

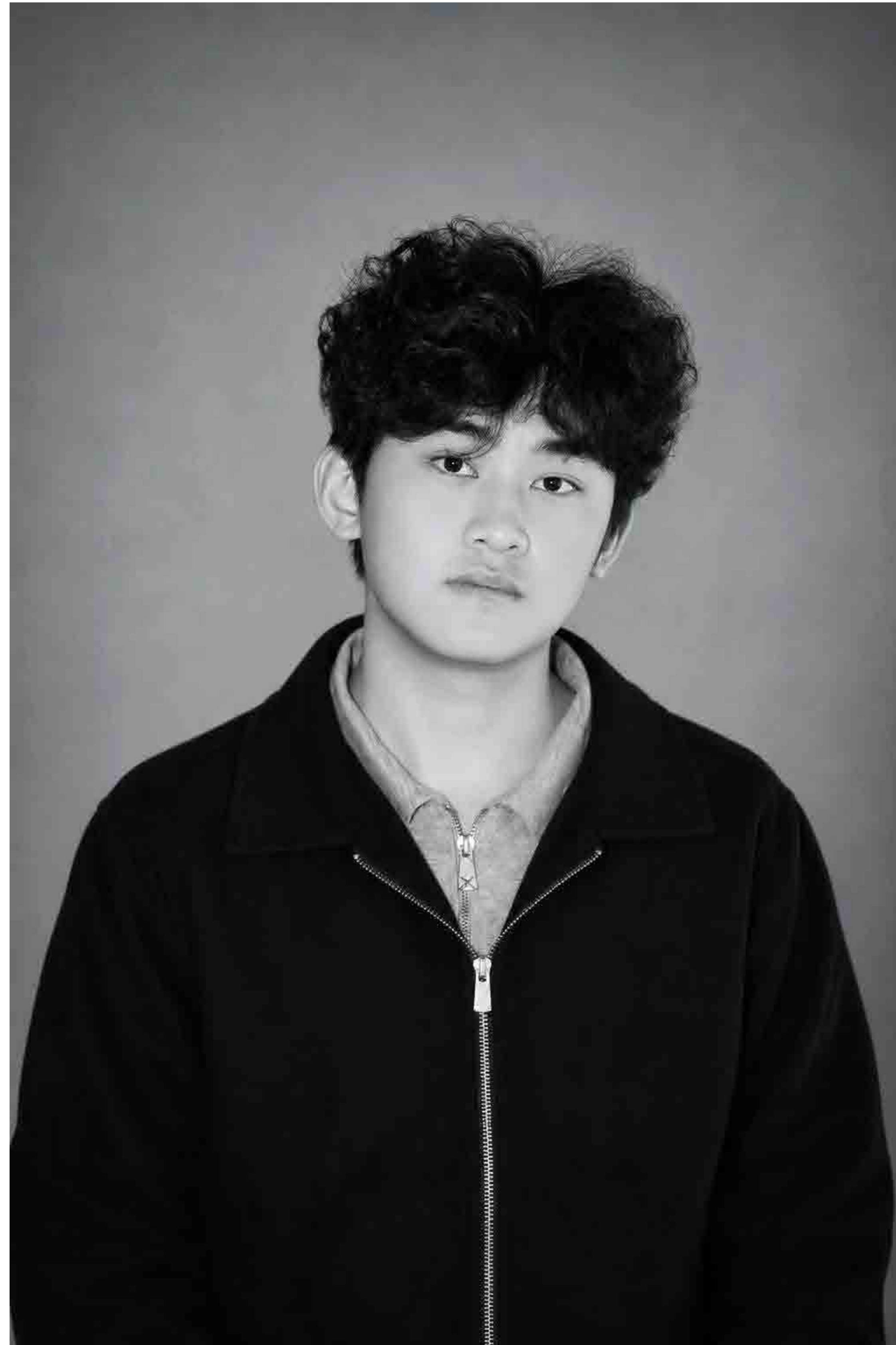
Team 26 - China

Meandering Confluence

A Living Interface between city, river and habitat



Tongji University
Team 26 - China
Teacher: DENG Feng, QU Zhang



Yuqian GE

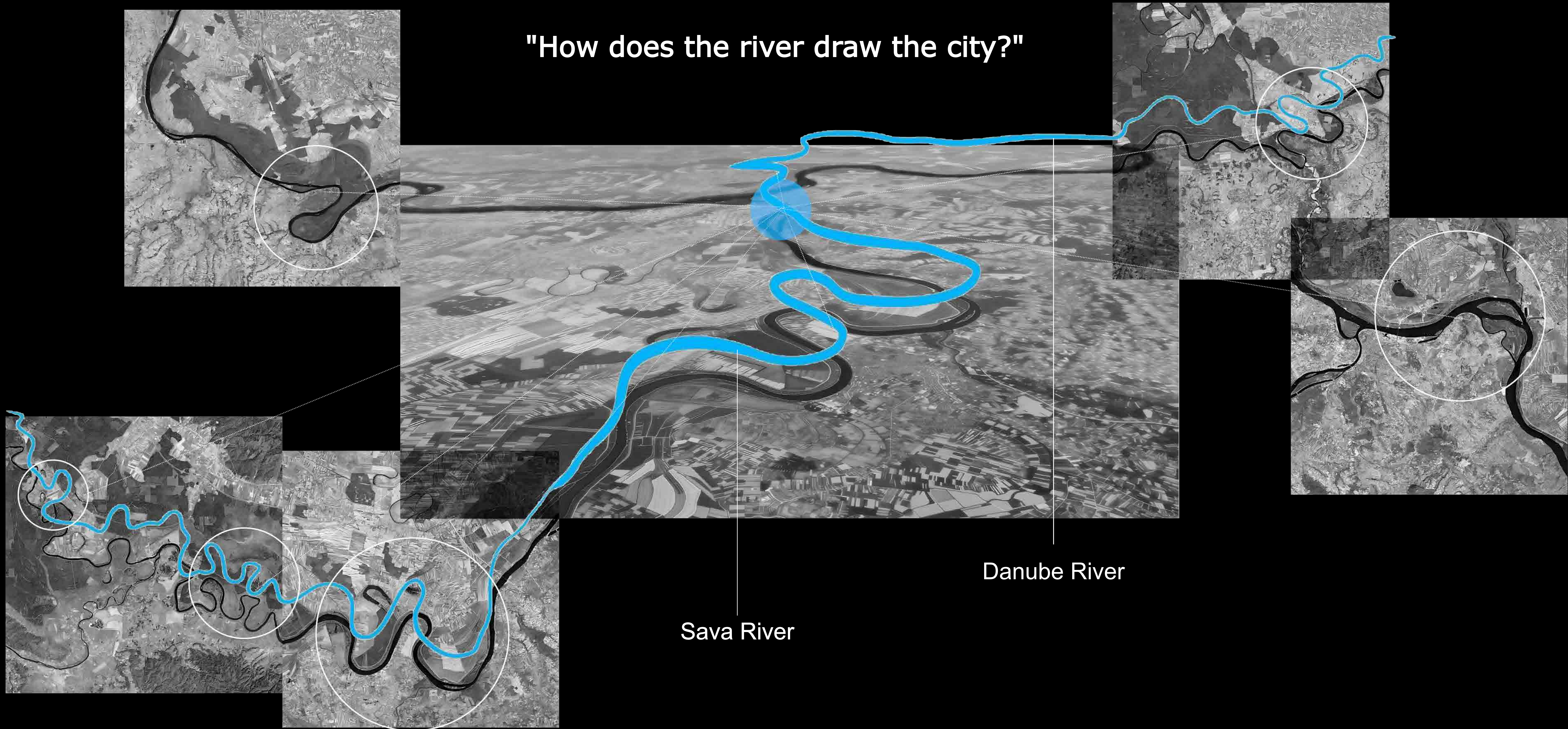


Nianci HUANG



Maicun ZONG

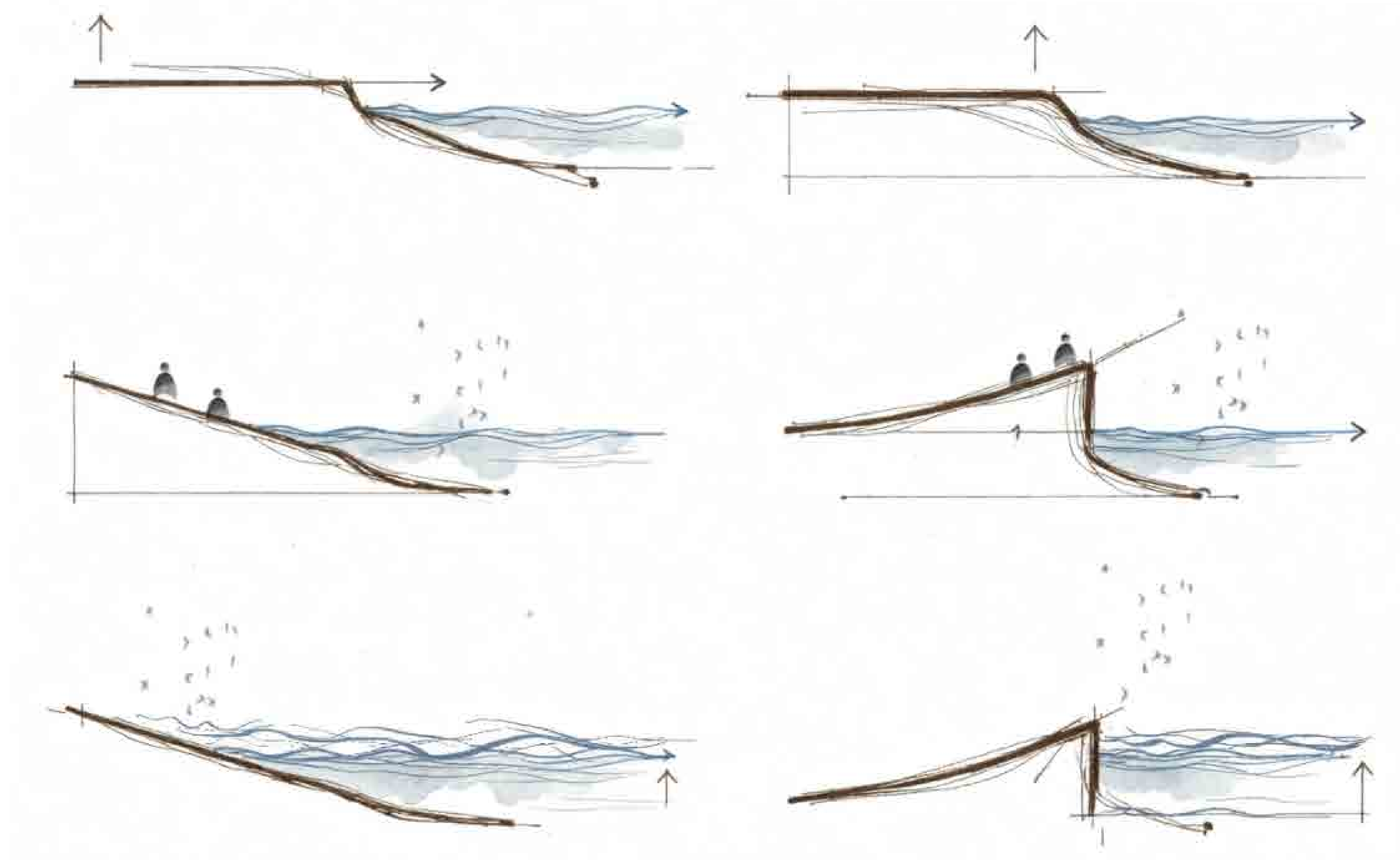
"How does the river draw the city?"



Sava River

Danube River

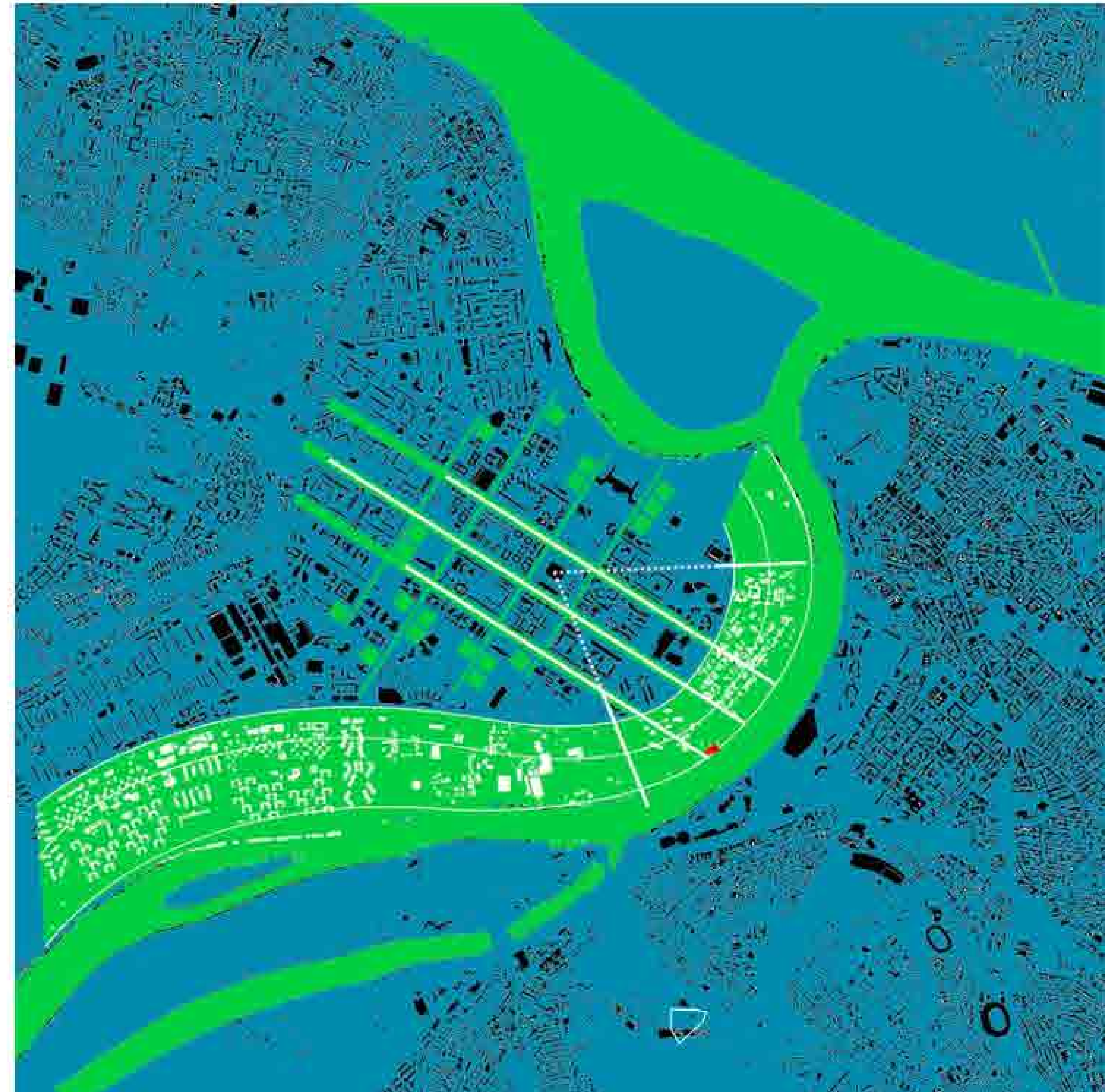
"How do people reach the river?"



Terrain Defines Access, Vision and Temporal Use of the River.

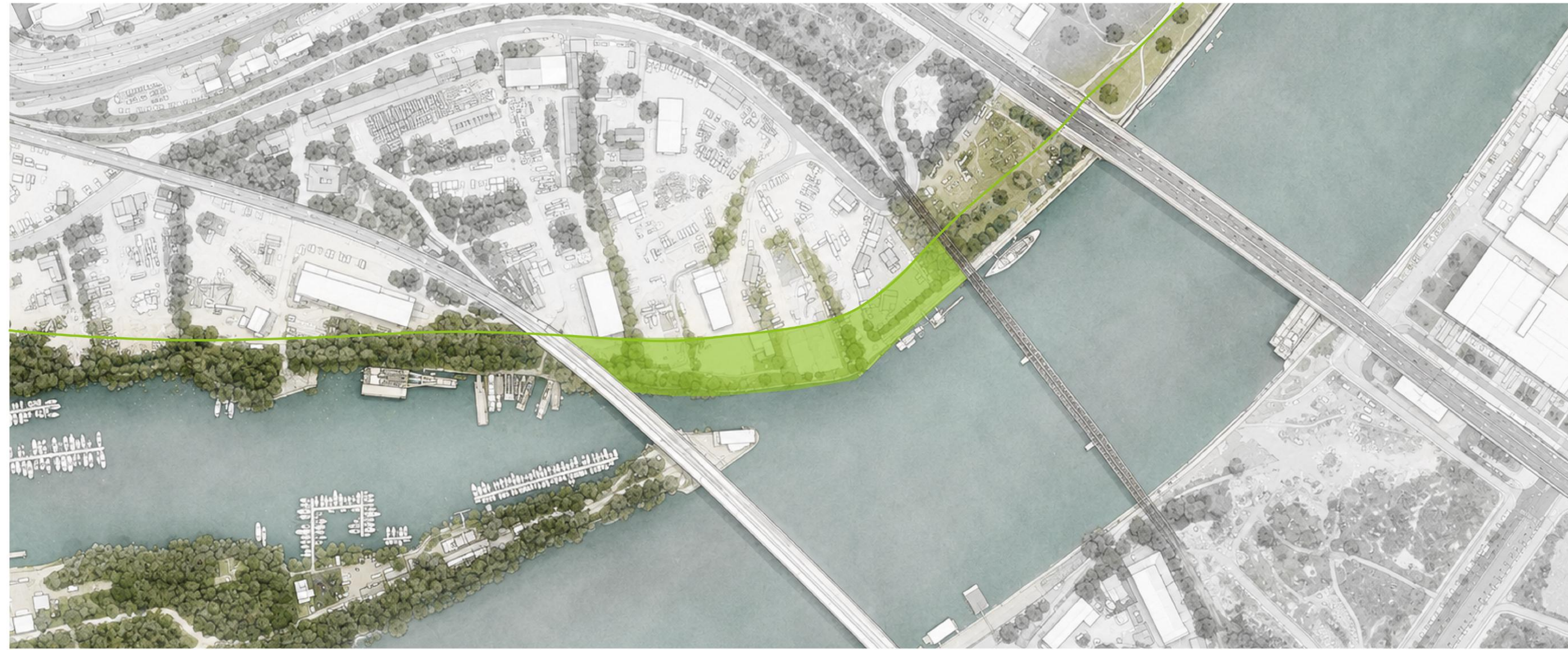


Existing Condition
Fragmented and Disconnected Green System



01 Widen the River Ecological Zone
02 Extend Ecology into the Urban Fabric

30m Ecological Buffer



Core Birds



Pygmy Cormorant
Microcarbo pygmaeus



Great Cormorant
Phalacrocorax carbo



Mixed Heron Species
(Grey Heron) *Ardea cinerea*



Reed / Marsh Birds
(Great Reed Warbler)
Acrocephalus arundinaceus



Common Kingfisher
Alcedo atthis

Core Trees



White Willow
Salix alba



Crack Willow
Salix fragilis



Black Poplar
Populus nigra



White Poplar
Populus alba



Alder
Alnus glutinosa

Ground / Wetland Species



European Pond Turtle
Emys orbicularis



Eurasian Beaver
Castor fiber



Eurasian Otter
Lutra lutra



European Tree Frog
Hyla arborea

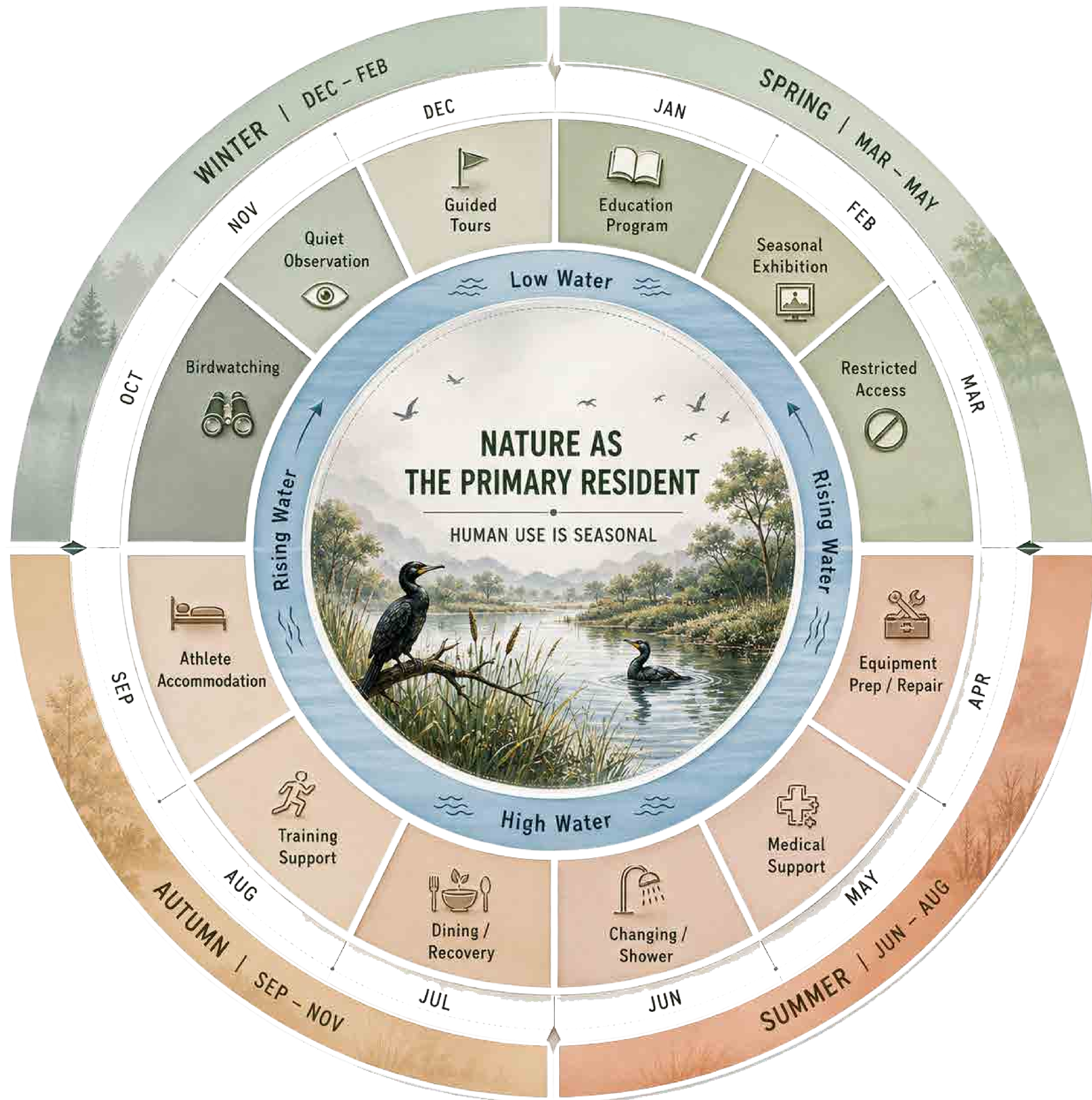


Grass Snake
Natrix natrix



Dice Snake
Natrix tessellata

Temporal Coexistence Strategy



NATURAL RHYTHMS

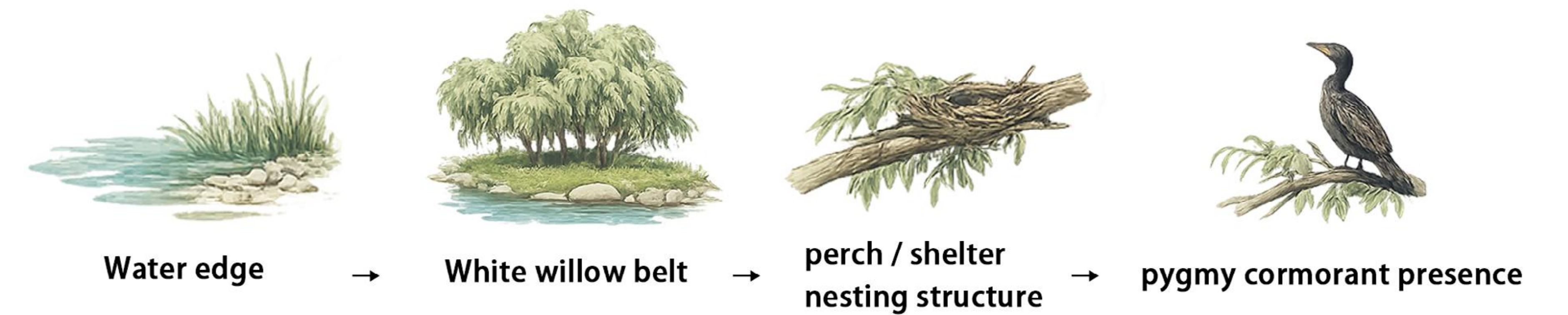
- Birdwatching**
Seasonal observation
- Quiet Observation**
Low-disturbance viewing
- Guided Tours**
Controlled access
- Education Program**
Ecological learning
- Seasonal Exhibition**
Temporary display
- Restricted Access**
Habitat protection

HUMAN OCCUPATION

- Athlete Accommodation**
Seasonal living
- Training Support**
Preparation / practice
- Dining / Recovery**
Shared rest
- Changing / Shower**
Daily service
- Medical Support**
First aid
- Equipment Prep**
Gear storage

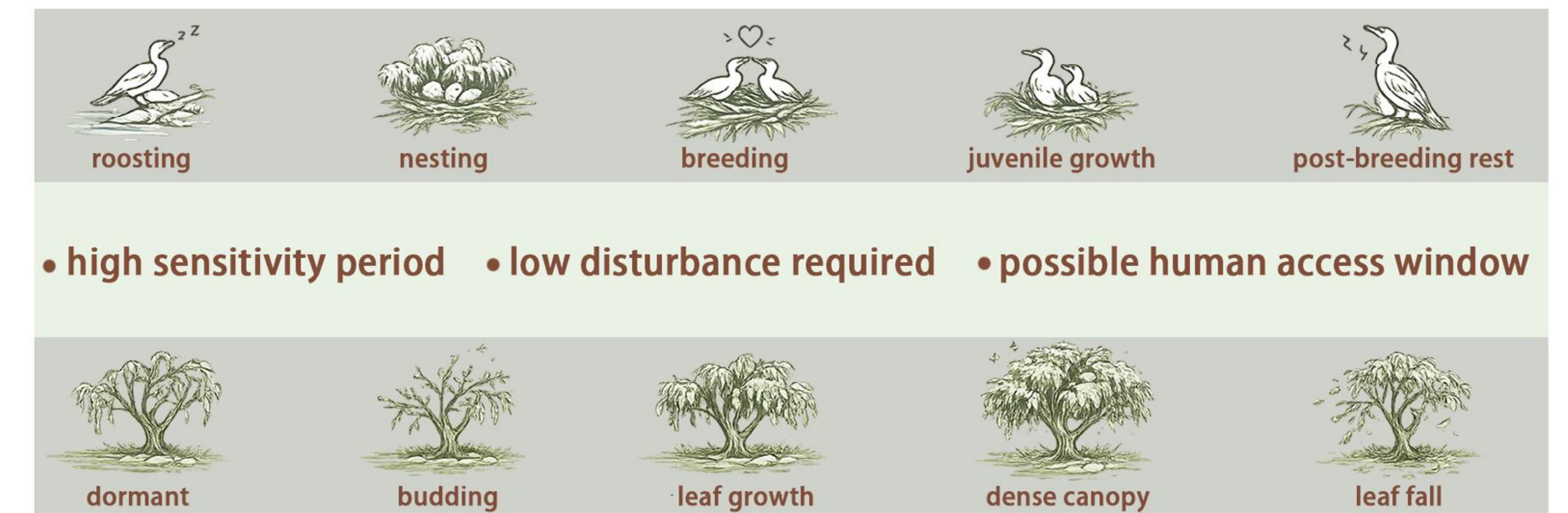
01 Habitat Dependency

----Pygmy cormorants rely on riparian willow structure for perching, shelter, and nesting support.

