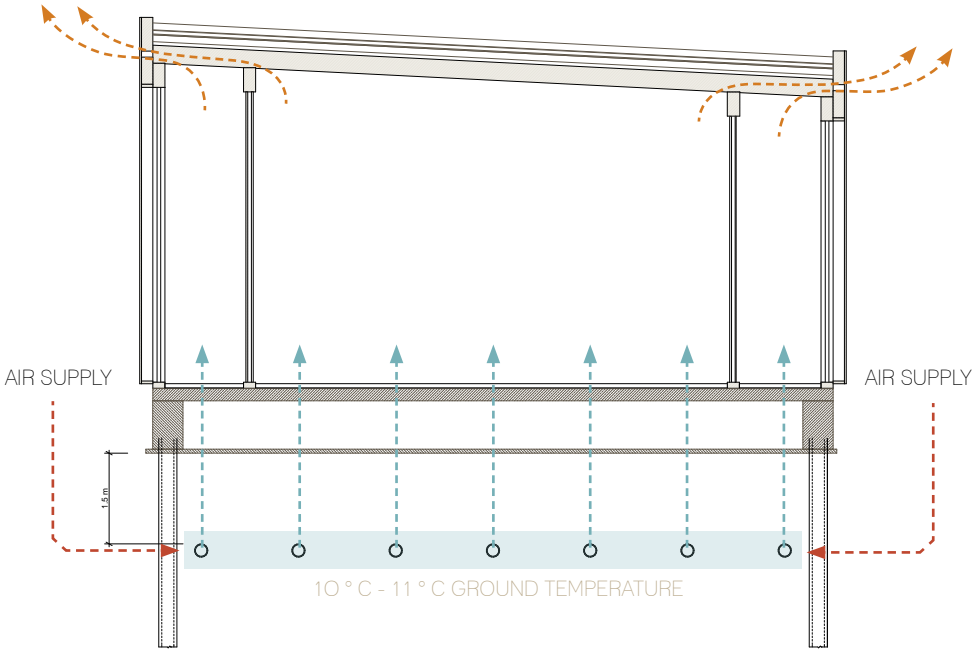
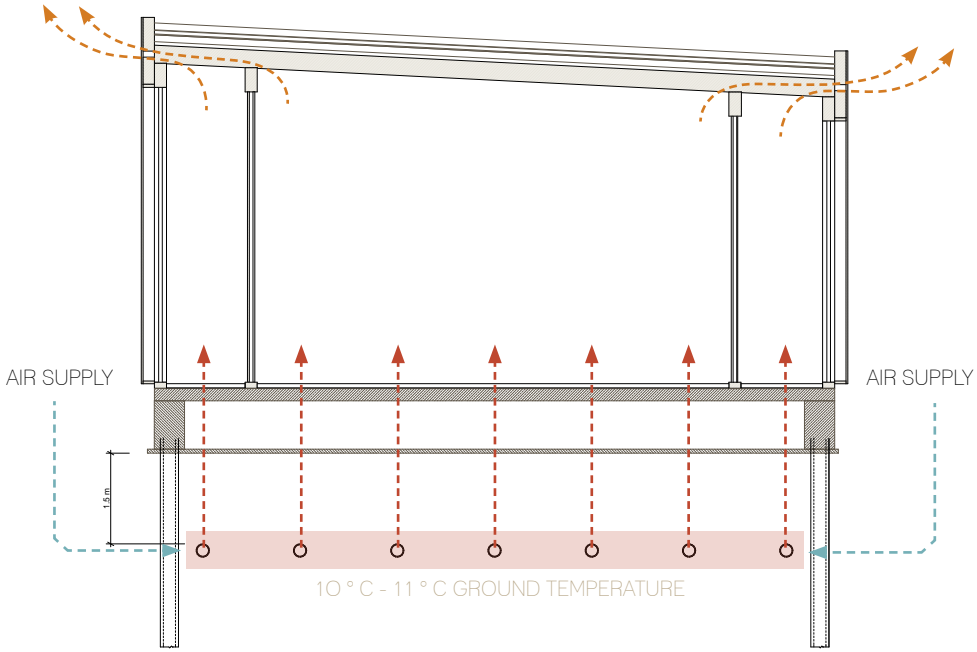