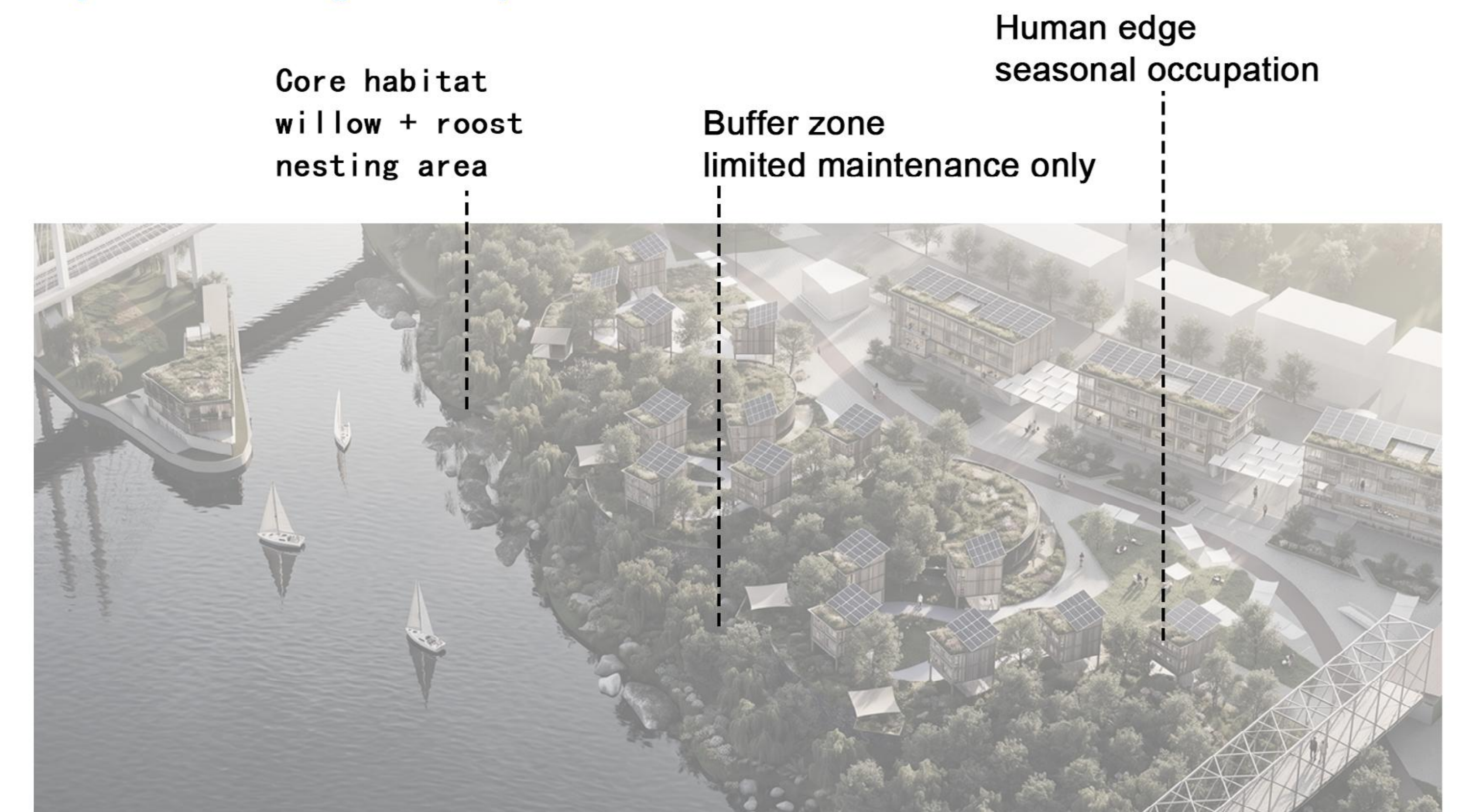


02 Seasonal Cycle of Use

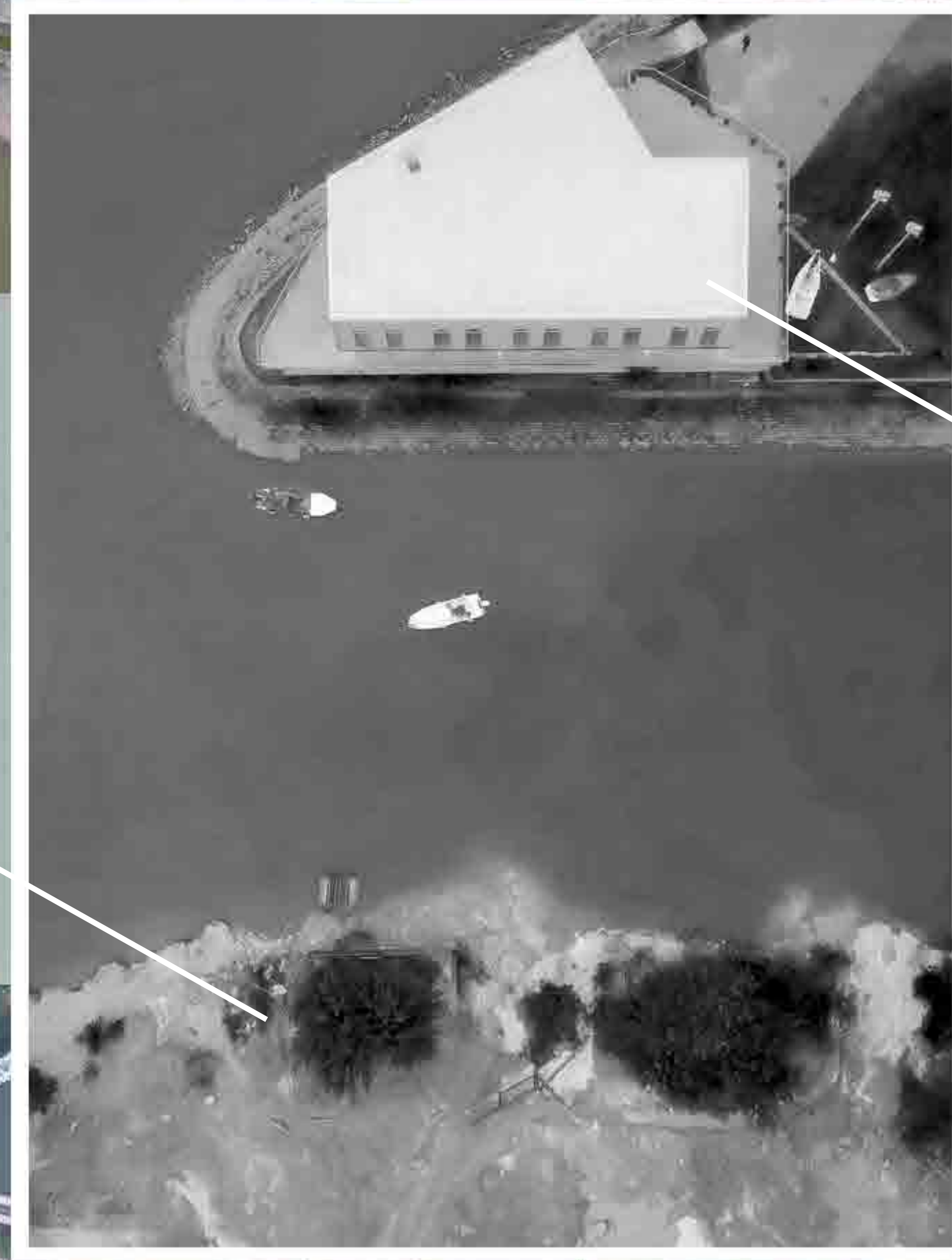
----Bird cycles and willow phenology together define periods of protection and possible access.



03 Spatial Design Response



Two Starting Points Within One Recovering Riverside Territory



Zone A

Zone B



Two Complementary Roles Within One Temporal Framework

Zone A

Seasonal Settlement Field



Zone B

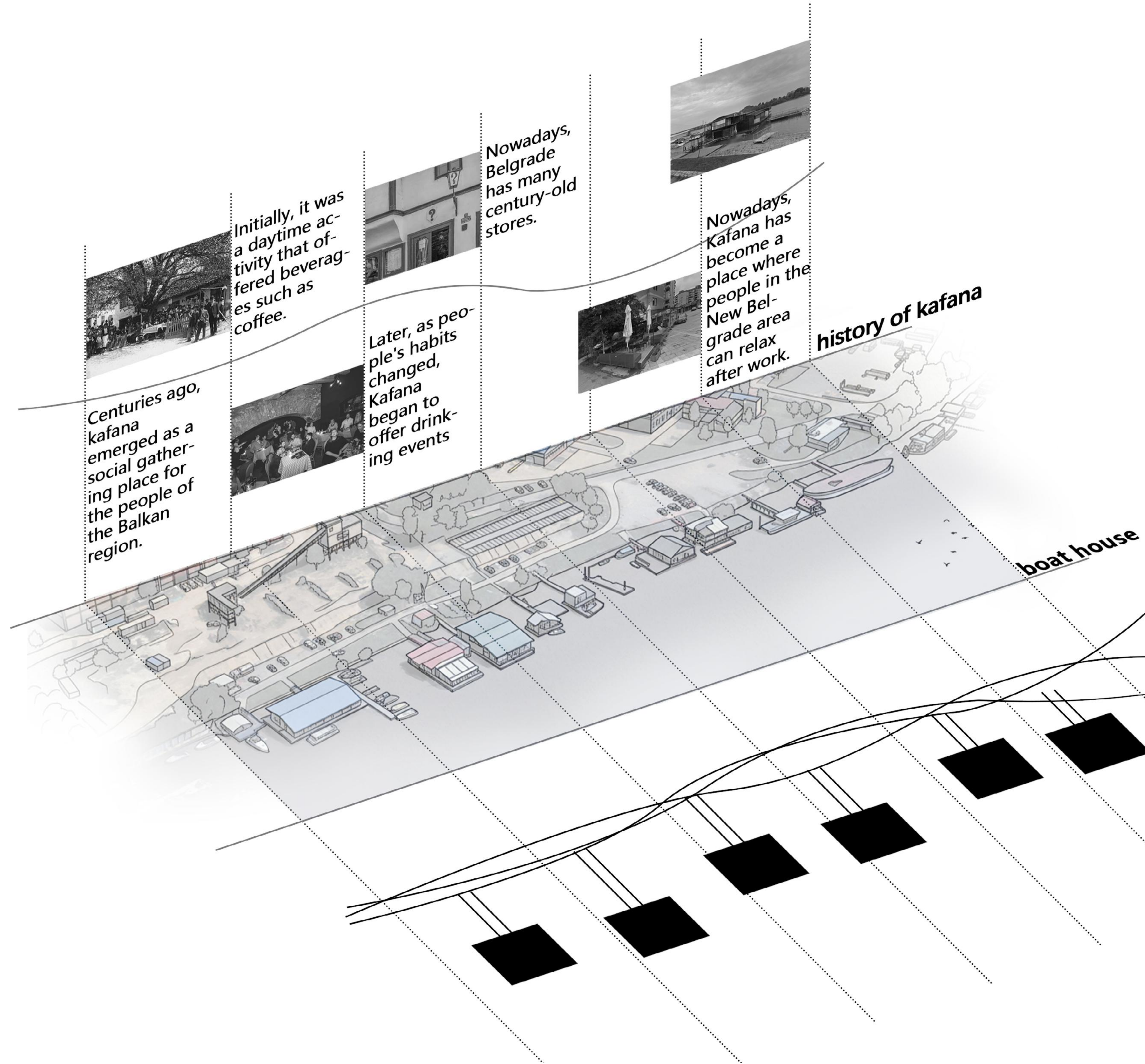
Civic-Ecological Threshold



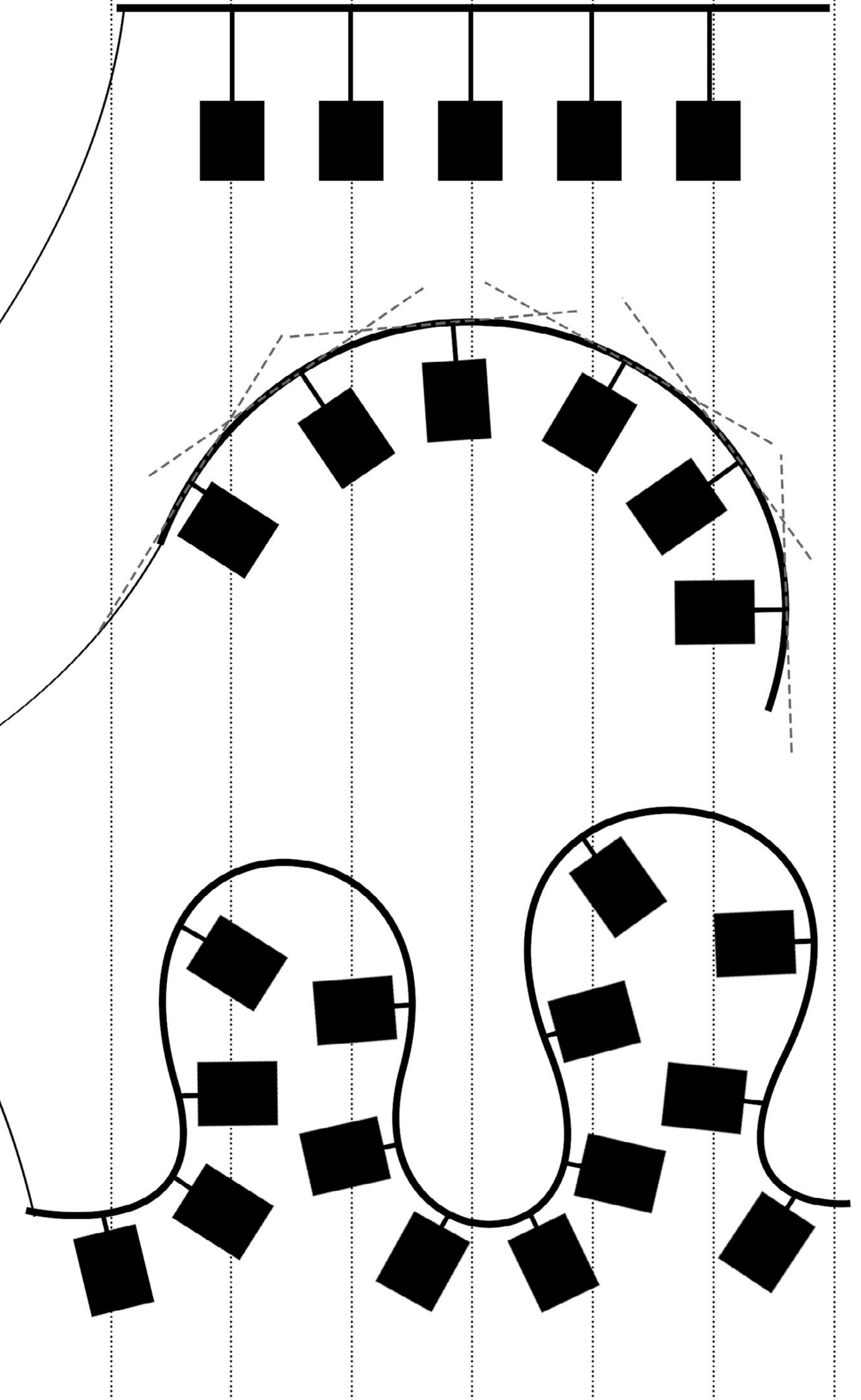


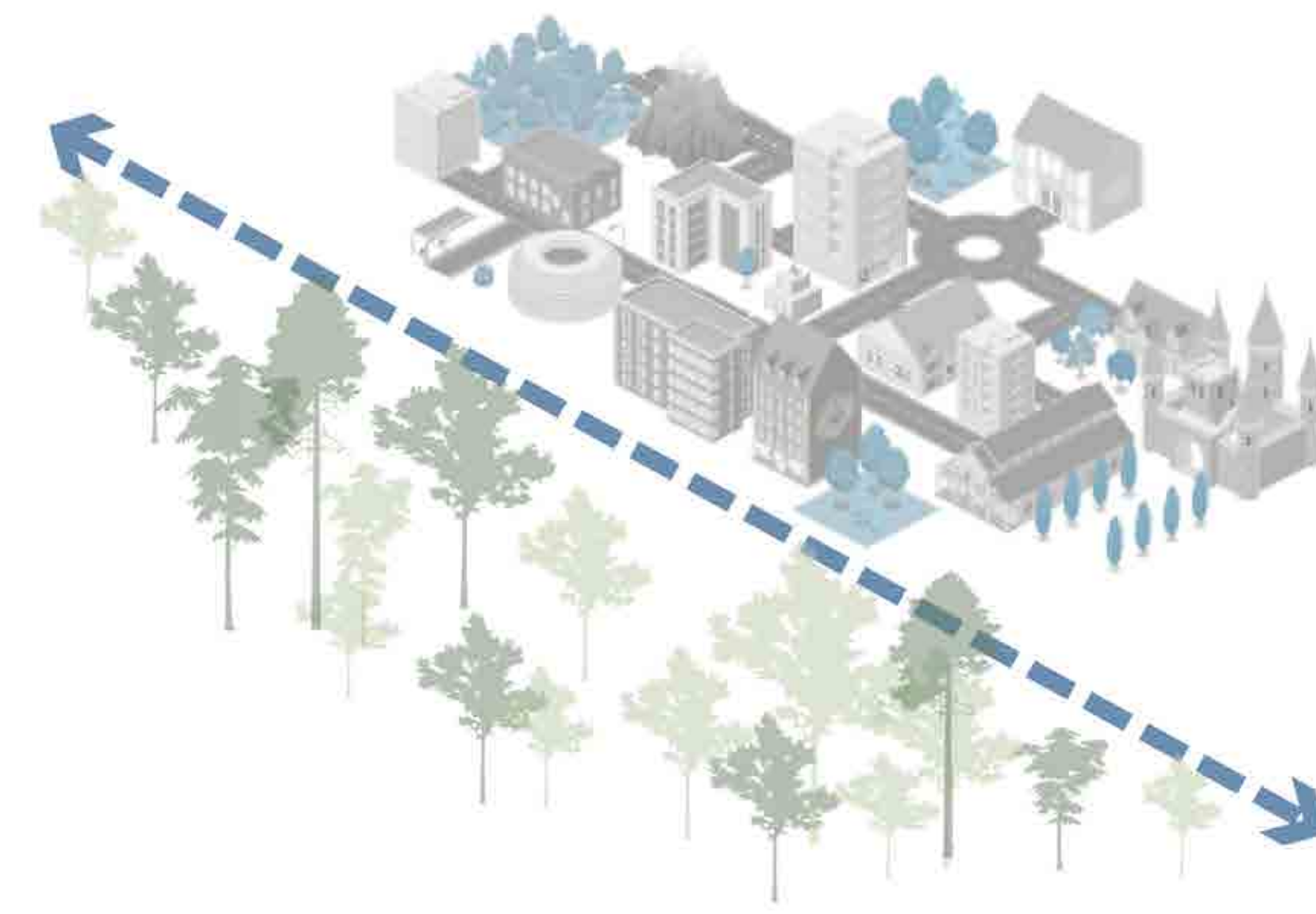
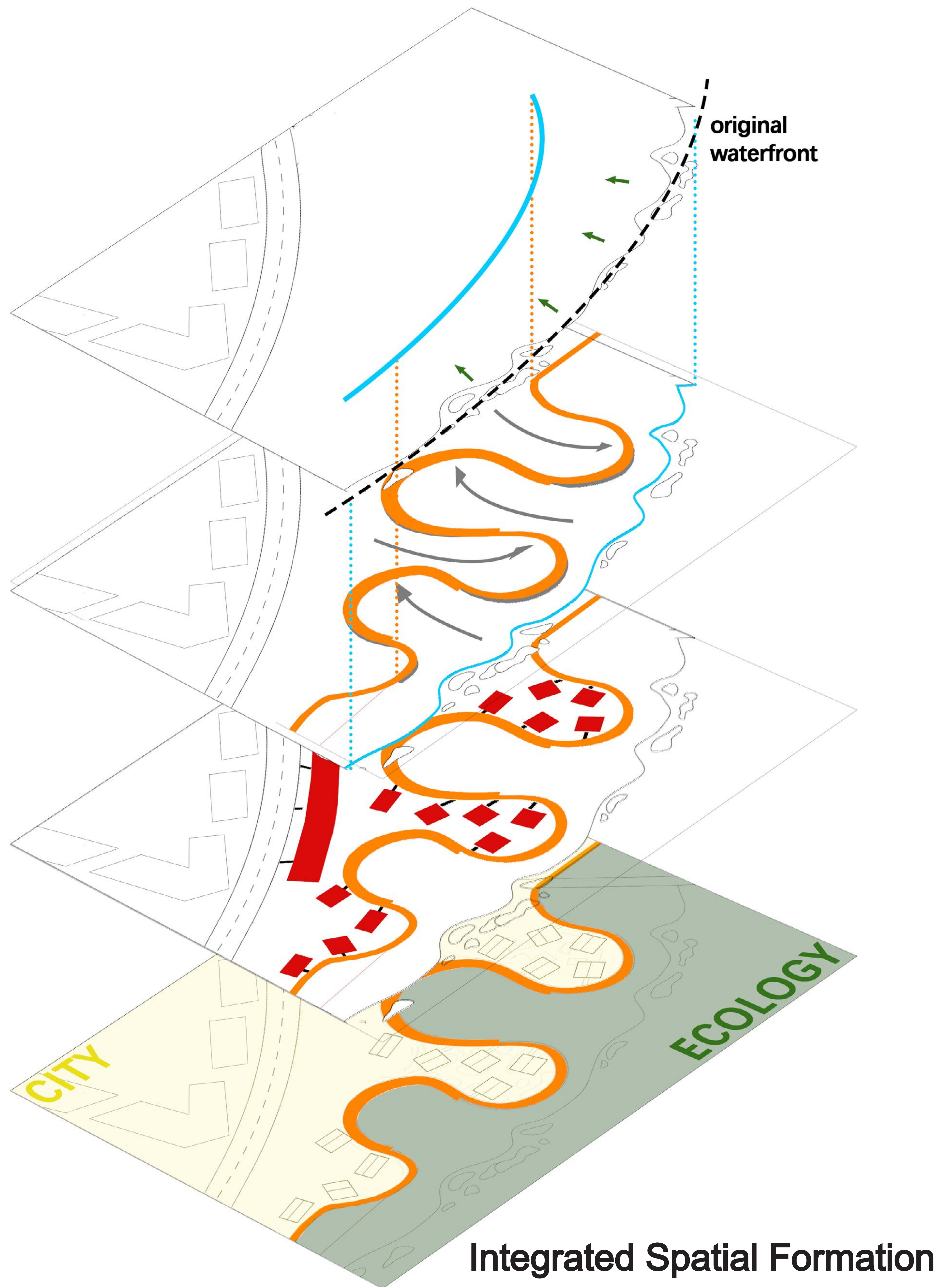


Two local prototype — kafana and boat house

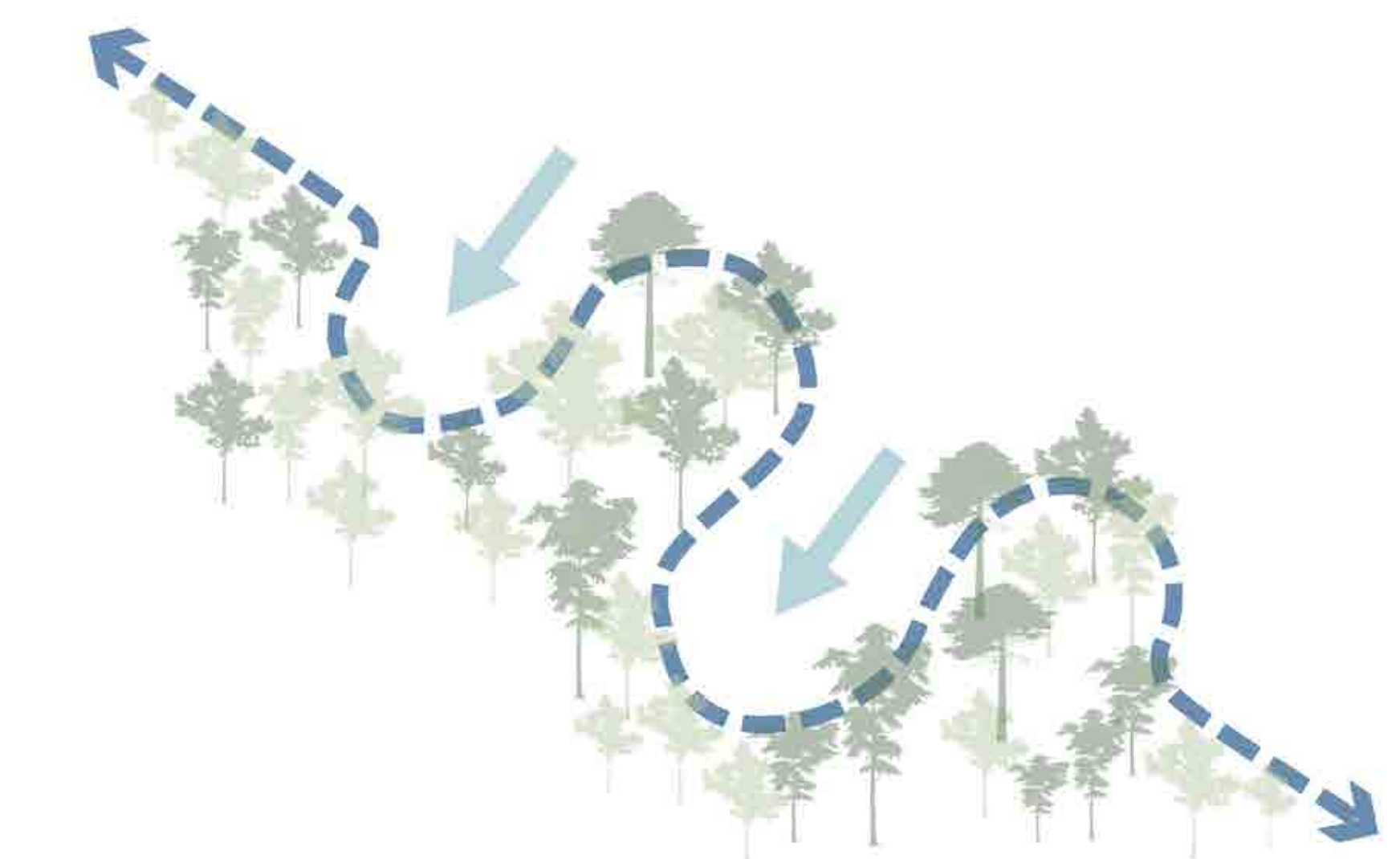


The riverbank curves to create more surfaces

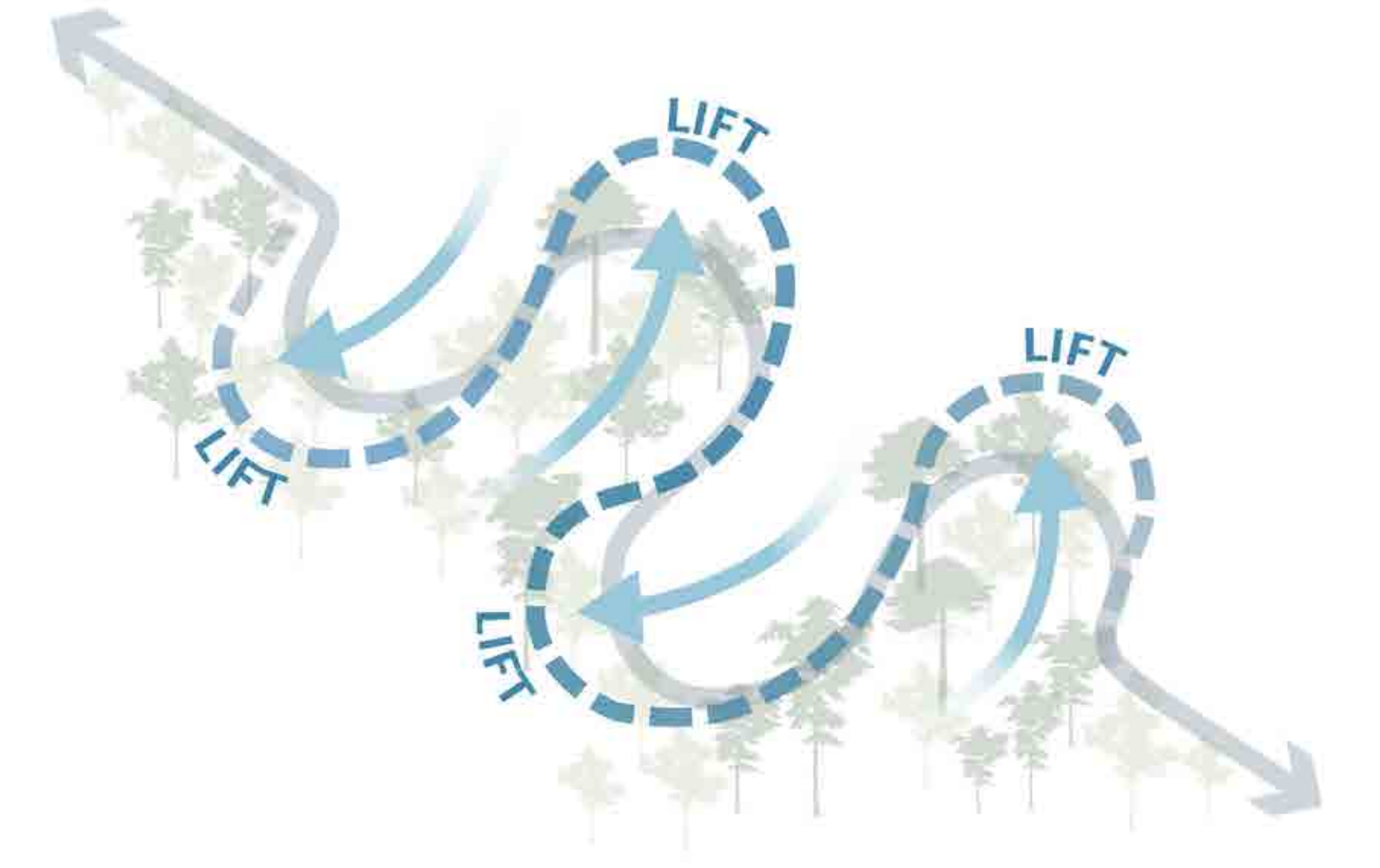




01 City and River Ecology



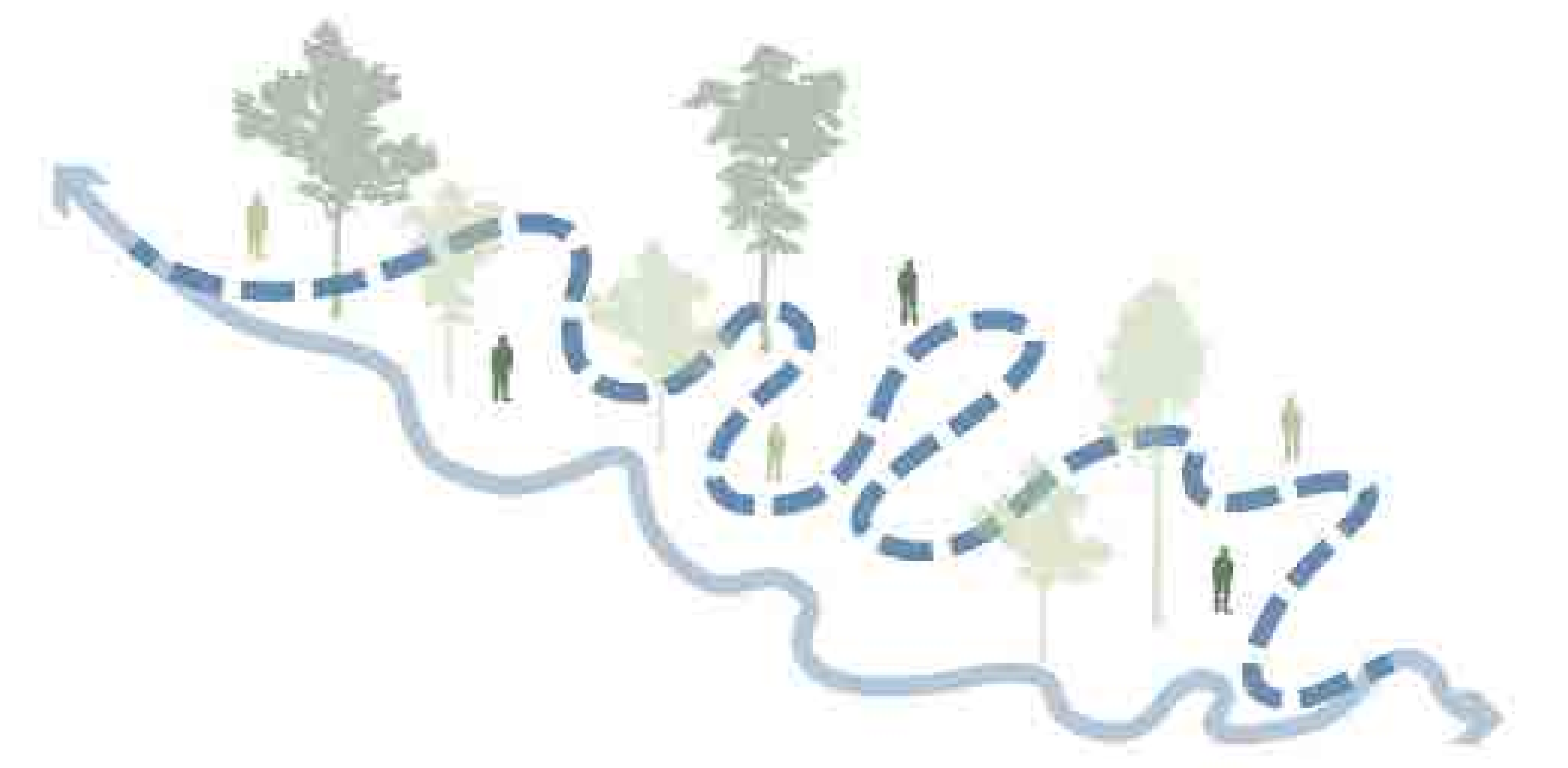
02 Mutual Penetration



03 Lifted and Interlocked Ground

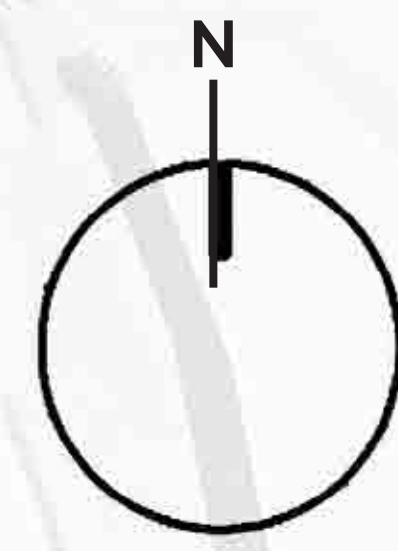
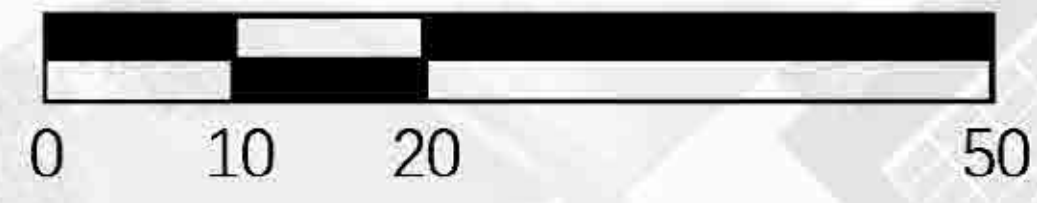


04 Existing River Edge



05 Retreated and Widened Riverfront

MASTERPLAN



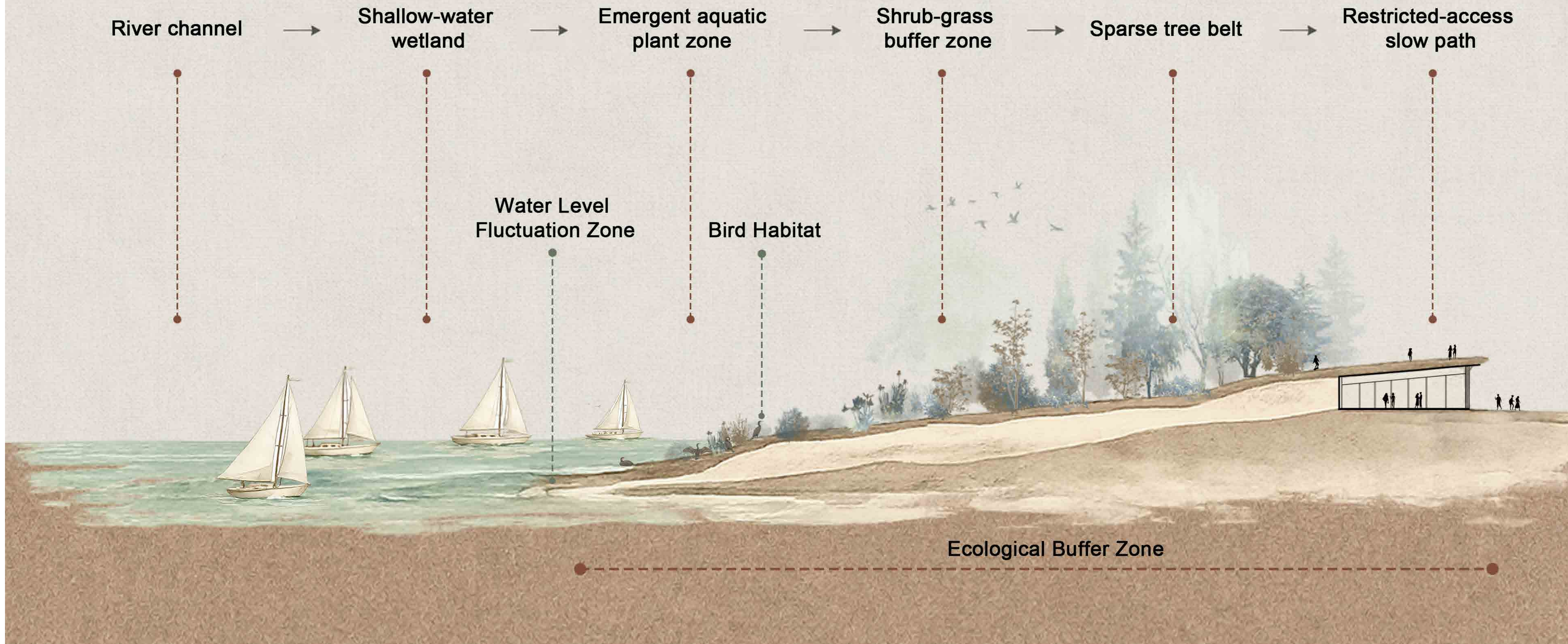
ZONE A

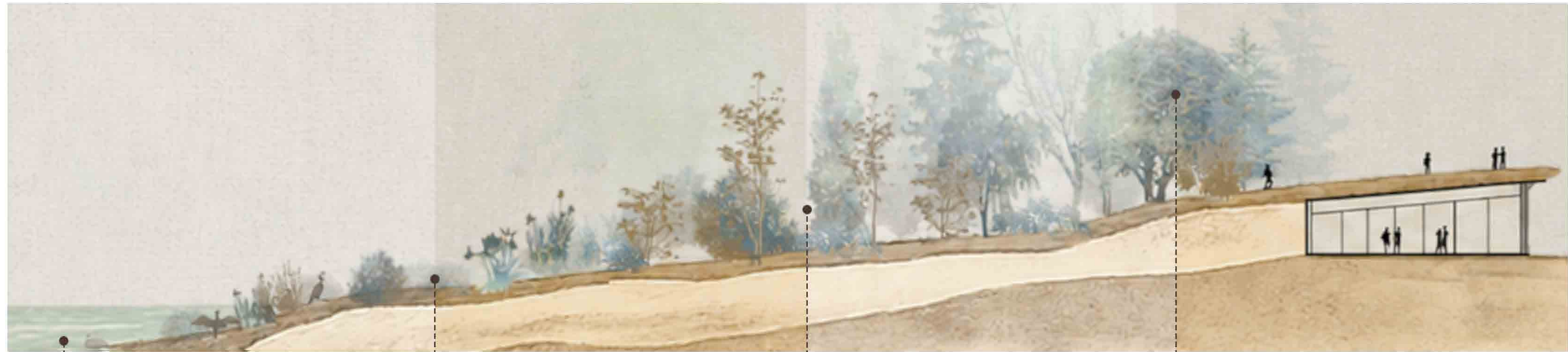
- 1 Urban Community Interface
- 2 Covered Playground
- 3 Energy Center
- 4 Activity Lawn
- 5 Living Unit
- 6 Pedestrian Bridge
- 7 Viewing Platform

ZONE B

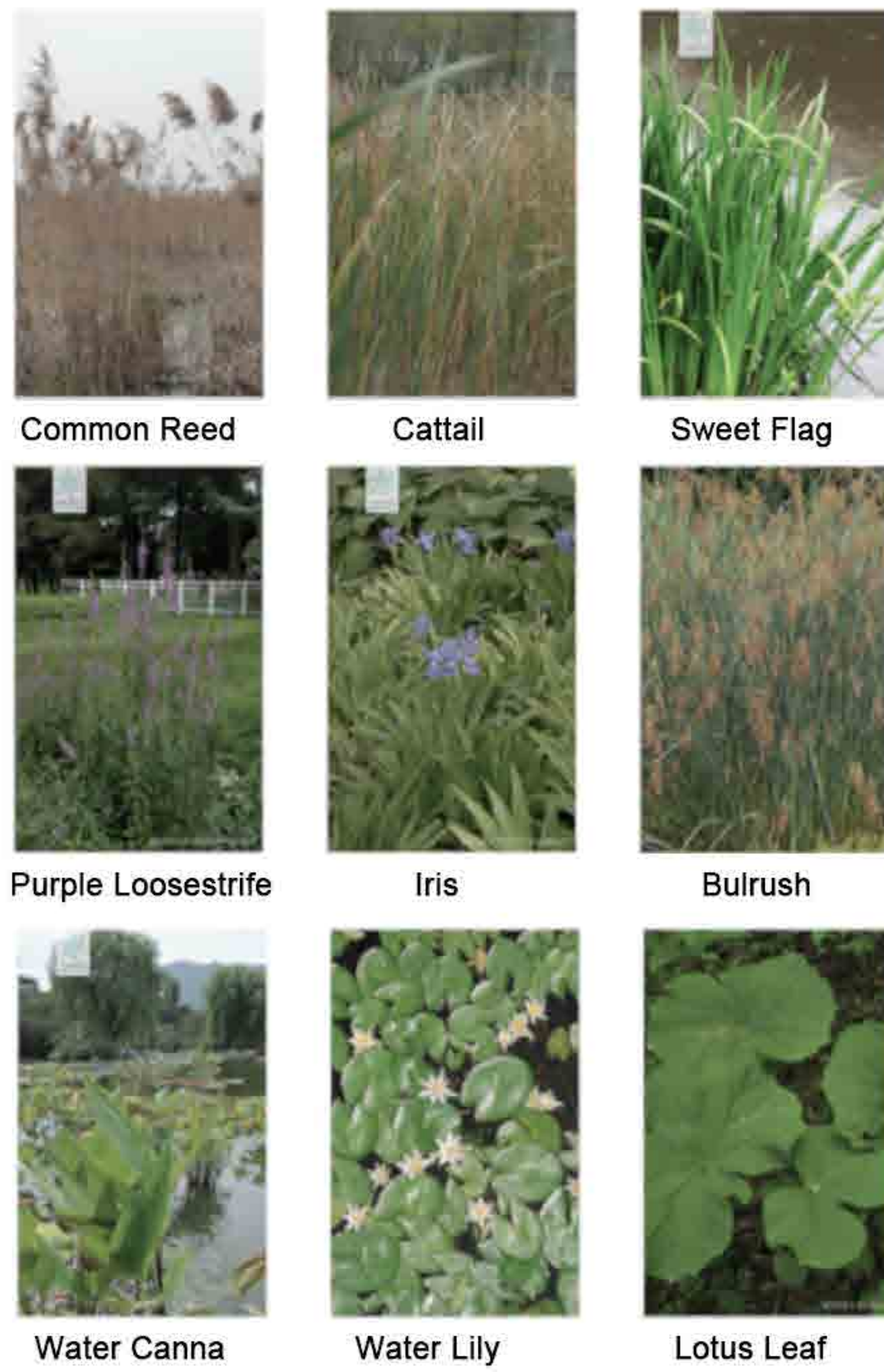
- 8 Original Building
- 9 Added Structure

River-side Ecological Green Belt Analysis





WETLAND PLANTS



GROUND COVER & PERENNIALS



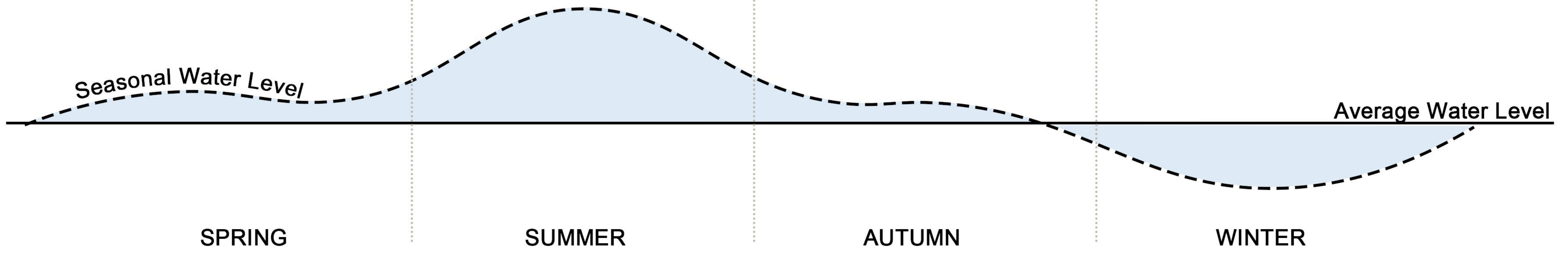
SHRUBS



TREES



Seasonal Water Level Variation



Topography shaping

Riverbank Ecology
Adapt to the flood season

Living in Nature
The city and nature interpenetrate each other

Urban boundary
Response to New Belgrade



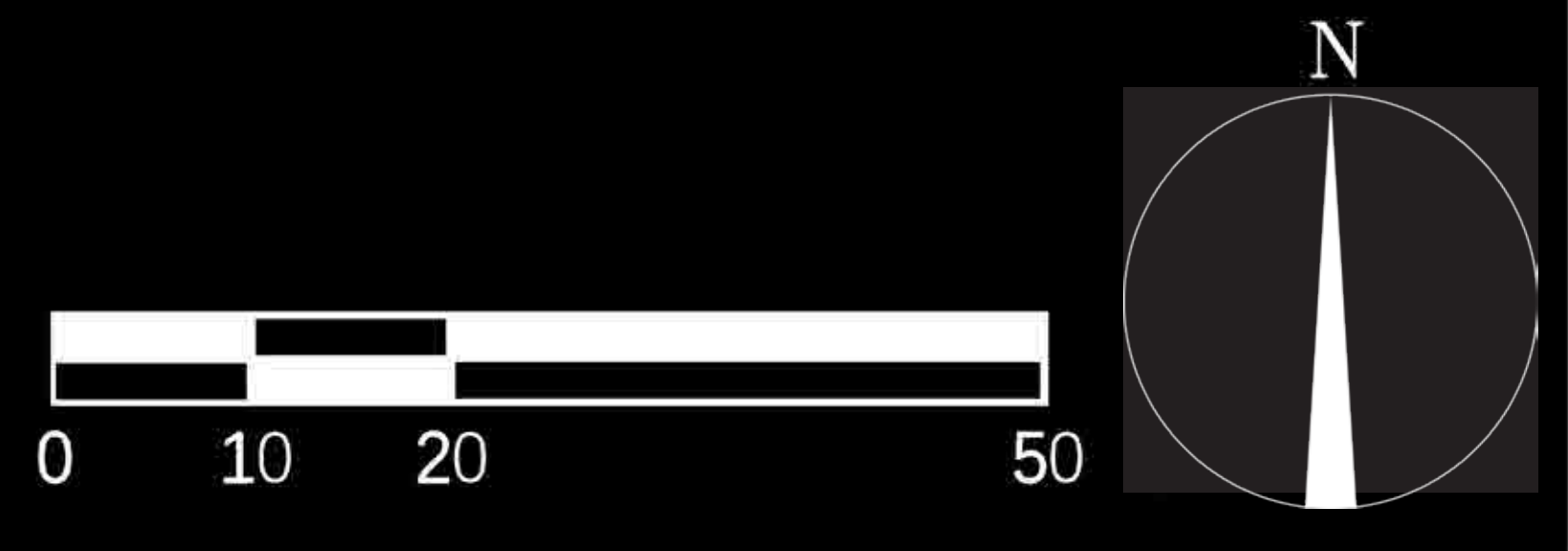
GROUND FLOOR PLAN

Indoor Program

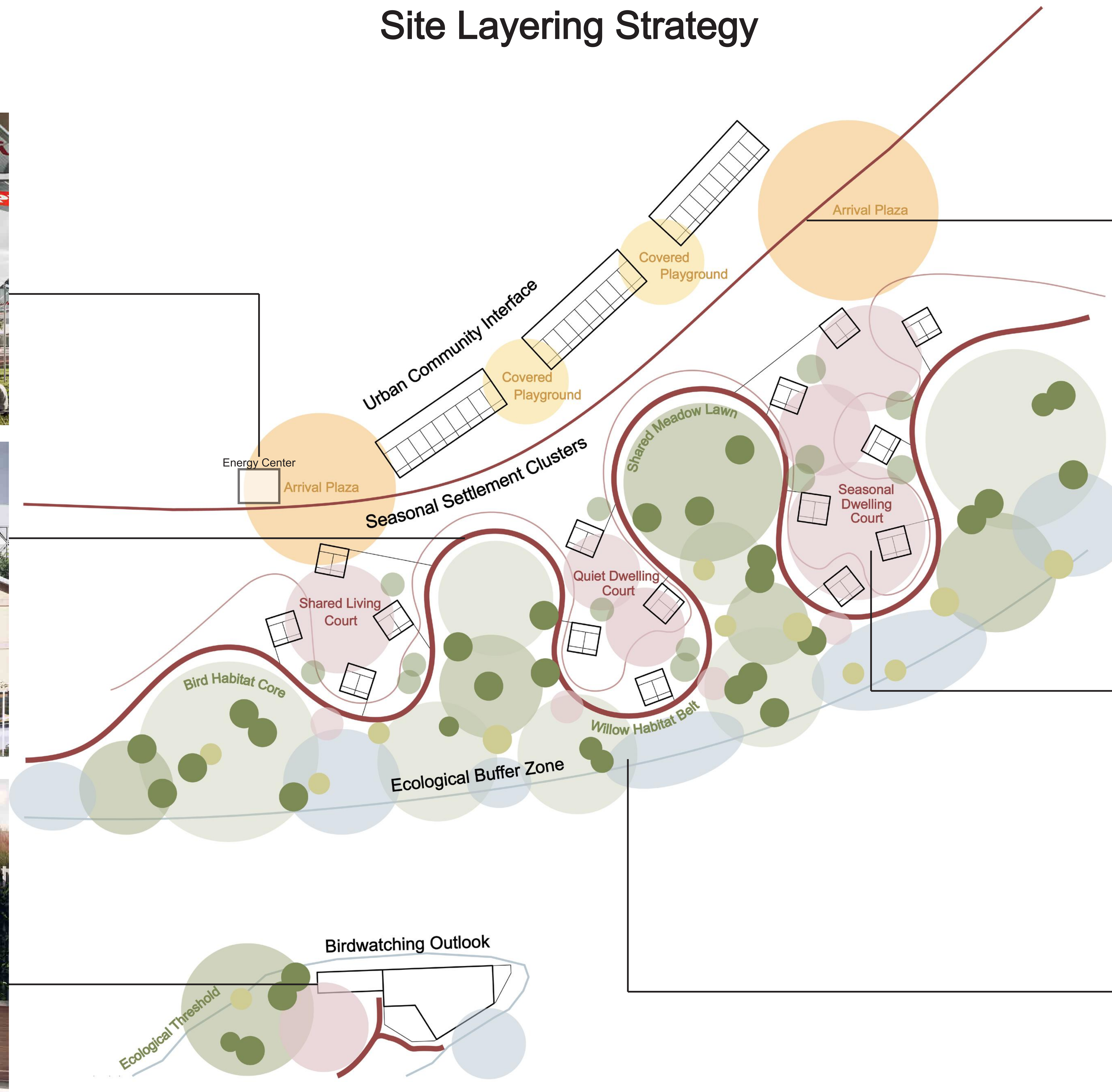
- 1 kafana
- 2 energy center
- 3 coffee bar
- 4 gym
- 5 shared living room
- 6 toilet

Outdoor Program

- 7 entrance square
- 8 activity lawn
- 9 bicycle lane
- 10 ecological trail
- 11 viewing platform