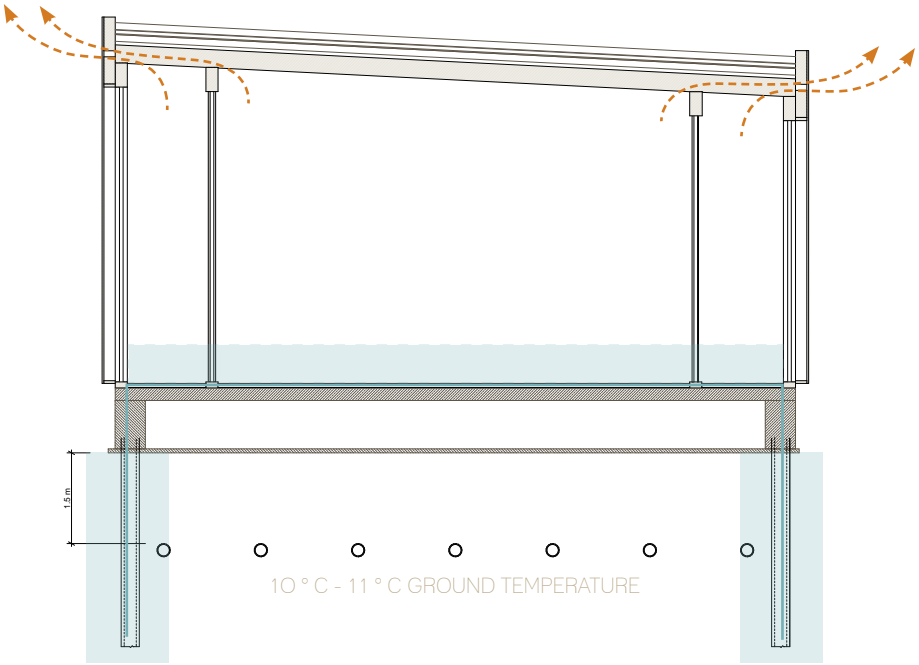