Site Layering Strategy



Two Spacial Responses

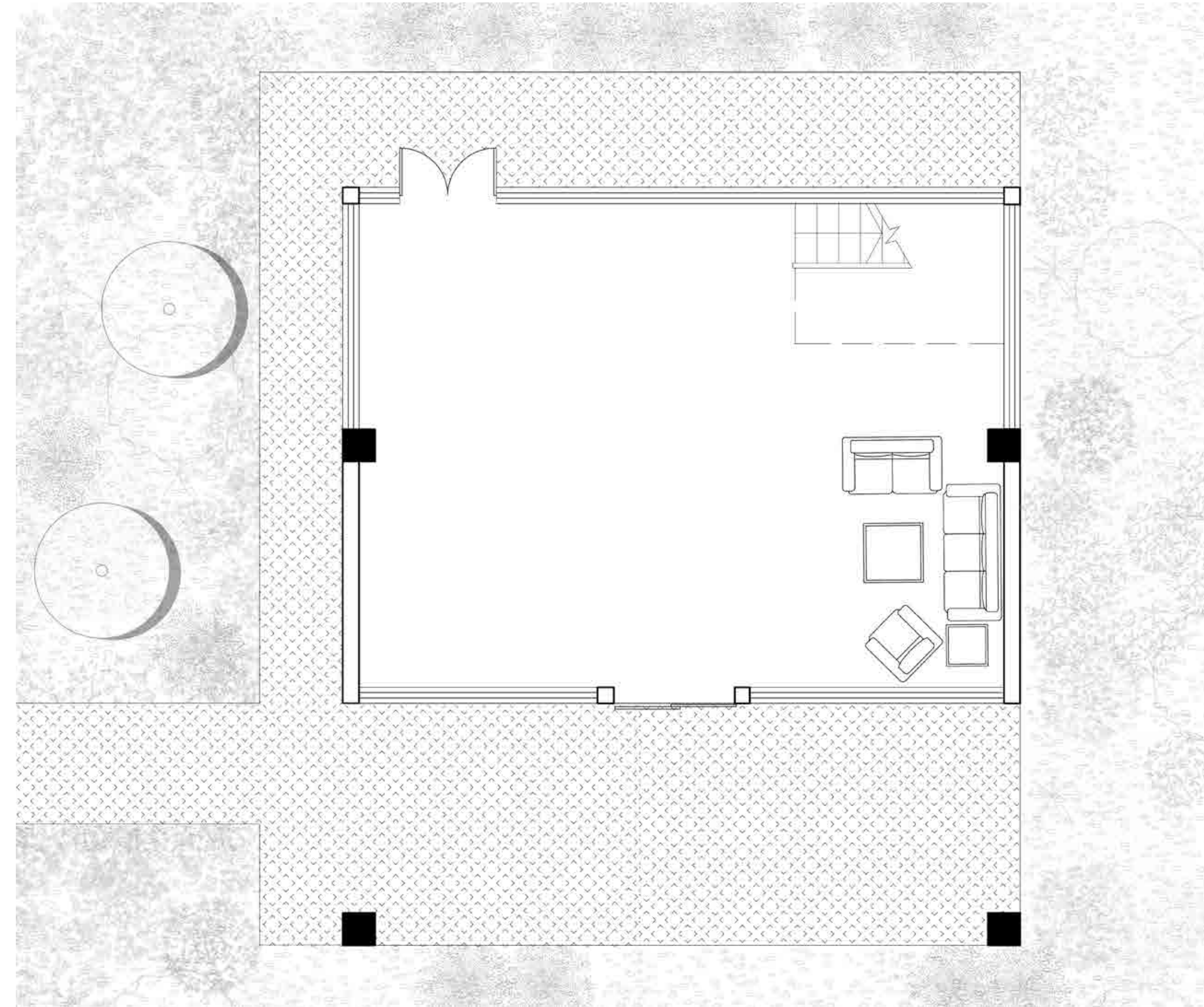
River Side
Towards Sava River



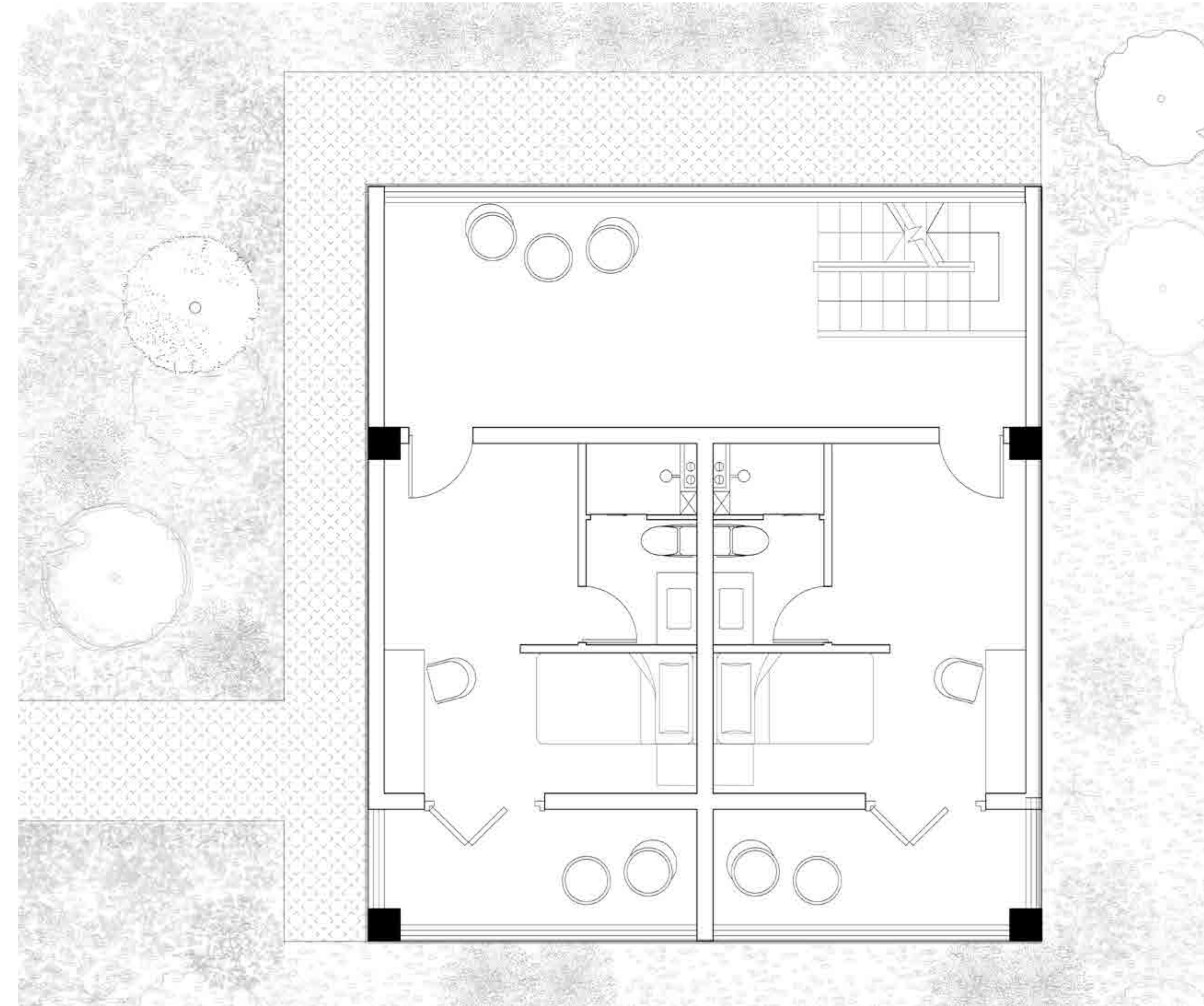
City Side
Towards New Belgrade



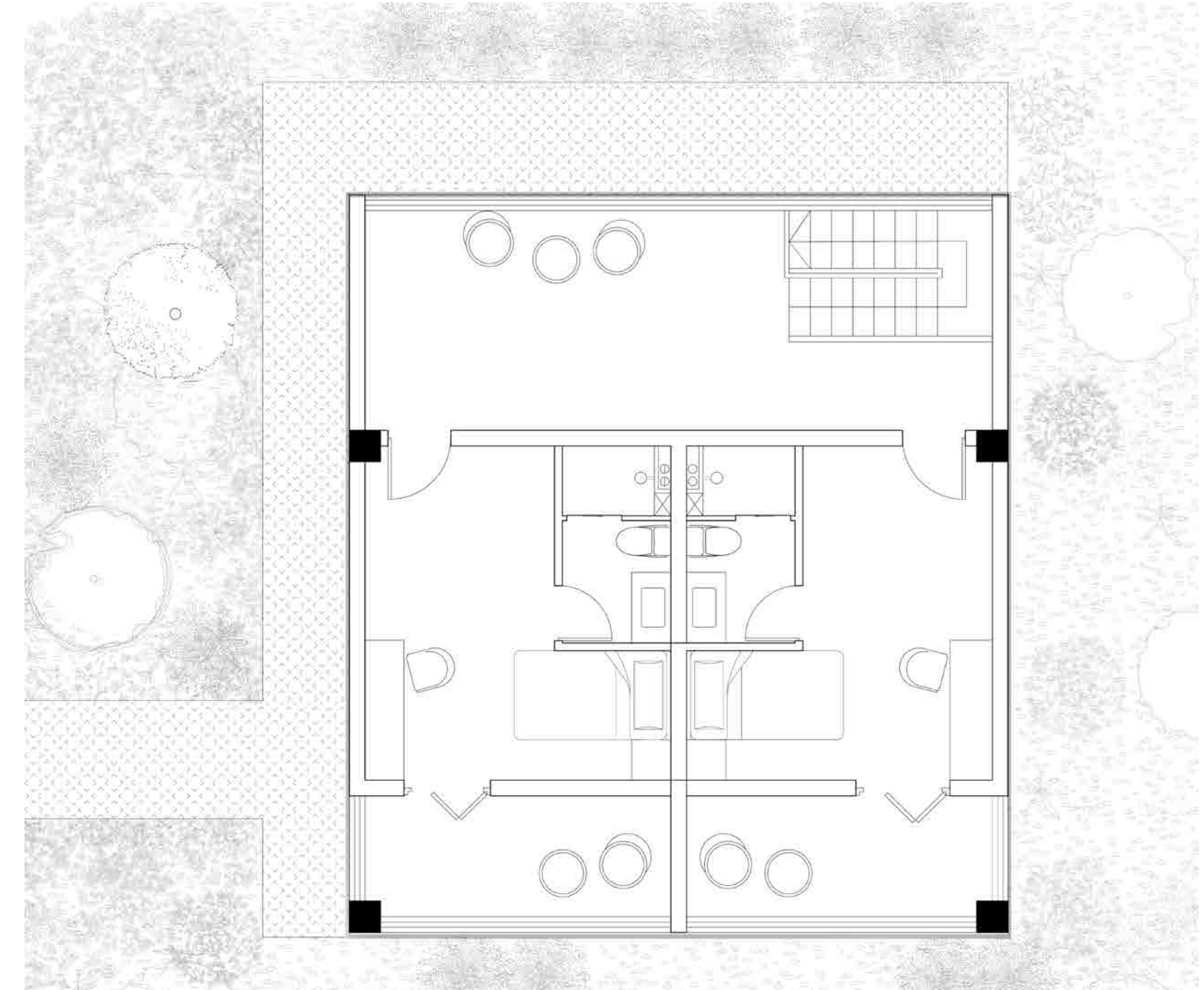
Athlete Dwelling Unit



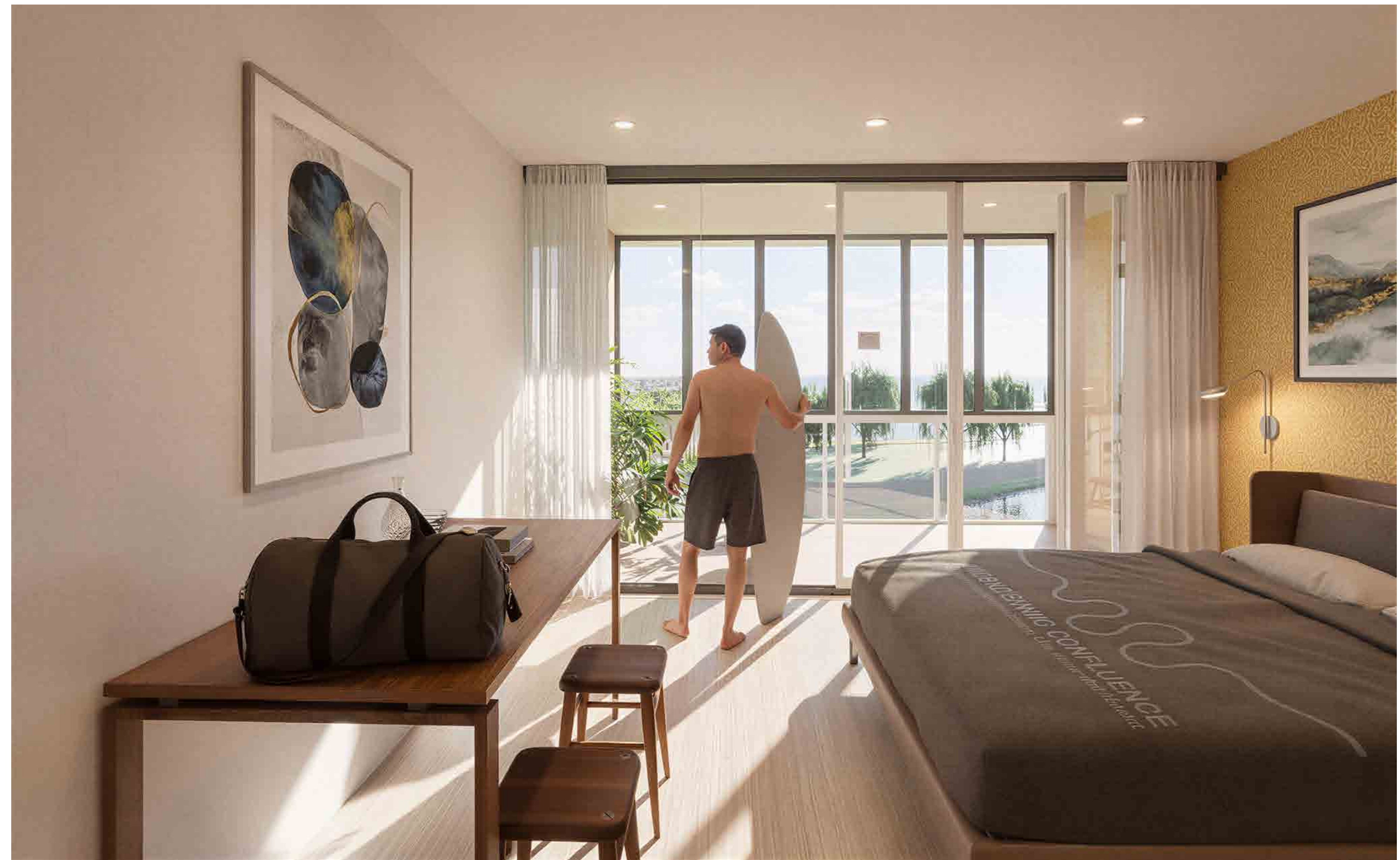
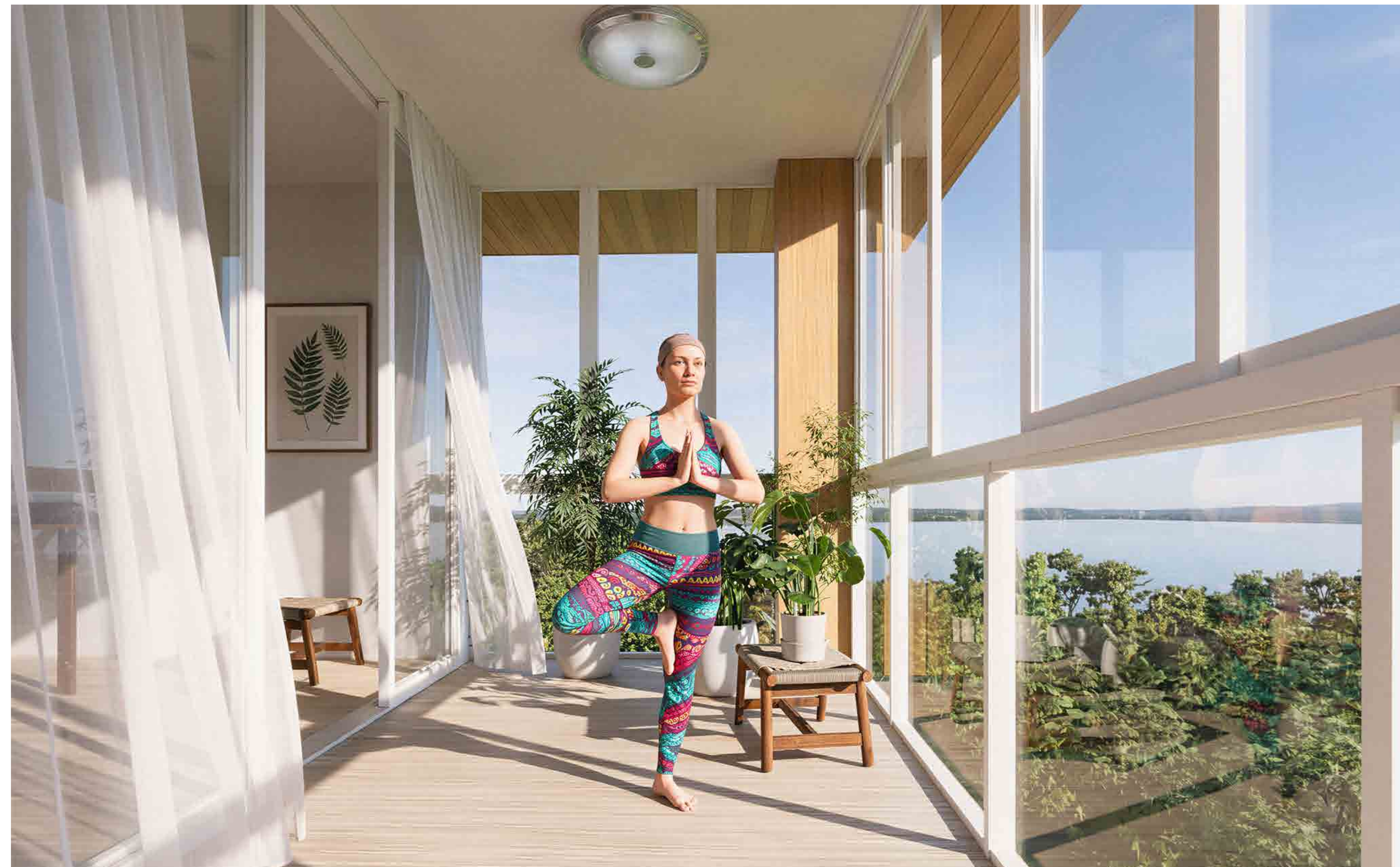
Ground Floor Plan

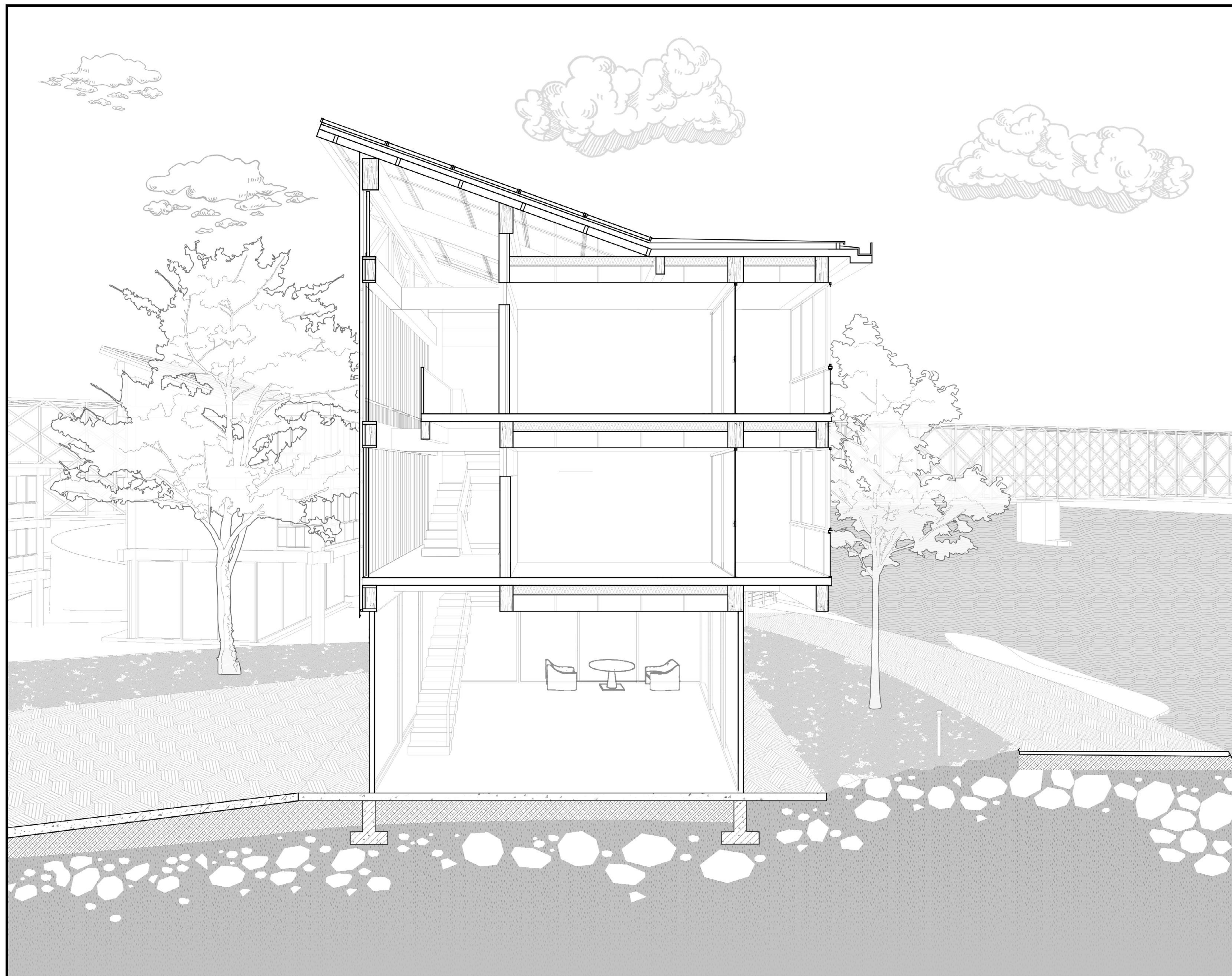


First Floor Plan



Second Floor Plan





Climate considerations and athlete comfort

light comfort

summer comfort

winter comfort

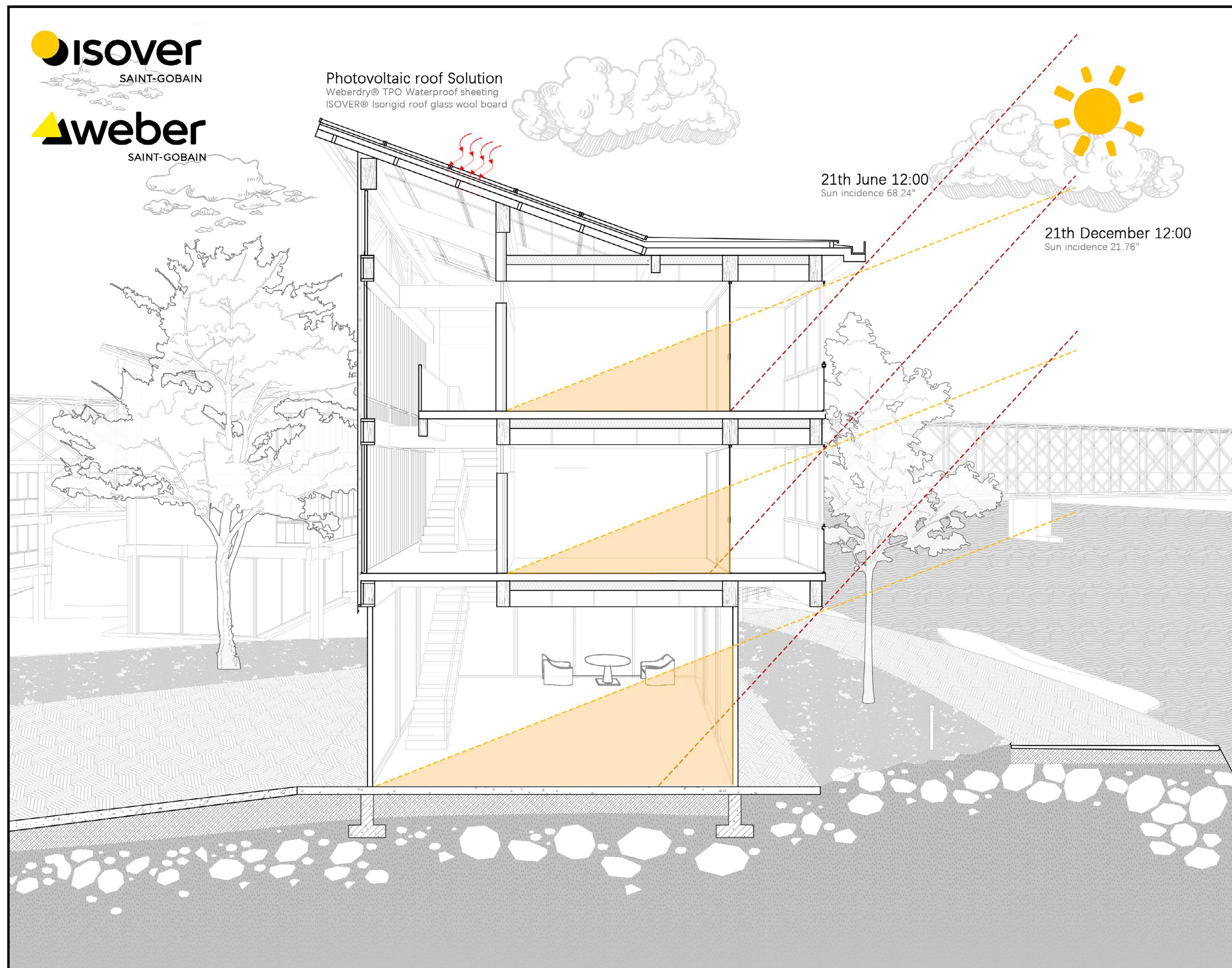
acoustic comfort

water management

Our selection of Saint-Gobain products and technologies is based on the design of an environment that is healthy and comfortable for athletes. Secondly, the design concept must also be taken into account. With the assistance of these products, the building volume should be minimized as much as possible, and the building should be concealed within the forest. Finally, all designs should serve the purpose of low-carbon and energy conservation.

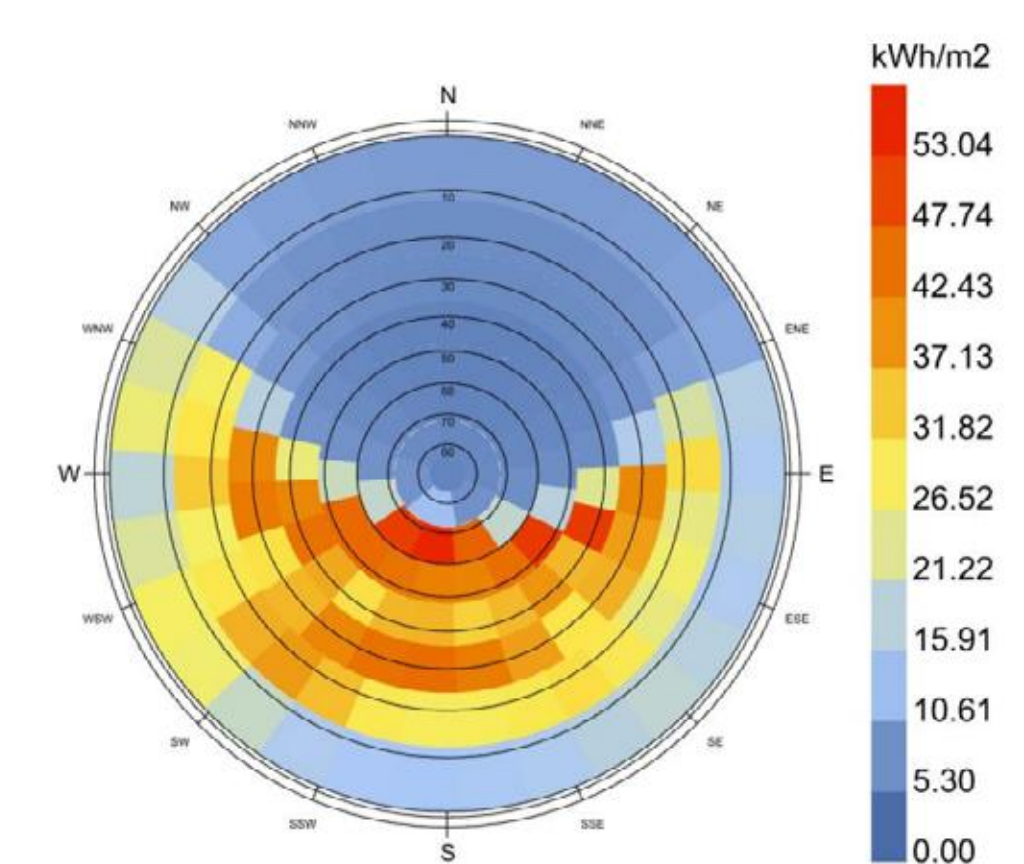


Photovoltaic roof Solution
 Weberdry® TPO Waterproof sheeting
 ISOVER® Isorigid roof glass wool board



Climate considerations and athlete comfort

- light comfort
- summer comfort
- winter comfort
- acoustic comfort
- water management



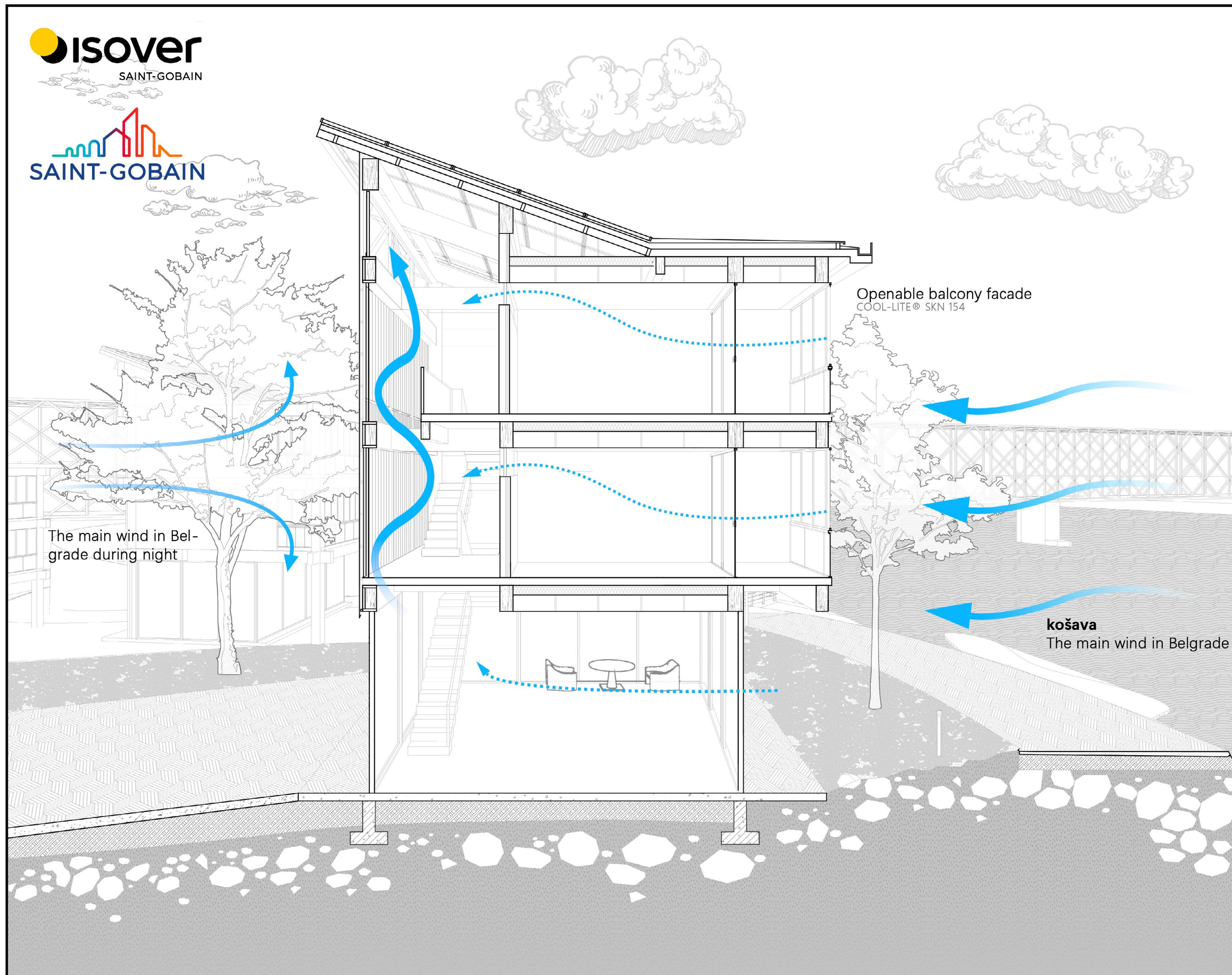
Total Radiation
 01 Jan 00:00 - 31 Dec 23:00
 country : SRB
 city : Belgrade
 source : SRC-TMYx
 time-zone : 1.0

Solar radiation

The solar radiation is extremely intense in the south-facing sector (SE-S-SW). Numerical characteristics:
 The annual total radiation reaches a maximum of approximately 1660 kWh/m². · The radiation in the south direction is significantly higher than that in the east-west direction.
 The radiation in the north direction is extremely low throughout the year.

Photovoltaic roof Solution

- Solar PV Modules + Aluminium Mounting System
- Weberdry® TPO R Membrane, 1.5-1.8 mm
- Protective Geotextile, 300 g/m²
- ISOVER® Isorigid High-density Glass Wool Board, 75mm
- Vapour Barrier
- Structural Roof Deck



Climate considerations and athlete comfort

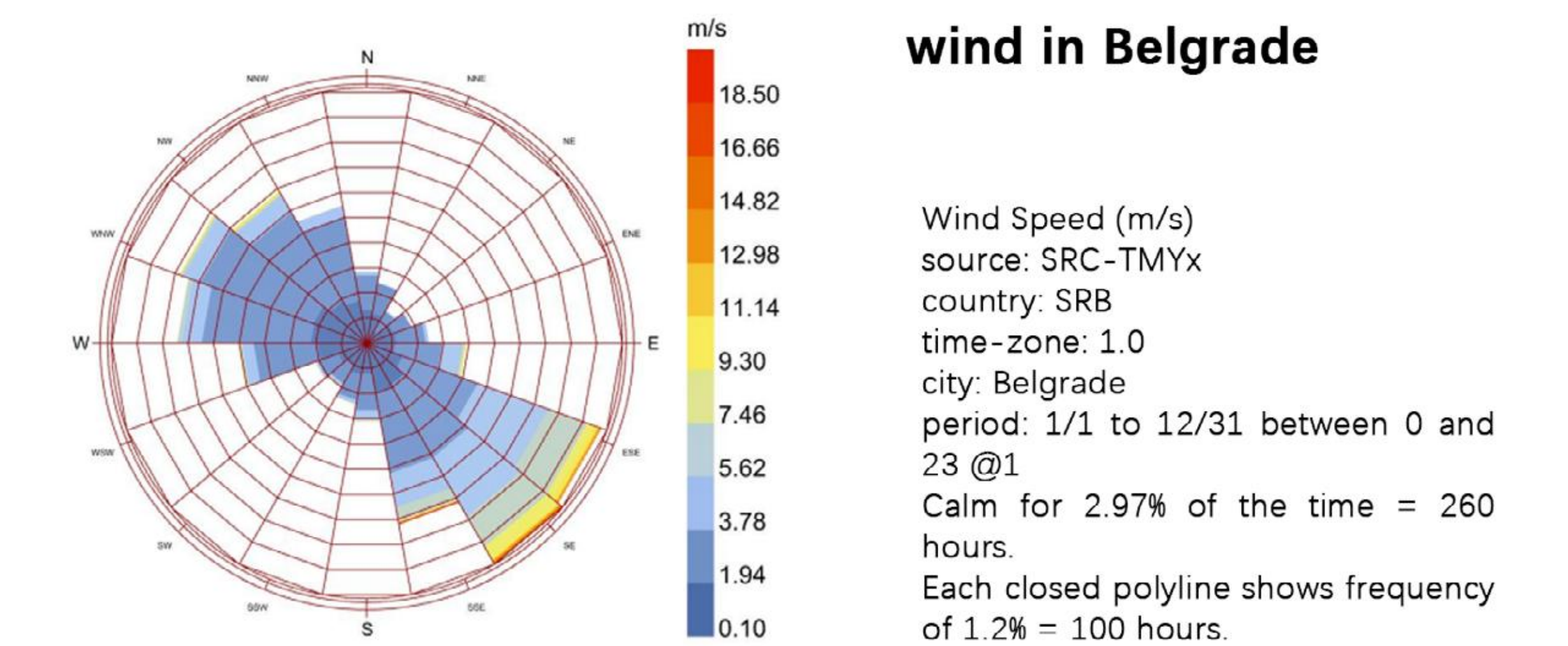
light comfort

summer comfort

winter comfort

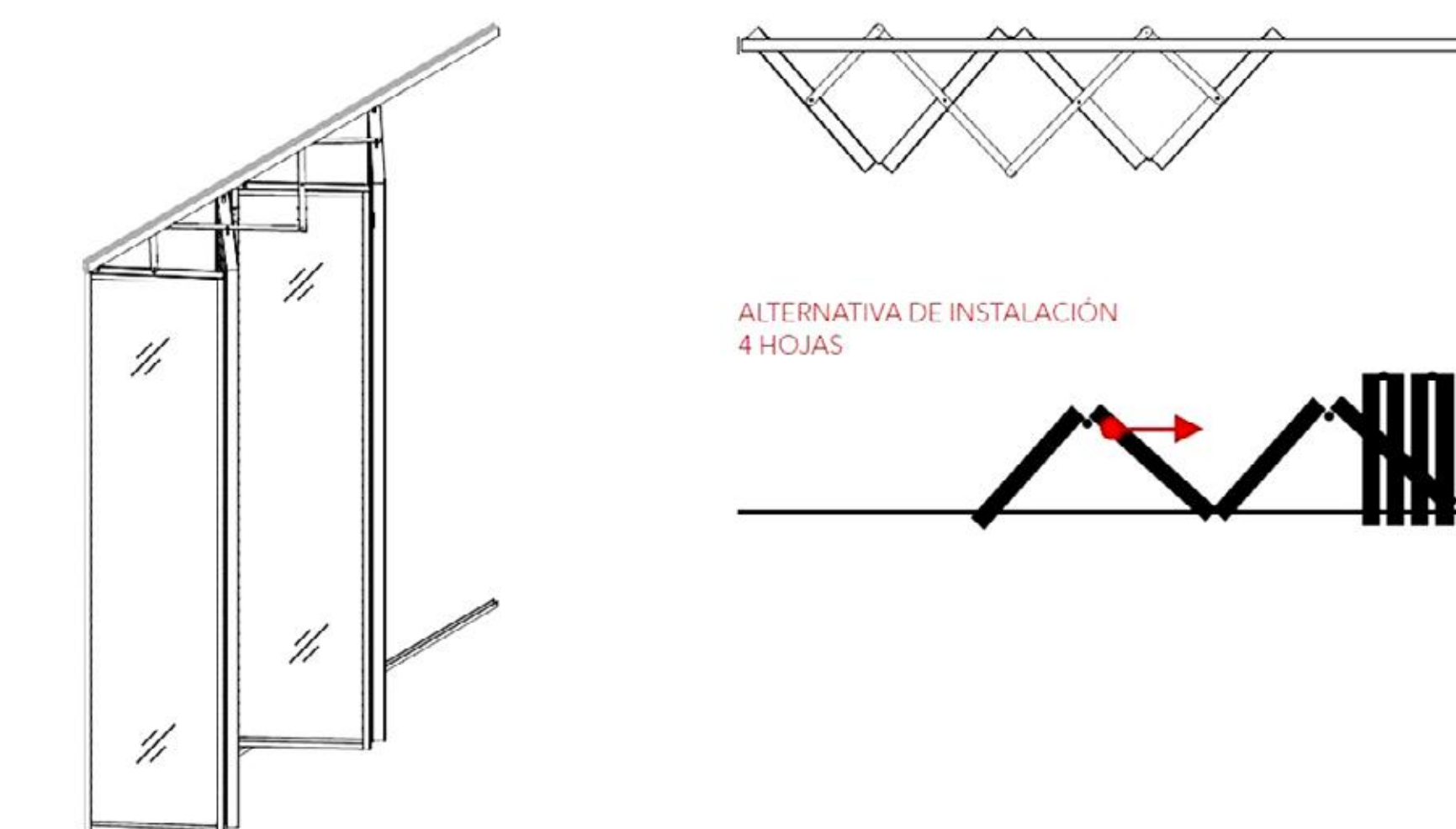
acoustic comfort

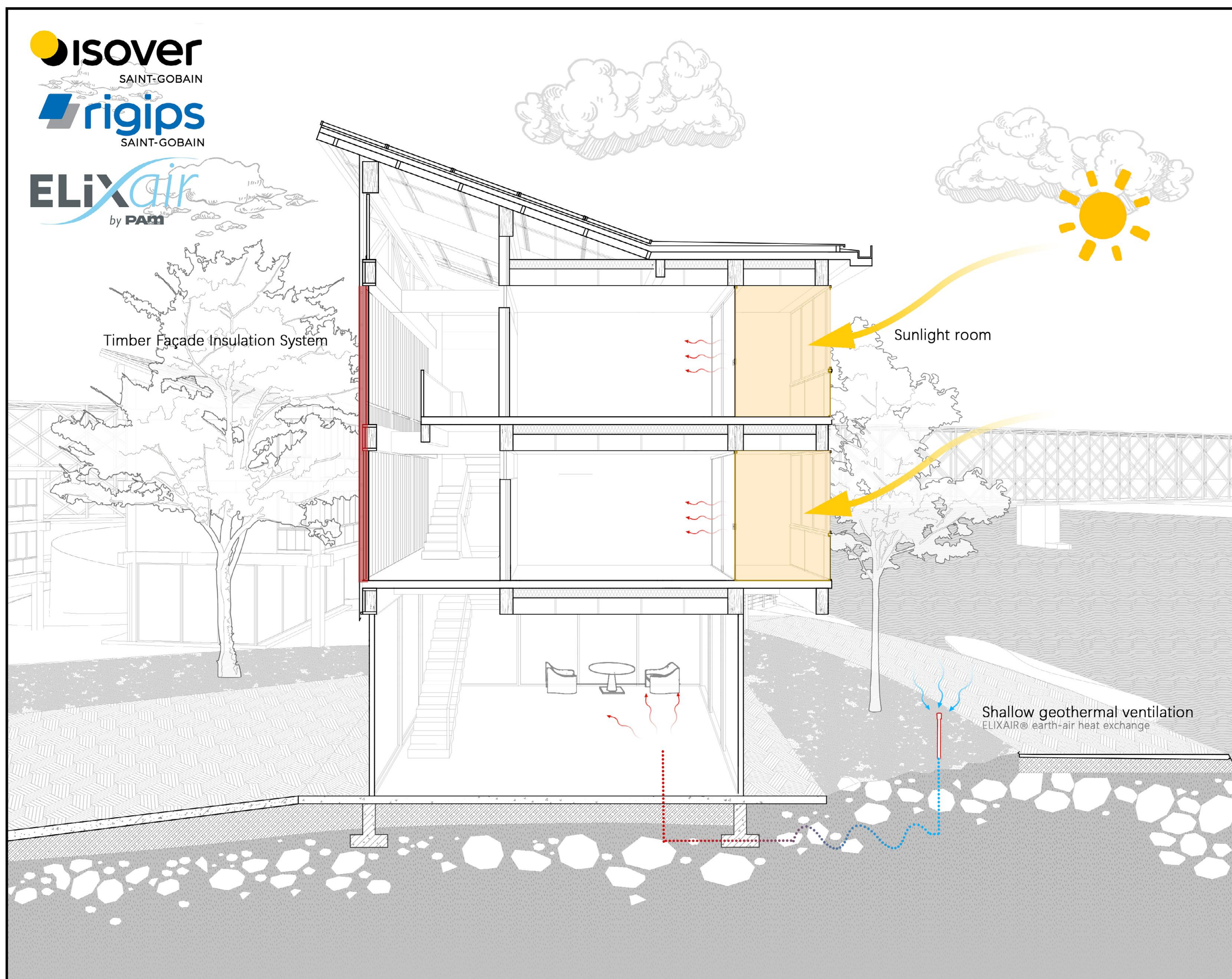
water management



košava is the biggest air purifier of Belgrade. The south-east wind brings clear and dry weather. The average speed is 25-43 km/h, but sometimes it can reach a speed of up to 130 km/h. For the sake of the athletes' health, we made full use of the wind. The design of this building provides passive ventilation and insulation methods.

Openable balcony facade





Climate considerations and athlete comfort

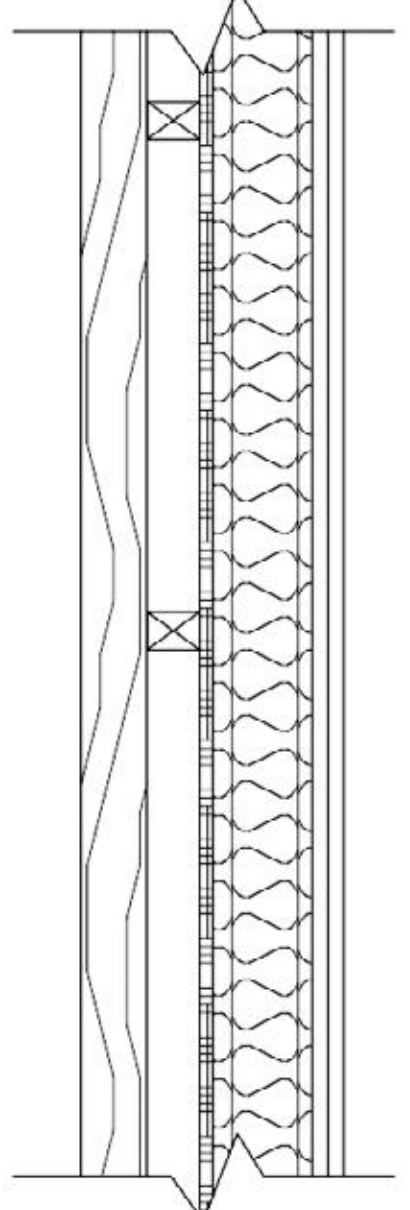
light comfort

summer comfort

winter comfort

acoustic comfort

water management

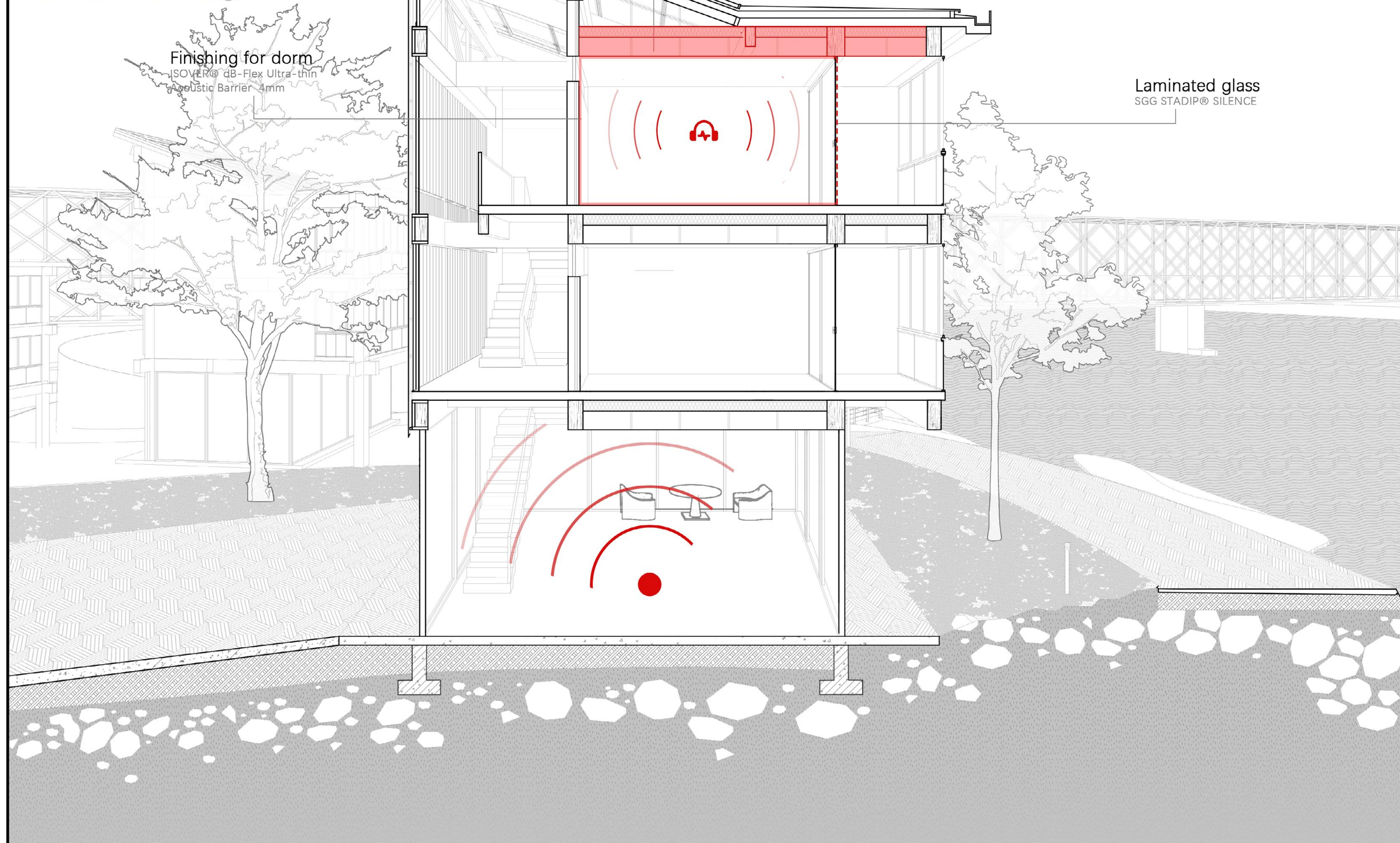


Timber Façade Insulation System (Saint-Gobain)

- timber façade boards
- Ventilated air cavity (20–40 mm)
- Isover Windstopper breathable waterproof membrane
- Isover thermal acoustic insulation batt (timber frame infill)
- Rigips / Gyproc 12.5 mm plasterboard (double layer)

- Thermal conductivity $\lambda \leq 0.032\text{--}0.036 \text{ W/m}\cdot\text{K}$
- Wall U-value down to $0.15\text{--}0.22 \text{ W/m}^2\cdot\text{K}$
- Additional airborne sound reduction up to 10–14 dB
- High water resistance & fully vapor-open construction
- Prevents mold, rot and moisture damage in timber walls
- A1 non-combustible insulation, improves wood wall fire safety
- Lightweight, no additional load on timber structure
- Perfect compatibility with Rigips interior linings
- Full-system solution from Saint-Gobain family

For the sake of the athletes' health, we made full use of the southerly wind in Belgrade. The design of this building provides passive ventilation and insulation methods. During the winter, all ventilation windows are closed, and we use the Saint-Gobain ELIXAIR® earth-air heat exchange system to improve the indoor air quality even when the exterior wall system is closed.



Climate considerations and athlete comfort

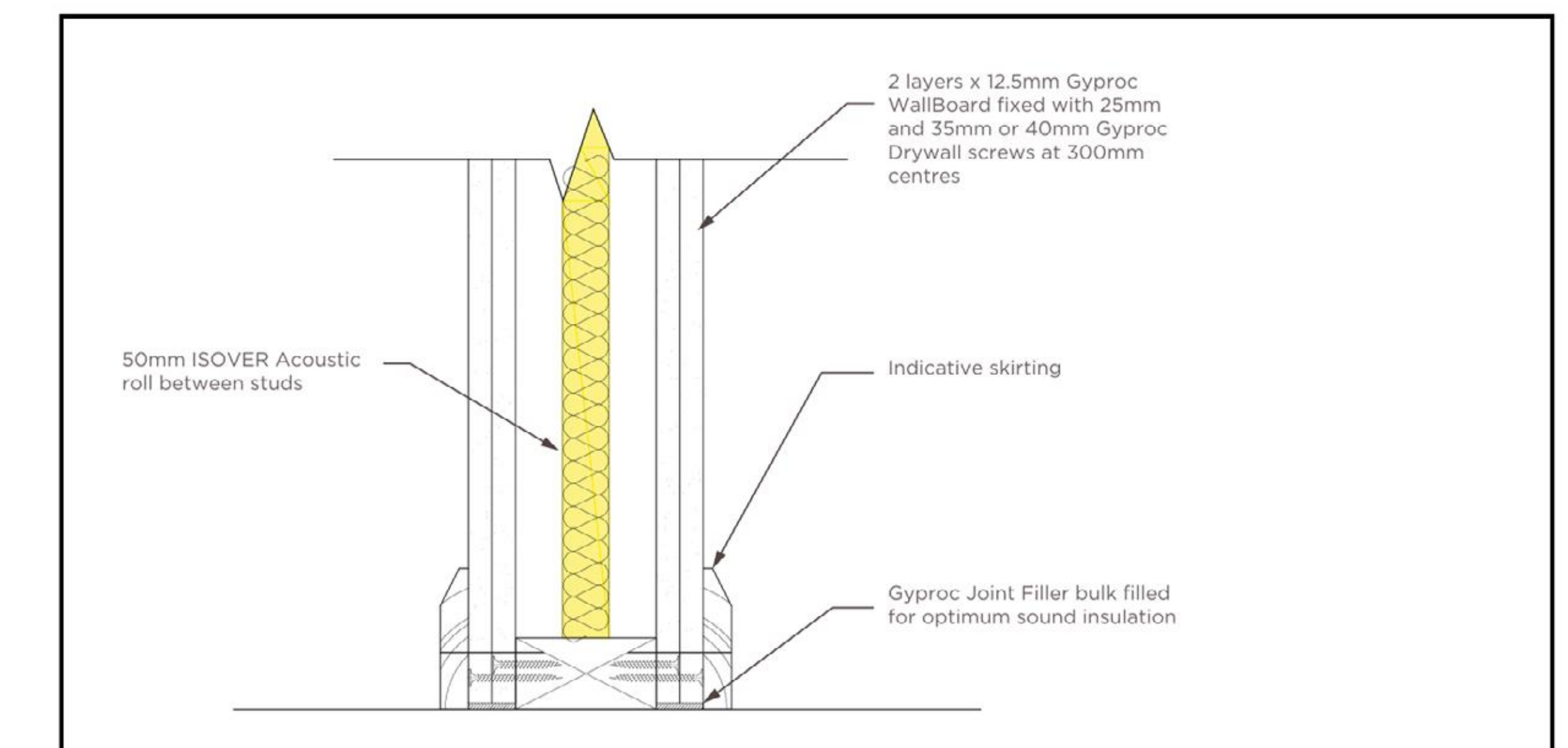
light comfort

summer comfort

winter comfort

acoustic comfort

water management



The interior partition walls are filled with Isover® sound insulation material within the wooden framing. Combined with the system composed of Rigips® gypsum boards and wooden framing, this enables the partition walls of the rooms to be made as thin as possible. This allows us to obtain more indoor space and reduce the building volume. This helps us achieve our design concept of hiding the building within the forest.

RIGIPS® SUSPENDED CEILING WITH DURALINE BLUEBOARDS

- Up to 43dB acoustic insulation performance
- Impact noise reduction up to 22dB
- Ambient indoor noise reduction up to 55%

SGG STADIP® SILENCE

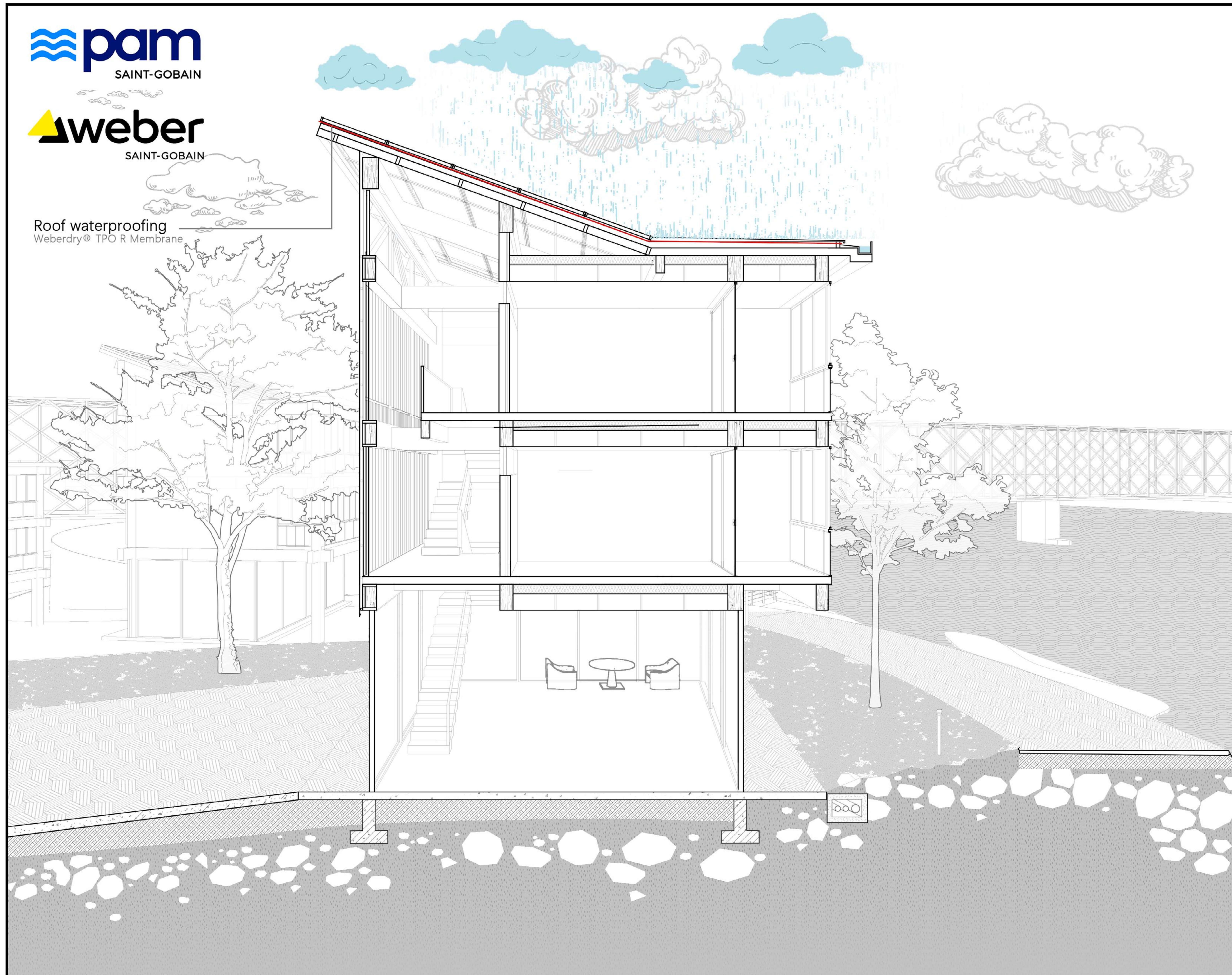
- Acoustic reduction up to 42 dB
- Up to 39 dB traffic noise reduction
- Impact noise reduction up to 20 dB
- Recycled low-carbon Oraé option up to 64% recycled content
- 100% UV blocking & Class A fire safety

ISOVER® dB-Flex Ultra-thin Acoustic Barrier 4mm

- Ultra thin material thickness, minimal space occupation
- Up to 12 dB additional airborne noise reduction
- Impact noise reduction up to 18 dB
- Reduce ambient indoor reverberation by over 50%



Roof waterproofing
Weberdry® TPO R Membrane



Climate considerations and athlete comfort

light comfort

summer comfort

winter comfort

acoustic comfort

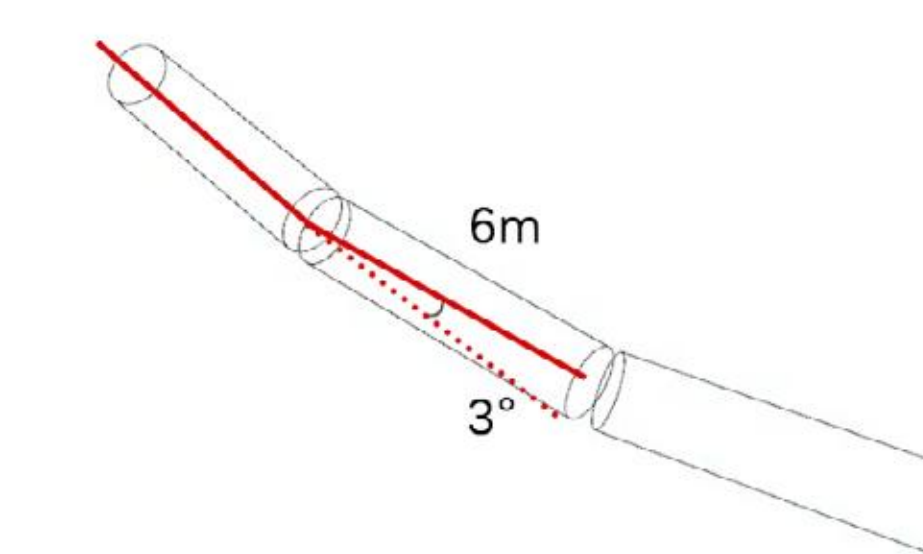
water management

Integrate the entire site organization to ensure the connection between pipelines and the city. Pre-install the integrated pipeline tunnel before constructing on the changing terrain. The drainage design of the building is determined to use organized drainage. Large drainage ditches are set between the solar panels and the planting roof to meet the drainage requirements of the planting roof.