SUMMER

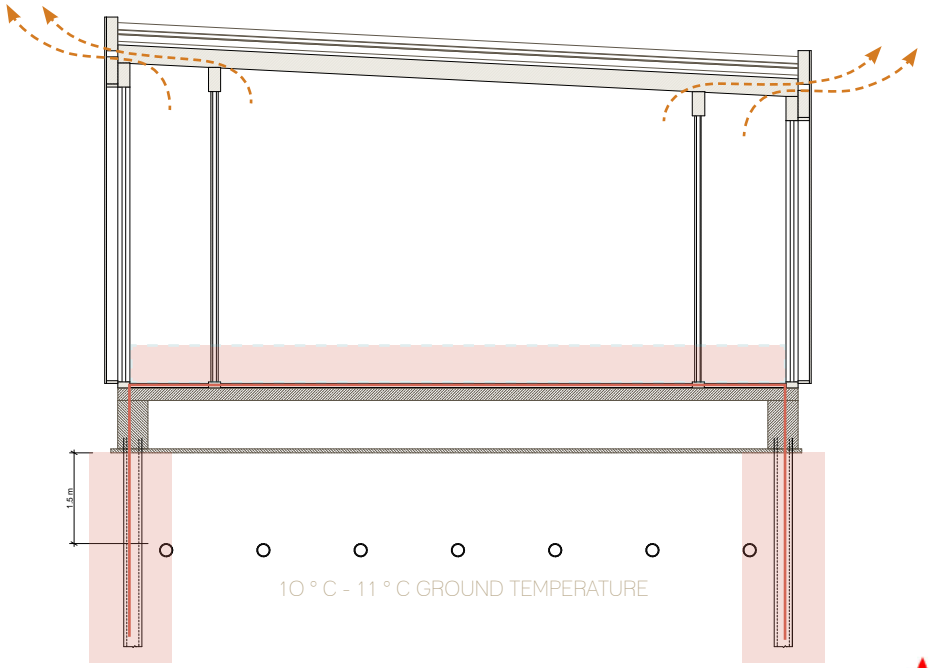


WINTER

VENTILATION SYSTEM - SOIL ENERGY



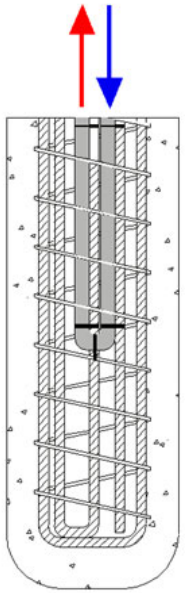
SUMMER

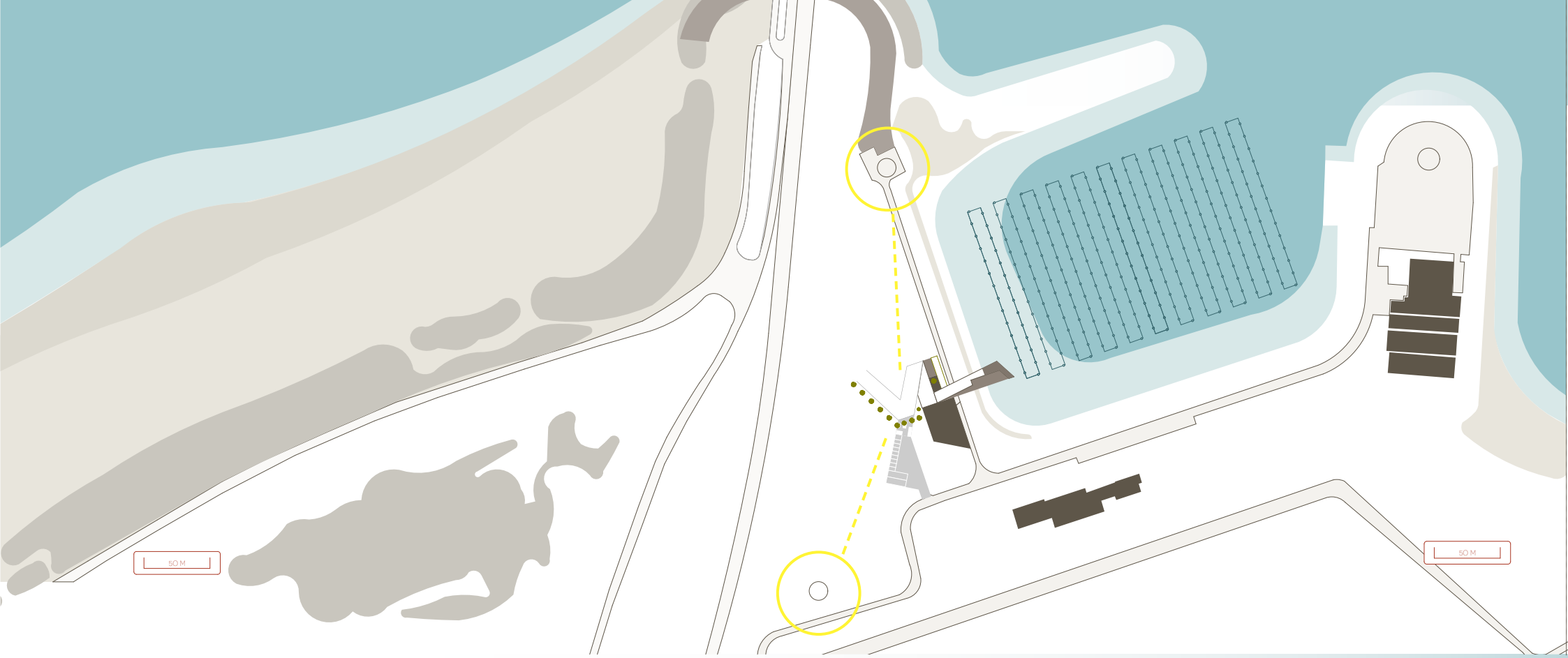


WINTER

HEATING & COOLING SYSTEM

HOLLOW HEAT-EXCHANGING FOUNDATION PILES





SUSTAINABLE ENERGY

FROM NEIGHBOURING WINDTURBINES

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SUSTAINABLE SEAWEED FARM

FOR FOOD PRODUCTION IN THE NETHERLANDS

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CLIMATE CONTROL
- Greenroof
- sunshading facade
- ventilation and heating with soil energy

PROGRAMME
- more sustainable food production (no fertilizers)