Pam® pipeline and the Pamlock® technology enable the pipeline to achieve a certain degree of turning, and it can conform to the terrain.

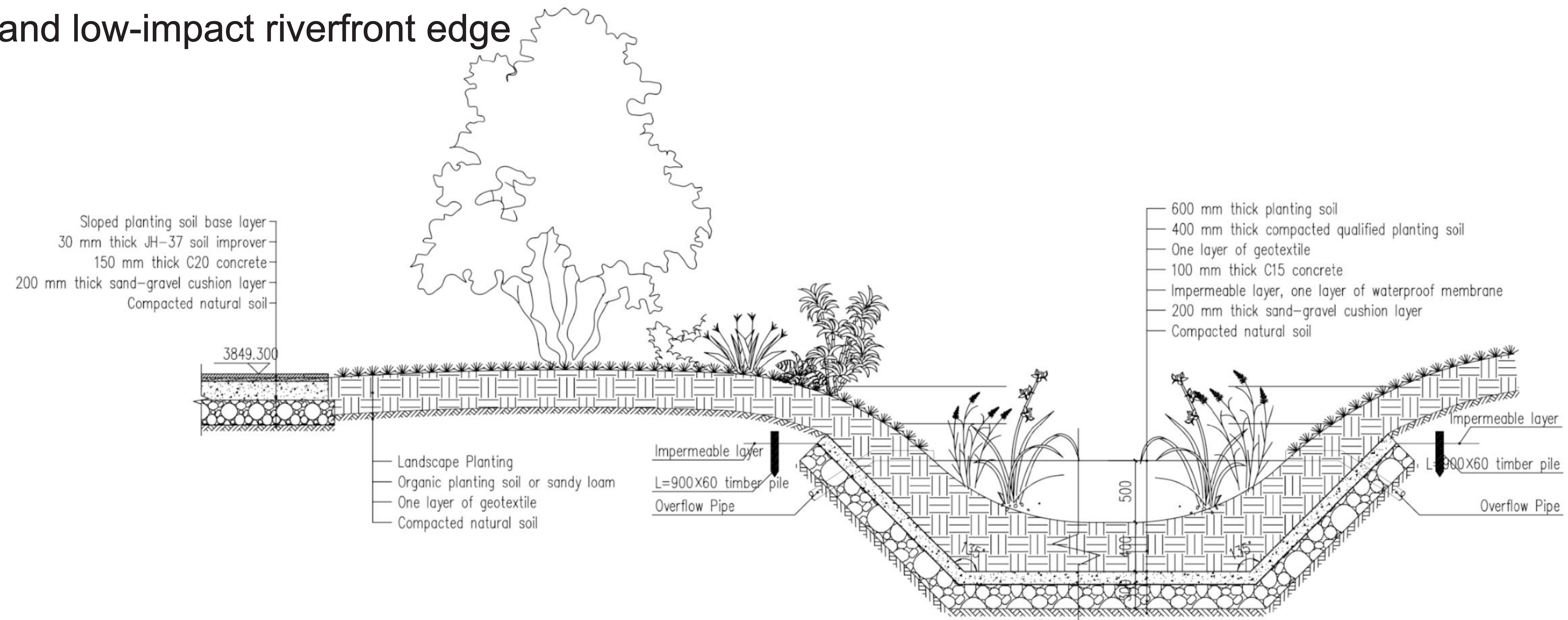
Integrated pipeline tunnel with pam

Maximum deflection angle in the site: 120°

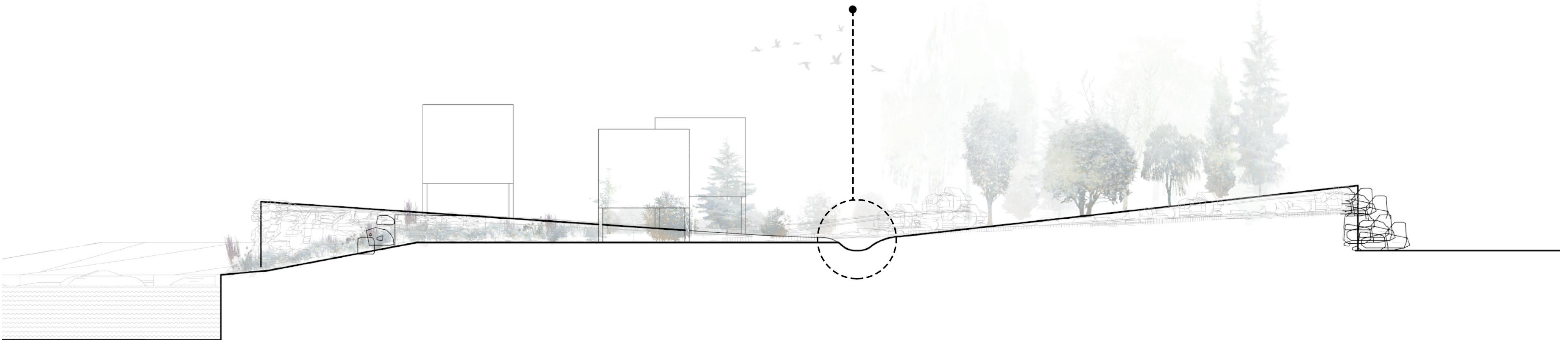


Terrain and Ecological Revetment Section

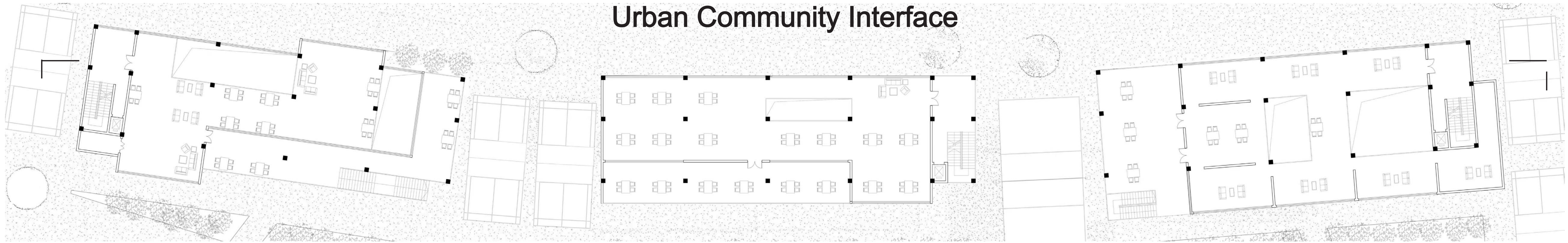
Detail of planted slope, swale, and low-impact riverfront edge



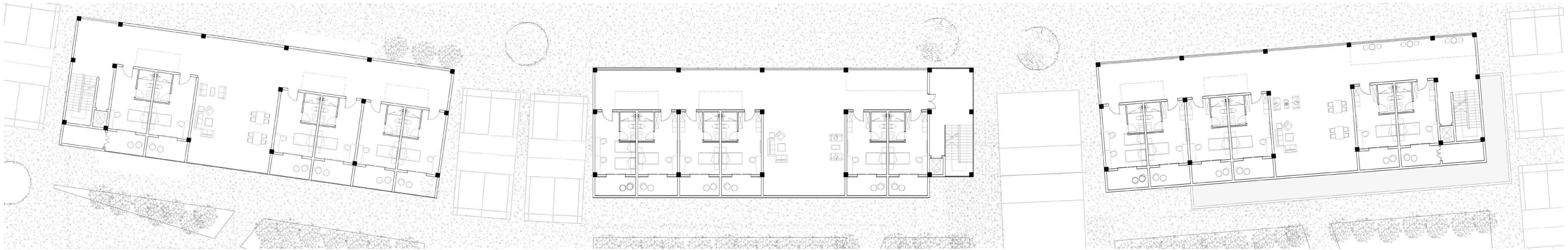
Construction Detail Drawing of Ecological Lake Revetment



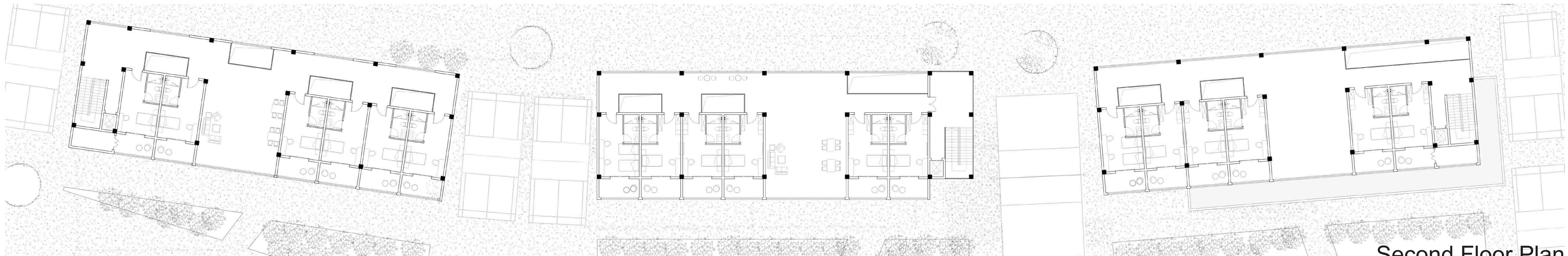
Urban Community Interface



Ground Floor Plan

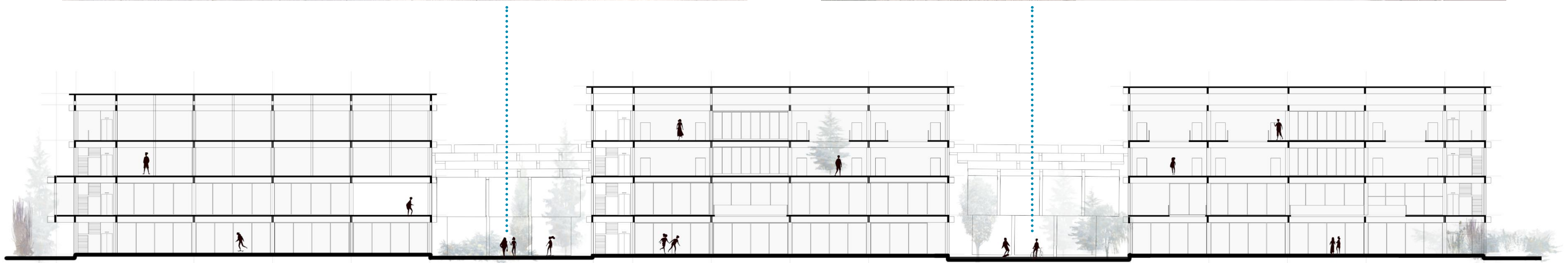


First Floor Plan



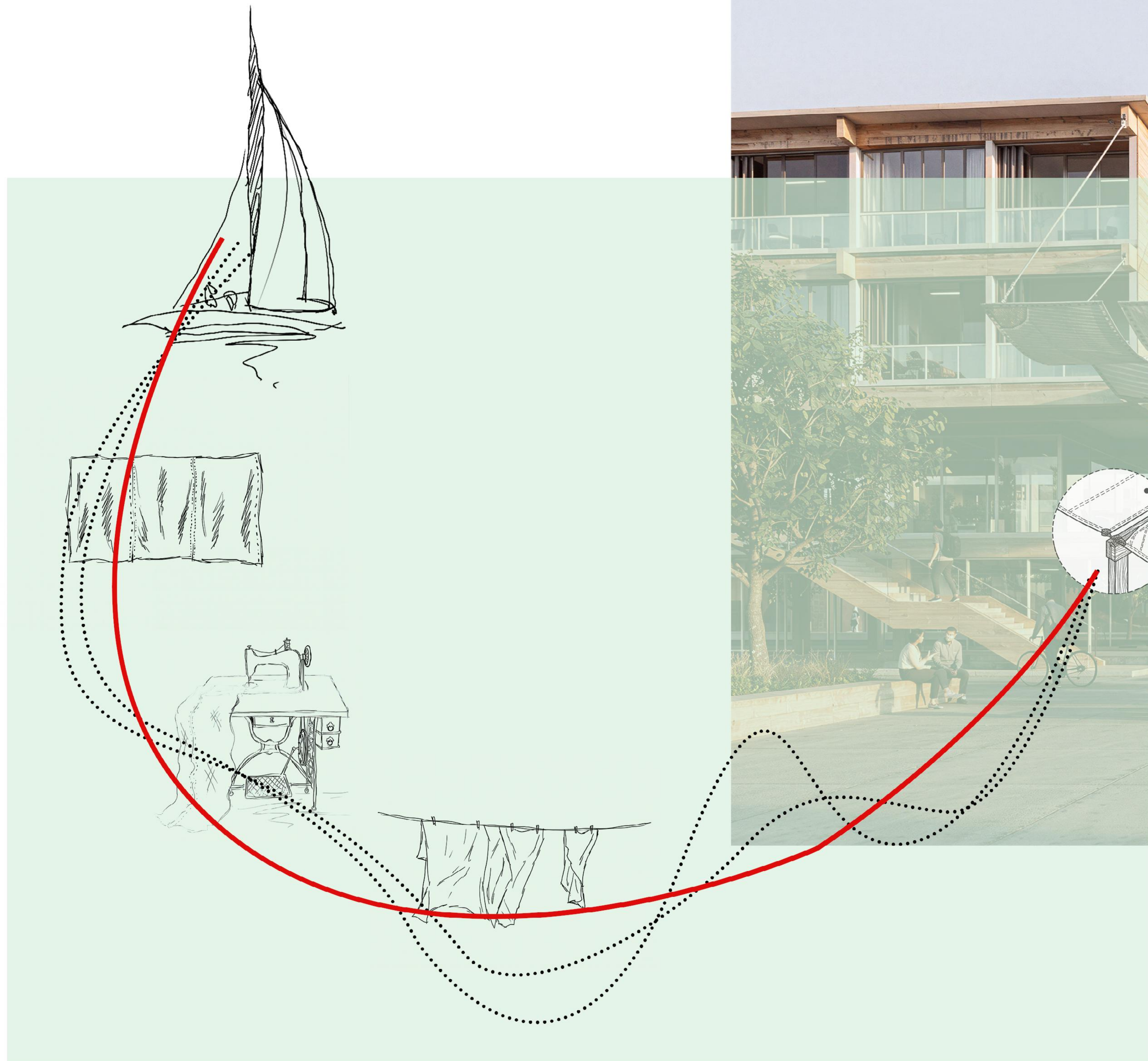
Second Floor Plan

Urban Community Interface



Section

Canvas recycling



Recycling the discarded sailcloth from the sailing club to use as sunshades for the sports field and rest area.


SUSTAINABILITY STRATEGY - Energy Center


 Solar Panels


 Water Retention

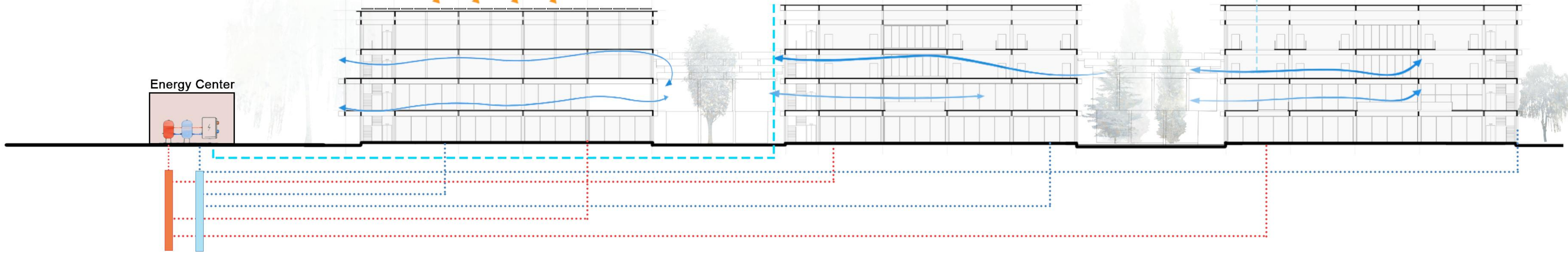
 Passive Ventilation


 Geothermal Heating/Cooling

 **Solar Panels**
Renewable energy is generated on roof and used to offset building energy use.

 **Water Retention**
Rainwater is collected and stored for irrigation and non-potable uses.

 **Passive Ventilation**
Natural airflow is promoted through building orientation, openings, and atrium spaces to reduce cooling demand.

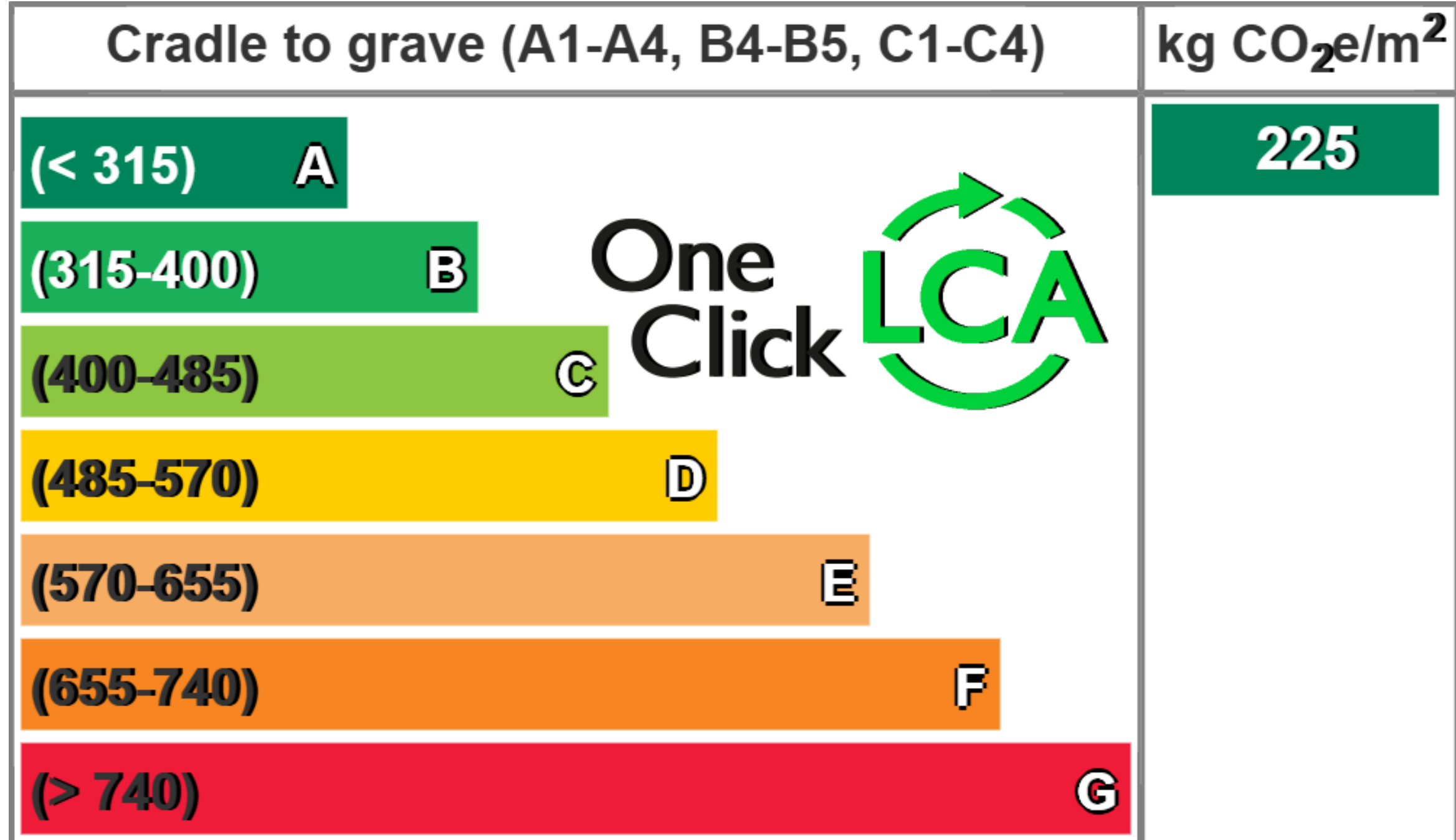


 **Geothermal Heating/Cooling**
Ground-source heat pumps exchange heat with the earth to provide efficient heating and cooling year-round.

The project integrates passive and active environmental systems to reduce energy demand, improve indoor comfort, and promote a low-impact, resilient built environment.

Life Cycle Carbon Assessment

Low-impact material system



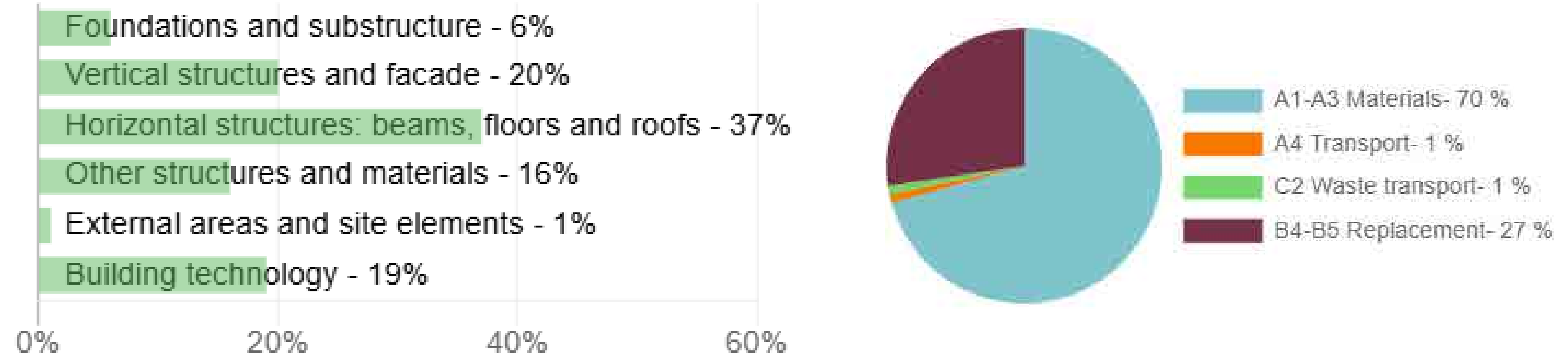
Zone A achieves **Grade A** under the Eastern Europe hotel benchmark.

Embodied carbon: **225 kg CO₂e/m²**
 Assessment scope: **A1-A4, B4-B5, C1-C4**
 Building area: **8,820 m²**
 Main system: **lightweight steel-timber structure**

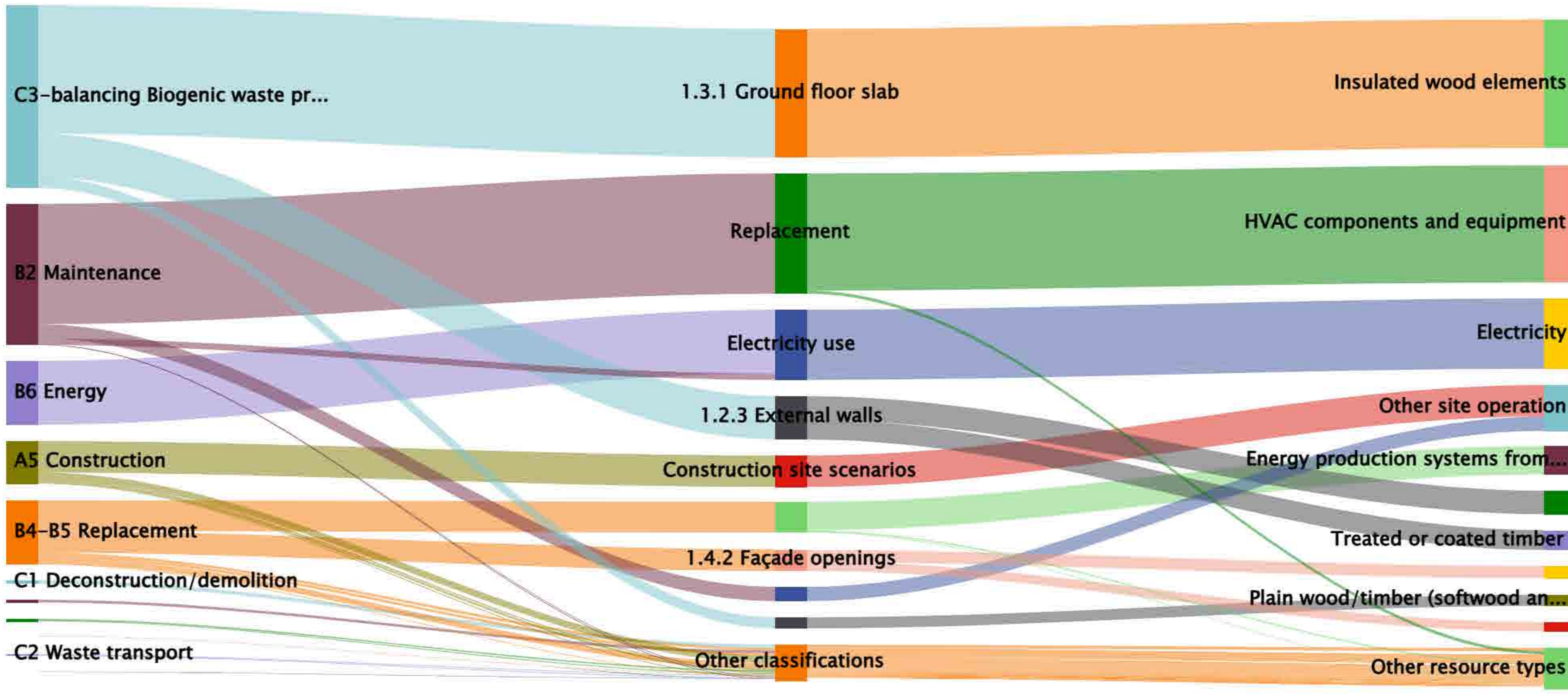
The result includes the main buildings, PV roof system, façade openings, floor and roof systems, and selected external works.

A1-A3 Carbon Hotspots by Building System

Roof decks and waterproofing are included under horizontal structures due to the software classification structure.

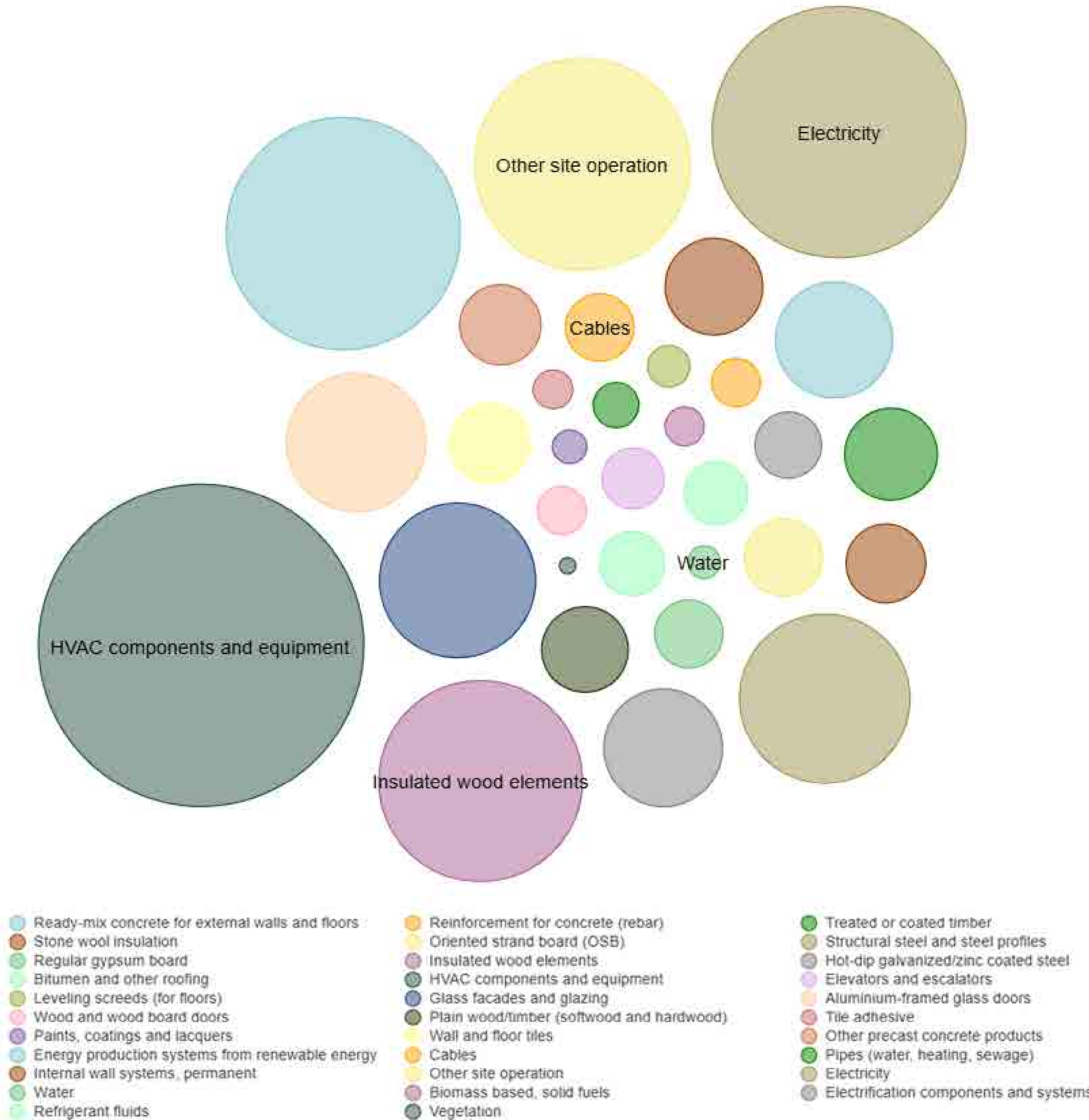


Carbon Flow by Life-cycle Stage and Material Type



Sankey diagram, Global Warming Potential total

Bubble chart, total life-cycle impact by resource type and subtype



Reused
576 m² reclaimed sail cloth reused as lightweight shading pavilions. Reported qualitatively due to the absence of a representative sail-cloth dataset.

Recyclable
 Steel frames, balcony platforms and PV supports are treated as separable and recyclable metal systems.

Renewable
 Timber floor slabs, roof decks and cladding form renewable, replaceable and demountable construction layers.



International SG SAVE Energy needs verification

Building description

Building description	
Building name	
New / Refurbishment	New
Building type	
Surface	142,8 m ²
Volume	496,9 m ³
Weather file	SRB_Belgrade.132720_IWEC.epw

Technician contact info

Name and surname	
Company name	
Address	
City	
Postal Code	
Country	
Email	

Compliance

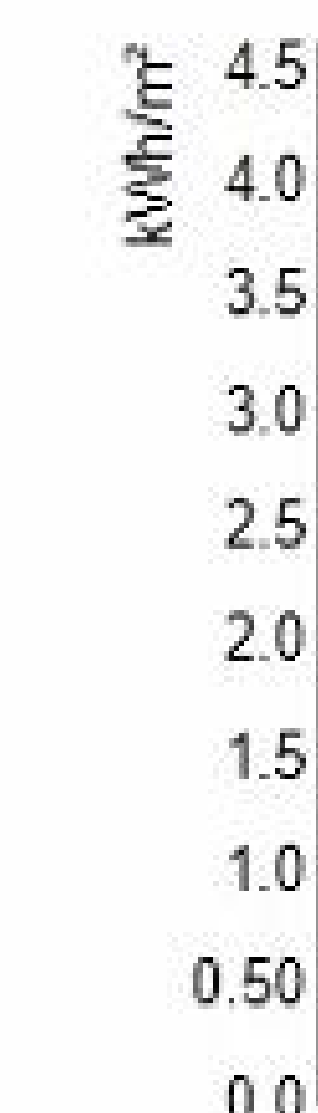
Indicator	Building [kWh/m ²]	Limit value [kWh/m ²]	Comply
Heating needs	12,7	15,0	Yes
Cooling needs	14,5	15,0	Yes

Lighting autonomy 300 Lux	Autonomy [%]	Required [%]	Comply
TZ: SPACE 3 DAYLIGHTINGCONTROLS	66,0	60,0 %	Yes
TZ: SPACE 5 DAYLIGHTINGCONTROLS	76,3	60,0 %	Yes

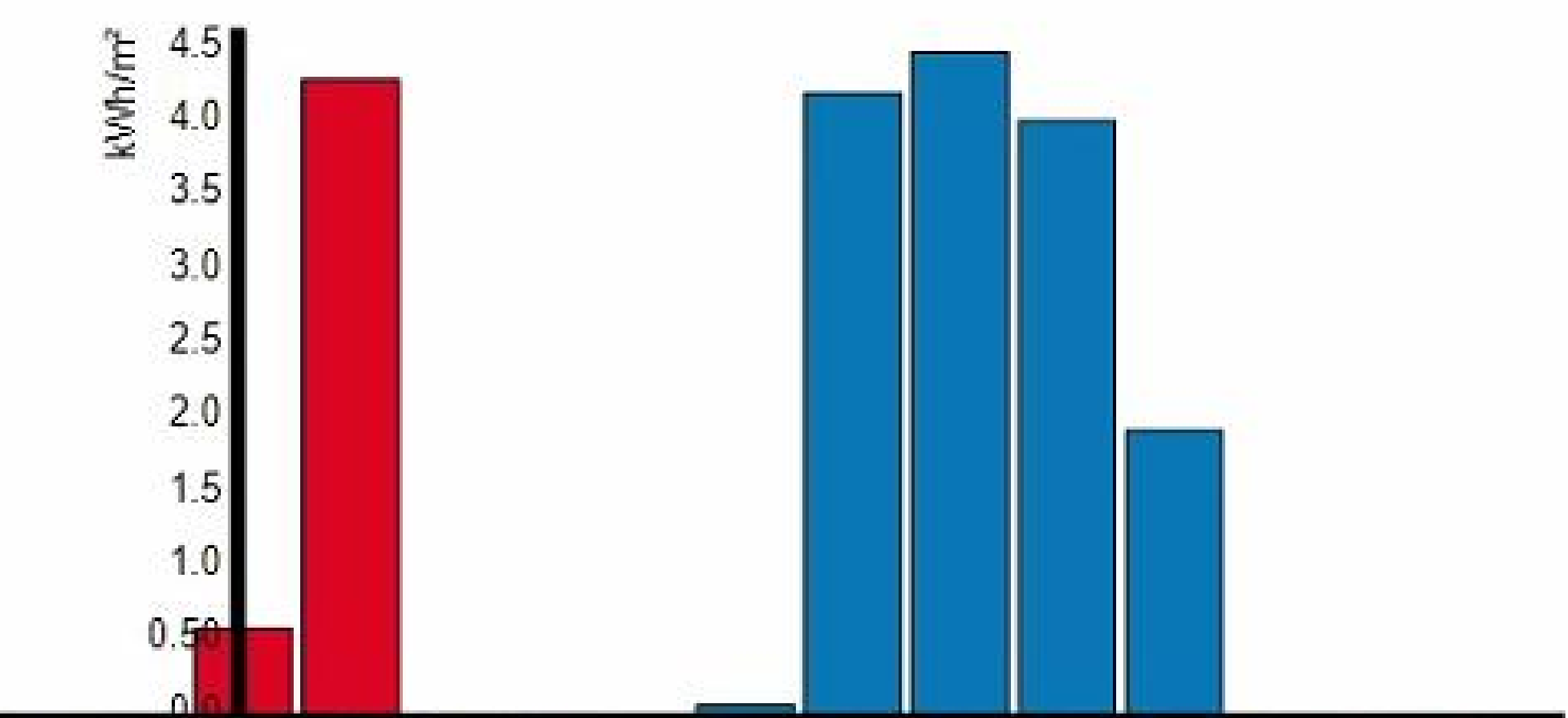
Summer comfort (overheating % of season)	Overheating [%]	Required [%]	target [%]	Comply
TZ: SPACE 3	0,0	10,0 %	5,0 %	Yes
TZ: SPACE 5	0,0	10,0 %	5,0 %	Yes

Graphs

Heating needs



Cooling needs



Heating needs (kWh/m²)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Heating	4,61	2,91	0,23	0,1	—	—	—	—	—	—	0,56	4,26	12,67
Total	4,61	2,91	0,23	0,10	—	—	—	—	—	—	0,56	4,26	12,67

Cooling needs (kWh/m²)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Cooling	—	—	—	—	0,04	4,17	4,44	3,98	1,9	—	—	—	14,53
Total	—	—	—	—	0,04	4,17	4,44	3,98	1,90	—	—	—	14,53

*All statements without guarantee

Zone B Existing Challenges



Isolated Waterfront Object



Insufficient Ecological Expression



Weak Public Interface



Lack of an Off-Season Use Logic



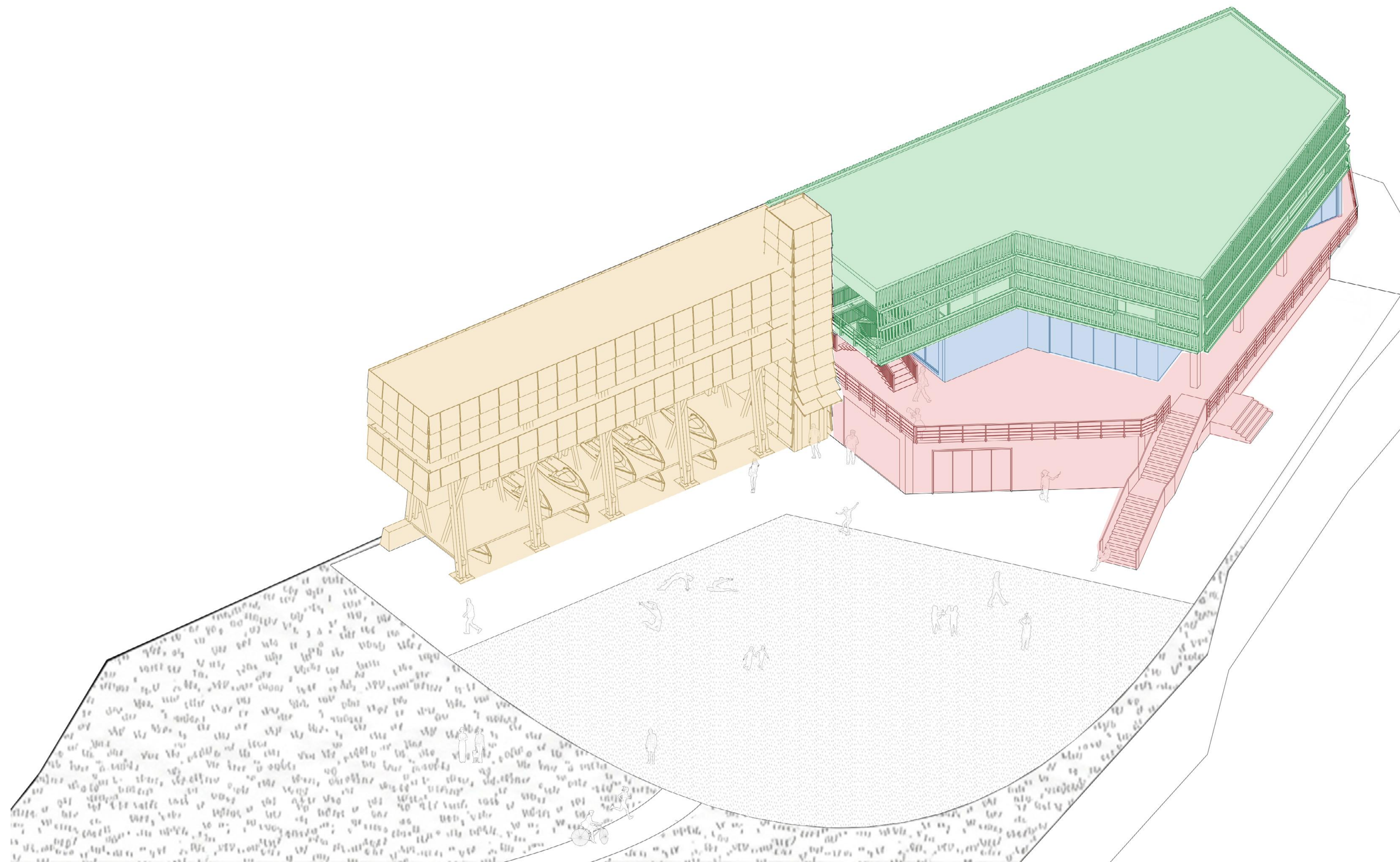
Lack of activity spaces



Mixed Circulation / Unclear Boundaries



The renovation strategy in zone B



Give the second floor new function, such as bird watching, education, exhibitions, and flexible activity spaces.

A new long-shaped bird-watching pavilion is being built to respond to the ecological protection area of the dwarf cormorants on the opposite bank.

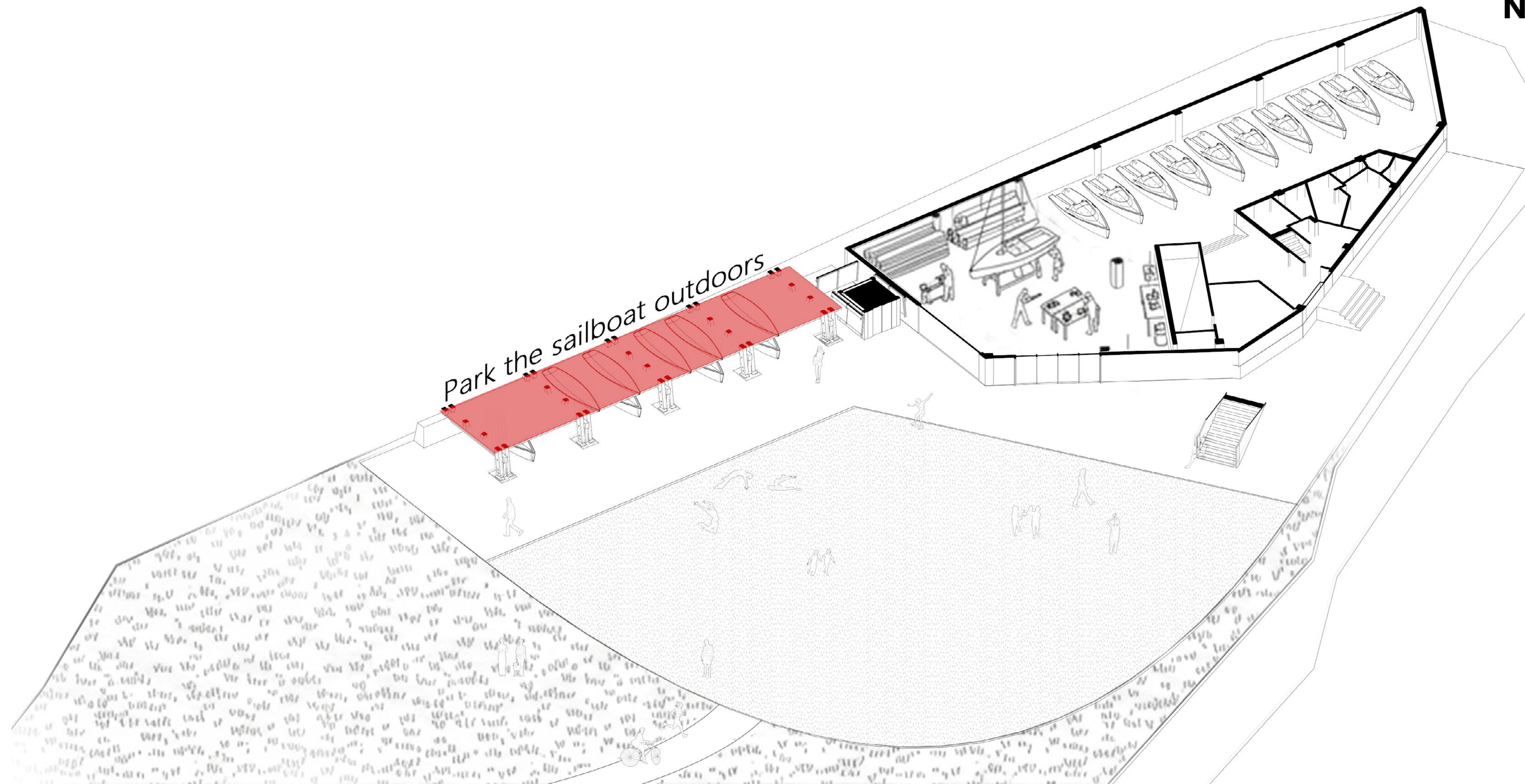
The second floor of the old building has been transformed into an exhibition hall. At the same time, the facade is covered with vertical greenery, which can attract birds to approach. Add an elevator as a separate flow line for the new functions on the second floor.

Improve the quality of the ground floor and the first floor space. The ground floor serves as the main area for sailing activities. The first floor, as the club reception area, will be integrated with the Kafana function.

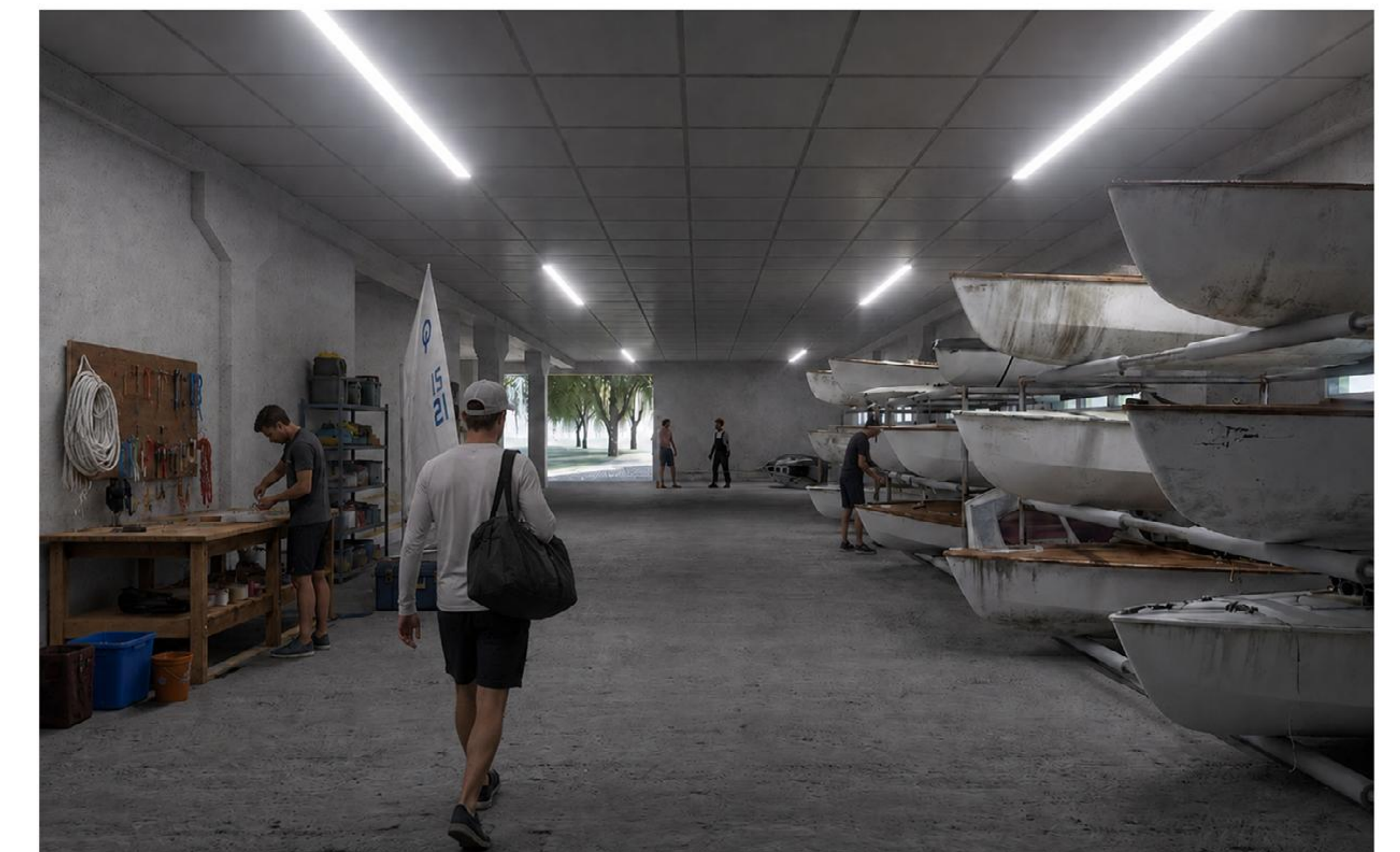
- Added bird-watching pavilion
- Bird observation station
- Reception with Kafana
- Sailing boat warehouse

GF Improvement of warehouse space

We have improved the narrow space on the ground floor and organized the space in the warehouse. The addition of outdoor sports areas also meets the requirement of placing the boats outdoors during the sports season.

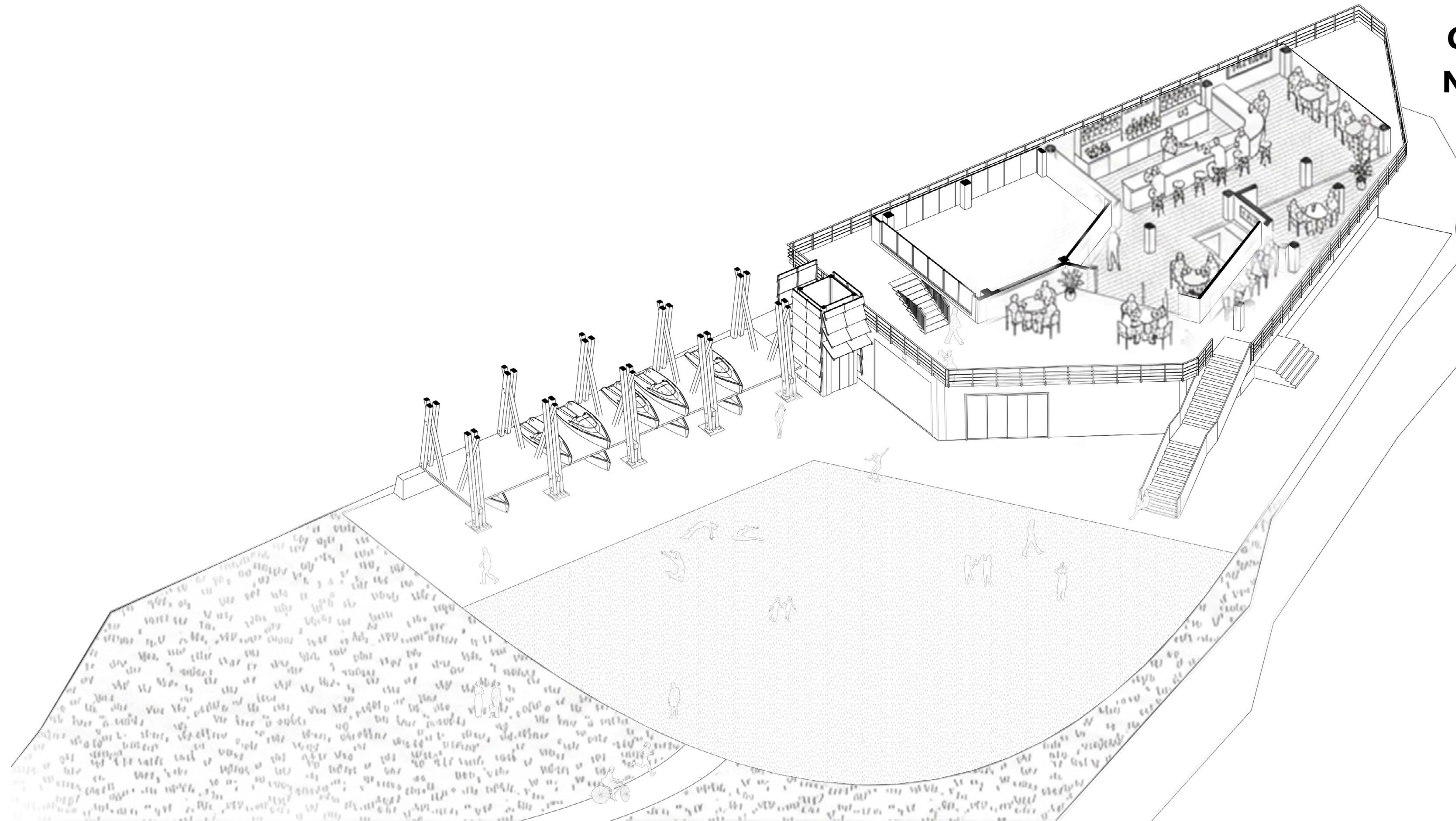


OLD
NEW

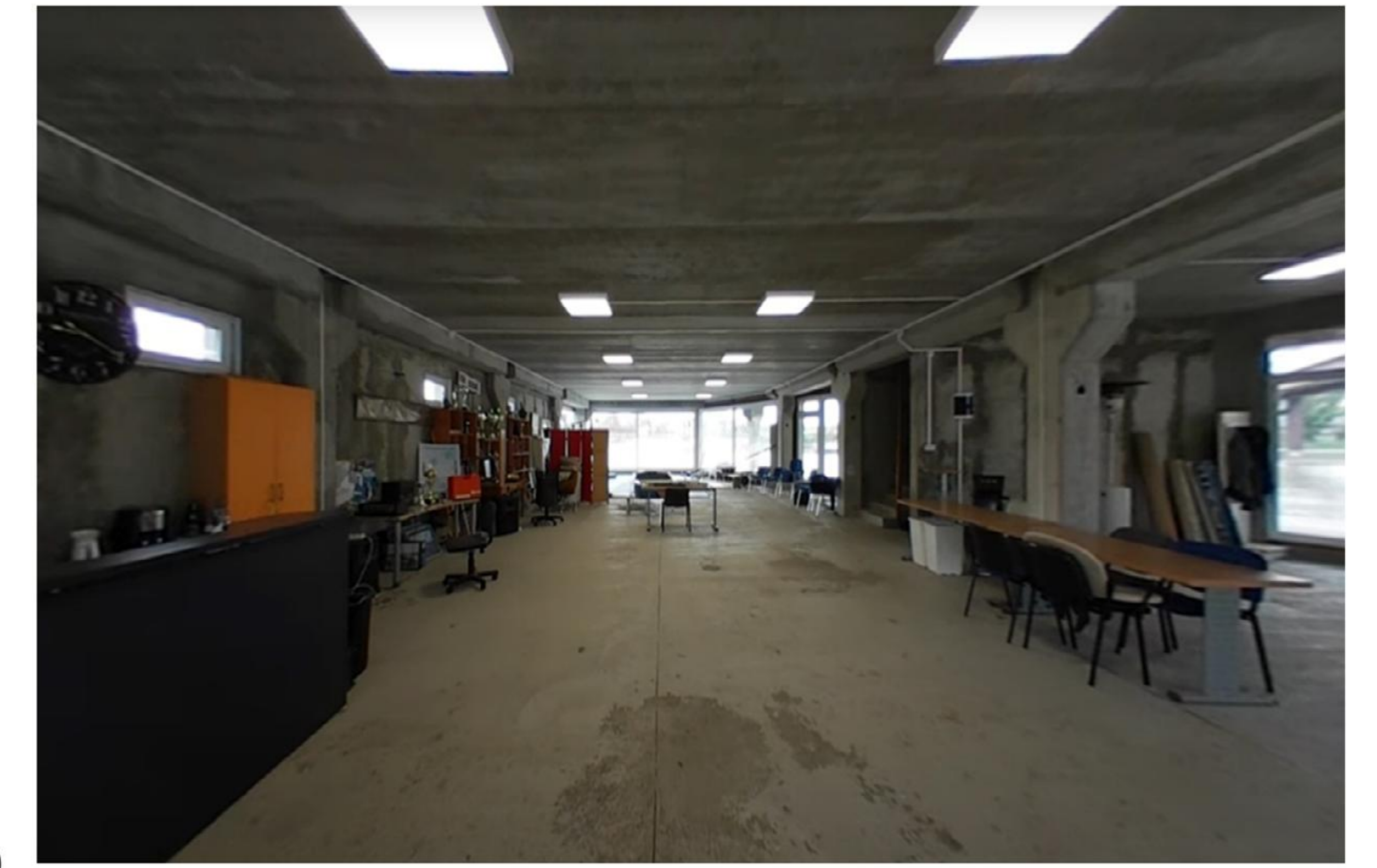


1F The integration of the sailing club with Kafana

Kafana exists in the form of a boat house along the riverbank. And the sailing club in the base is an eternal boat house. Combining Kafana with the club is a response to the human-nature activities along the riverbank.