- seaweed purifies the ocean
- reduction of seaweed import
- no waste of drinking water
- reuse of current agricultural space for public use

MATERIALIZATION
- renewable & reusable building structure
- little waste & emission

SUSTAINABILITY





GOOD EXAMPLE

of POSITIVE INTEGRATION of INDUSTRY in the coastal area

of use of SUSTAINABLE CLIMATE SYSTEM

of building with SUSTAINABLE NATURAL RAW BUILDING MATERIALS

PIONEER PROJECT

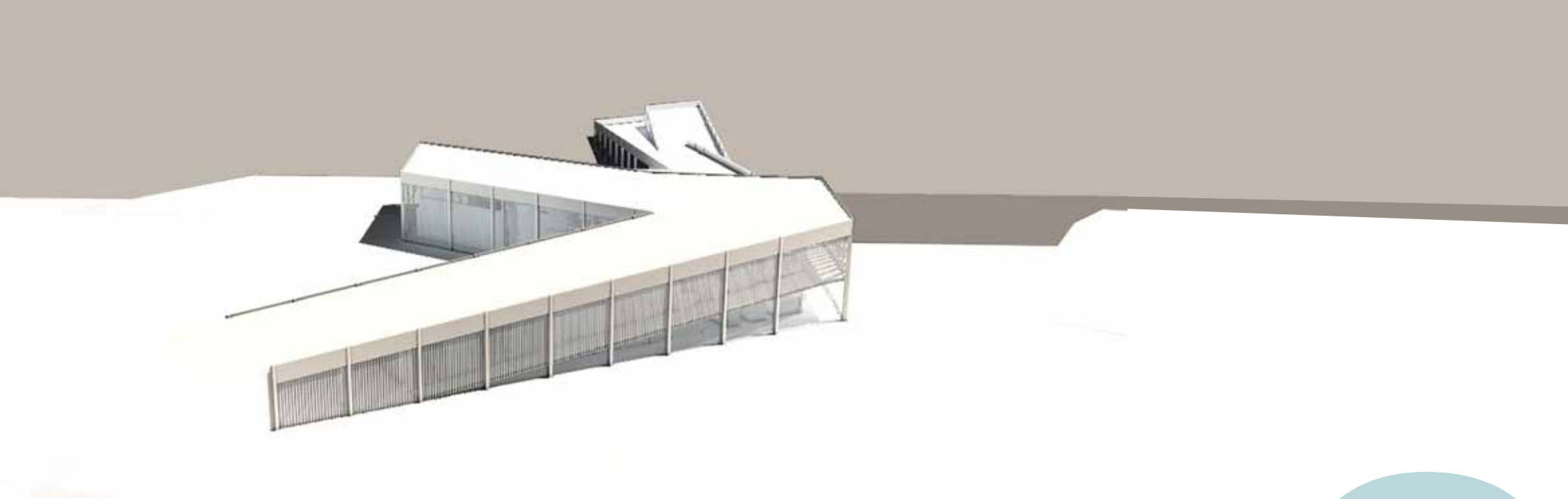
that provides for the first time a

SPACIAL PROGRAMME FOR A SUSTAINABLE SEAWEED FARM

RELEVANCE







THANK YOU FOR YOUR ATTENTION

QUESTIONS