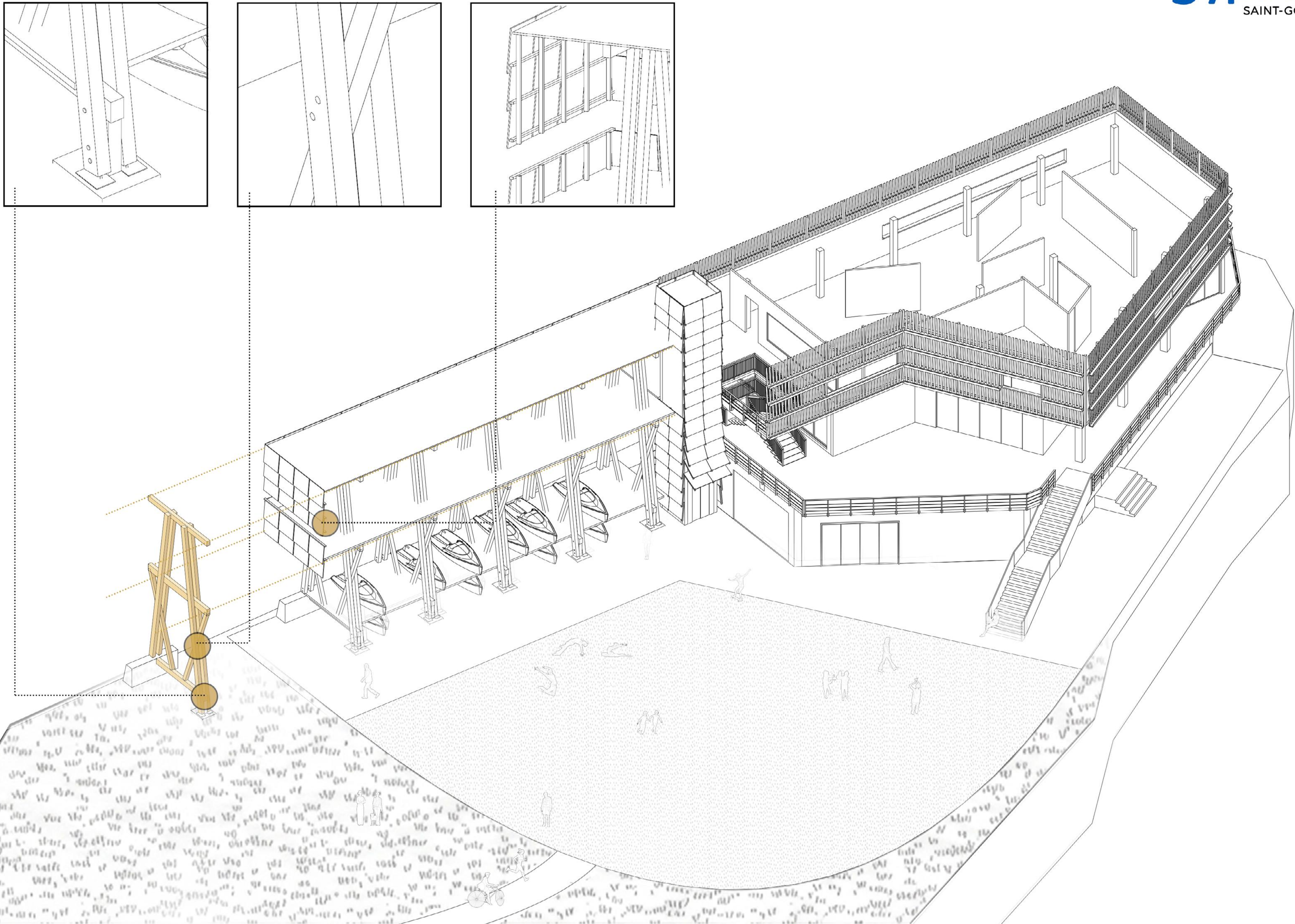


OLD
NEW

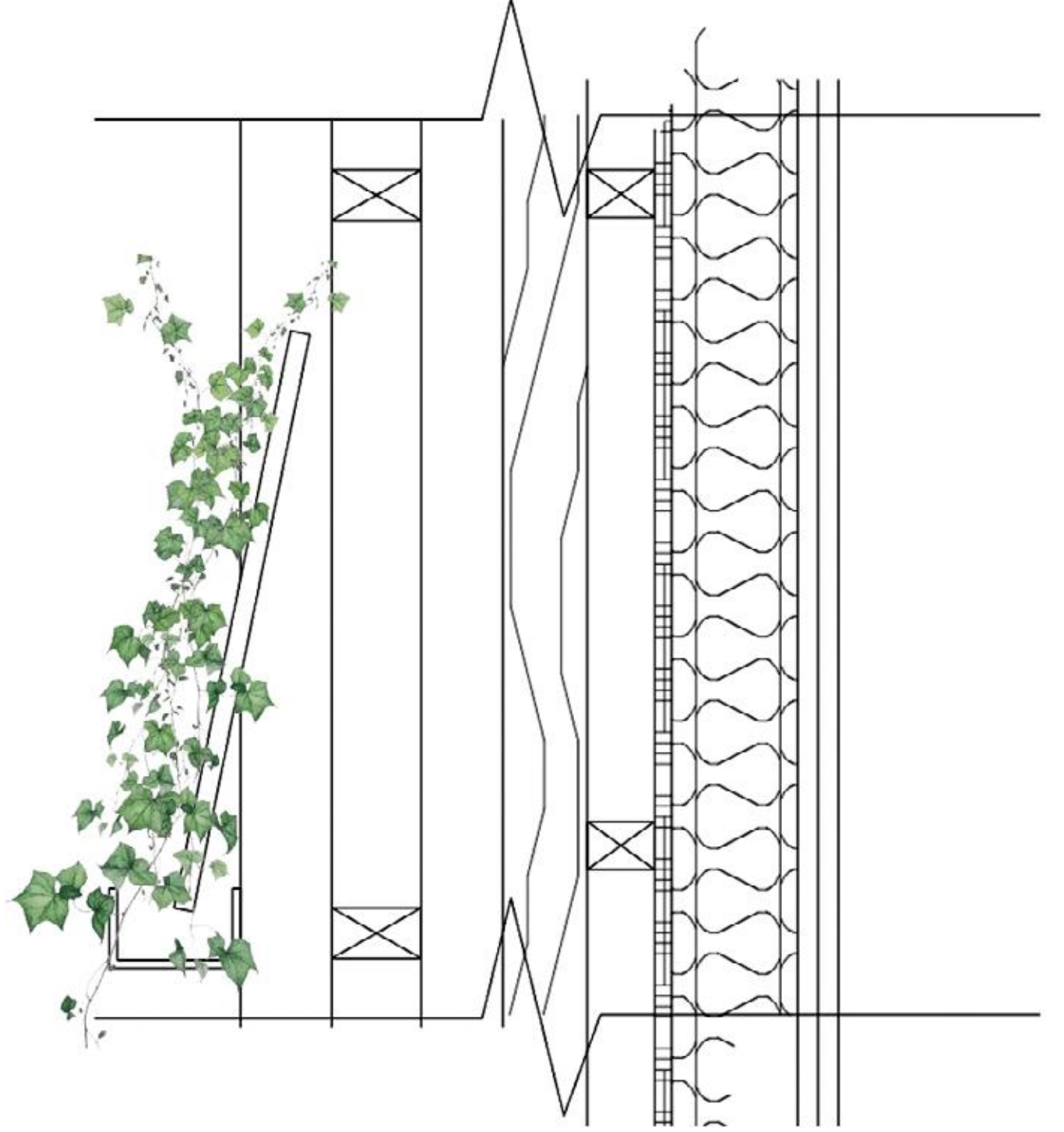


2F The added construction and Bird Observation Station

Response to the ecological restoration of zone A



Separate vertical greenery exterior wall with Gyproc® UAC gold vertical studs (75/100mm)



- Vertical greening modules
- Original material of old architecture
- Gyproc aluminium horizontal furring
- Gyproc UAC gold vertical studs (75/100mm)
- Timber Façade Insulation System with Gyproc

Bird friendly glass

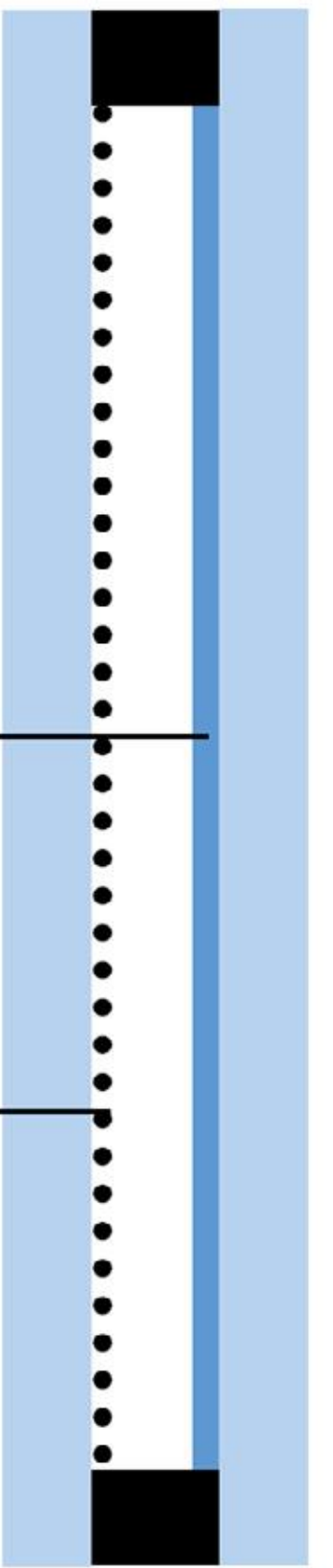
4BIRD® combine with COOL-LITE® solar control coated glass

Thanks to the 4BIRD® glass system from Saint-Gobain, we can use bird-friendly glass at the bird-watching station, while still maintaining excellent insulation properties.

solar control coating on #3

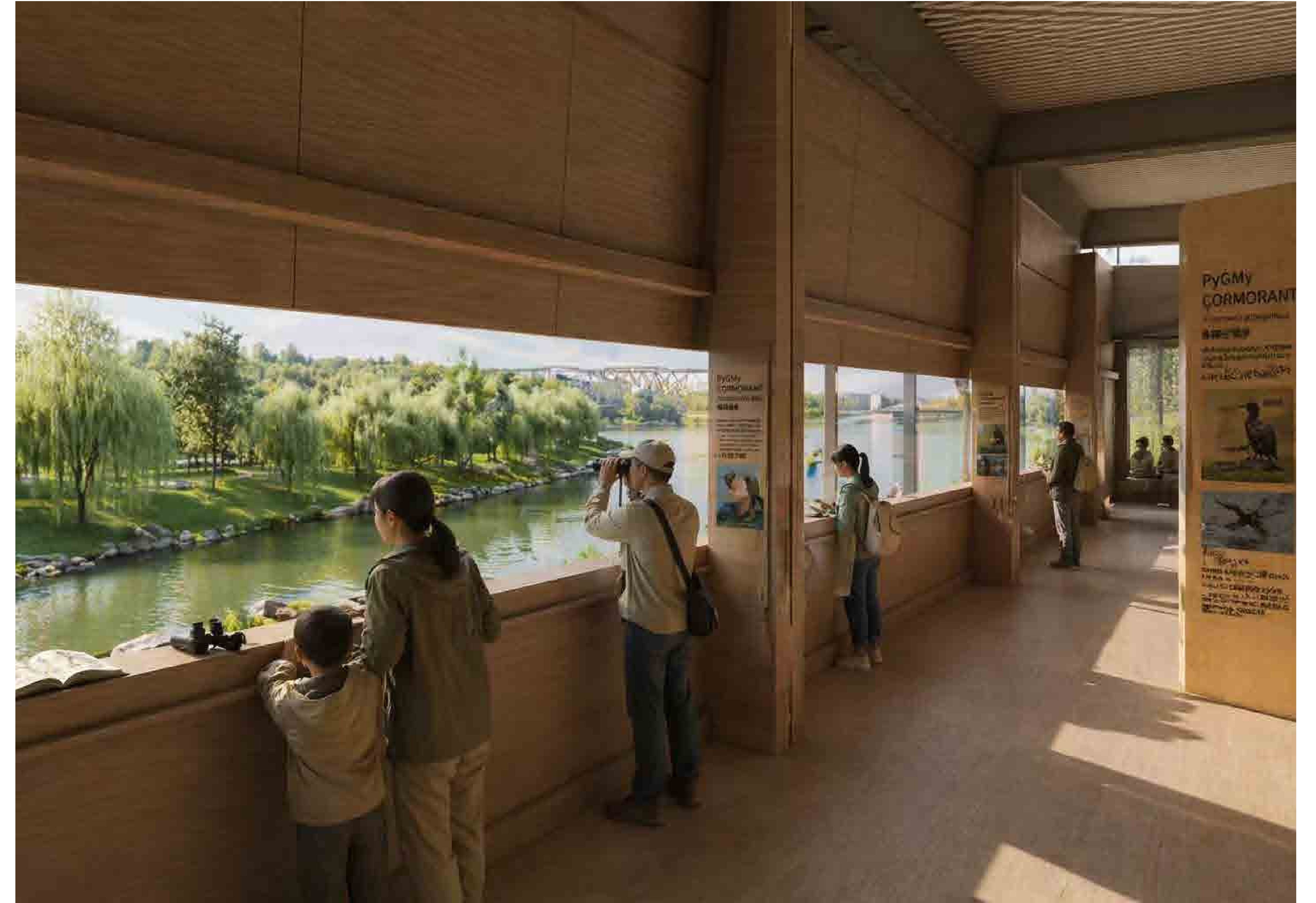
opaque enameled pattern on #2

cool-lite® skn 183 II

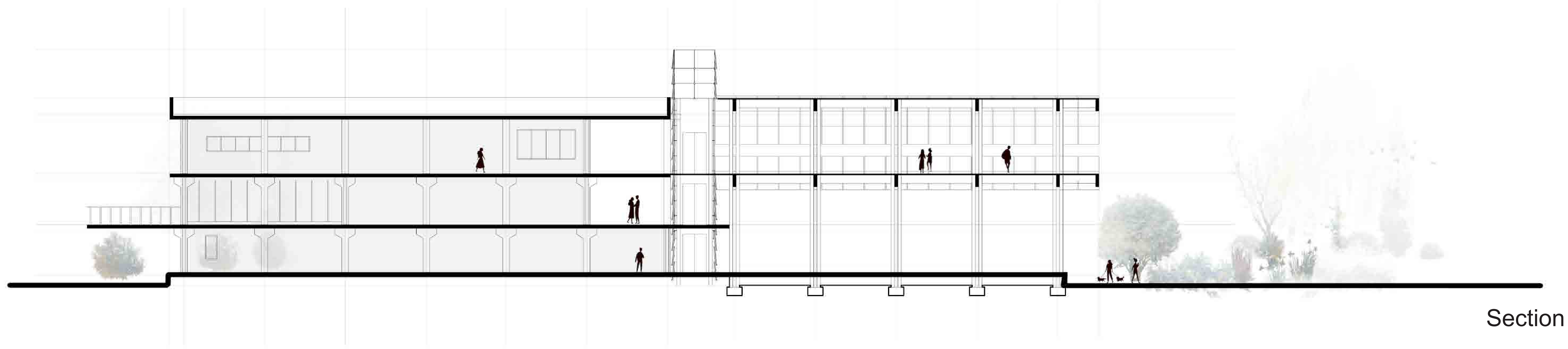




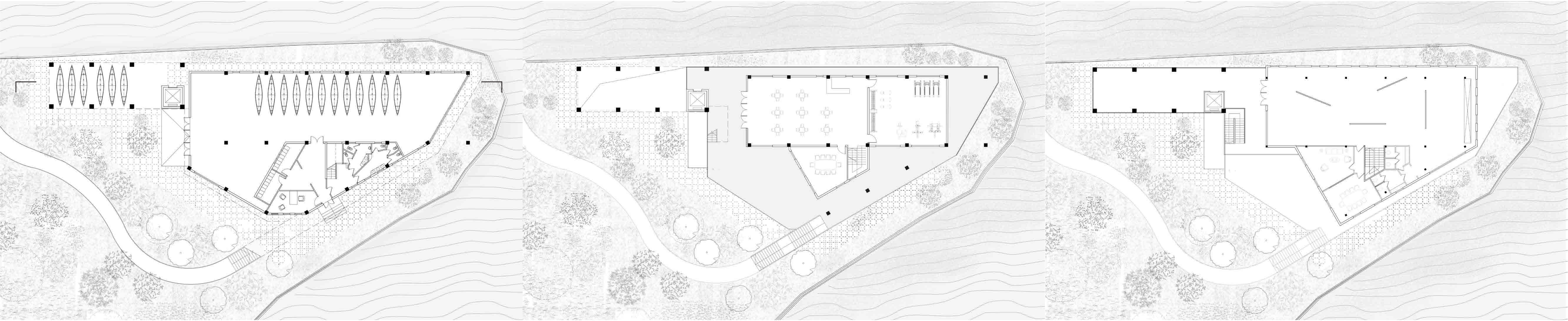
Exhibition



Birdwatching Area



Section



Ground Floor Plan

First Floor Plan

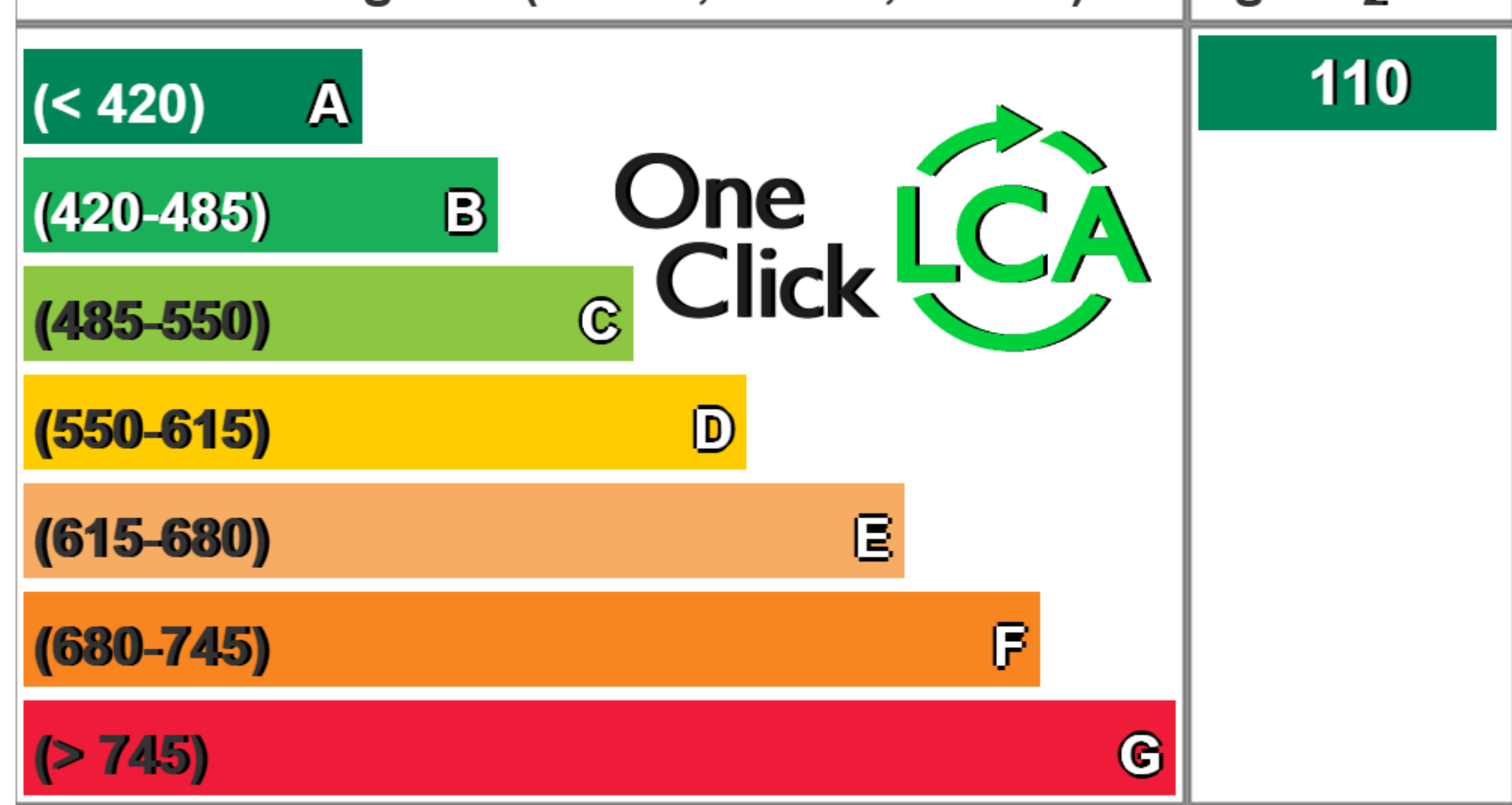
Second Floor Plan

Zone B Retrofit Carbon Footprint

Low-carbon upgrade through structural reuse and targeted additions

Retrofit intervention only

Existing structure excluded from new material inventory



110 kg CO₂e/m²

Cradle-to-grave carbon of added and replaced retrofit components

Retained:

existing structure/ slabs/ foundations

Calculated:

green façade/ green roof/ timber tower/ elevator shaft/ stair/ point foundations

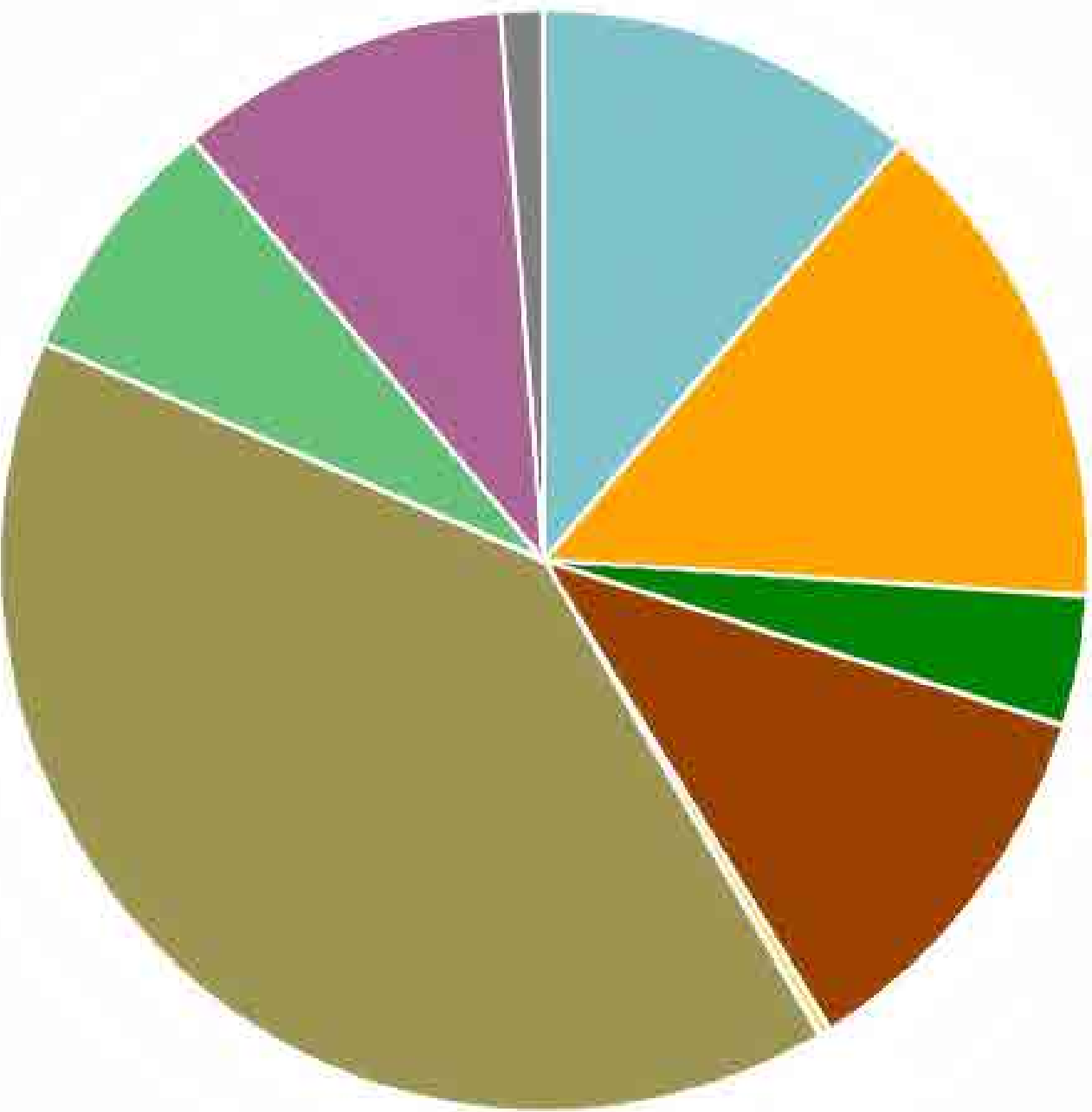
Carbon contribution by building part

Façade openings:
glazed elevator shaft
+
birdwatching windows

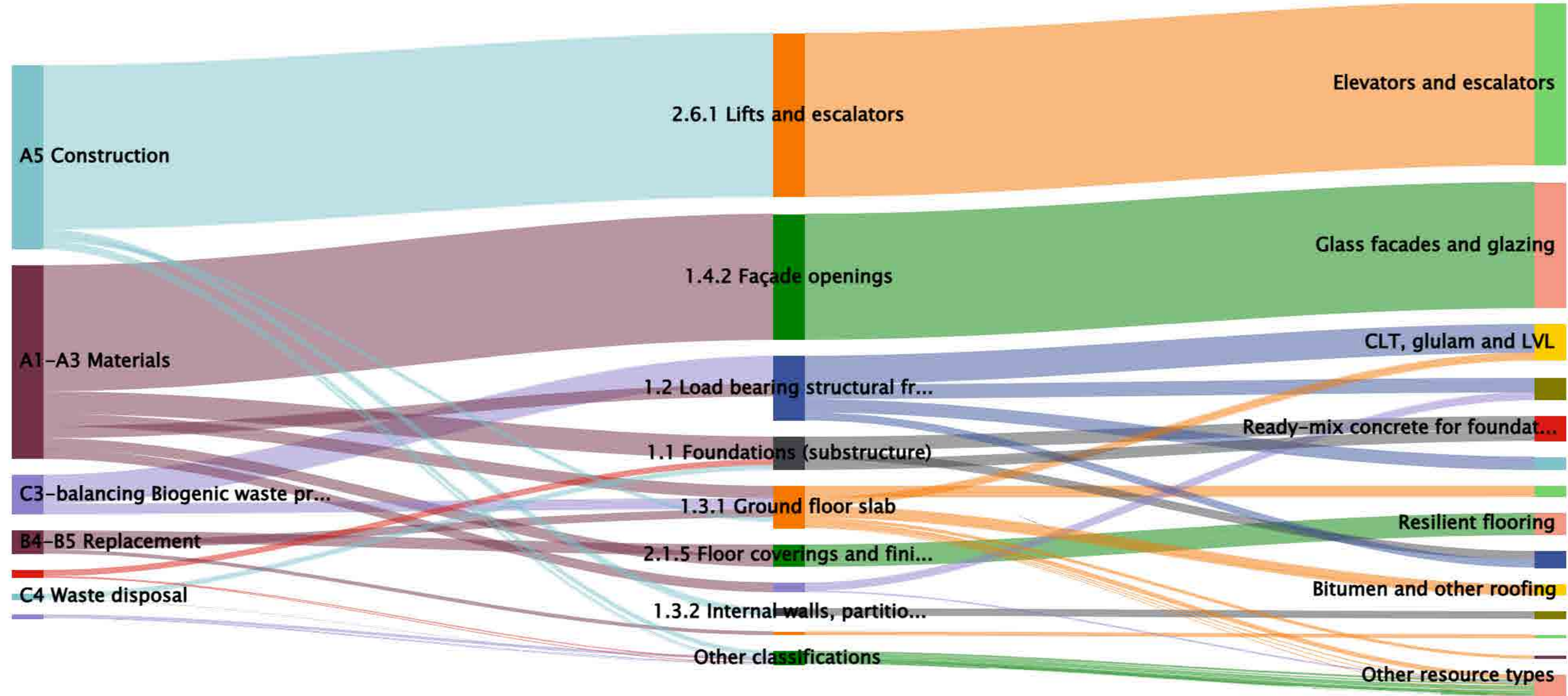
Structural frame:
timber tower
+
steel stair

Foundations:
local point foundations only

- 1.1 Foundations (substructure) - 11.4%
- 1.2 Load bearing structural frame - 14.6%
- 1.2.3 External walls - 3.8%
- 1.3.1 Ground floor slab - 11.4%
- 1.3.2 Internal walls, partitions and doors - 0.3%
- 1.4.2 Façade openings - 39.9%
- 2.1.5 Floor coverings and finishes - 7.4%
- 2.6.1 Lifts and escalators - 9.9%
- 3. External works - 1.3%

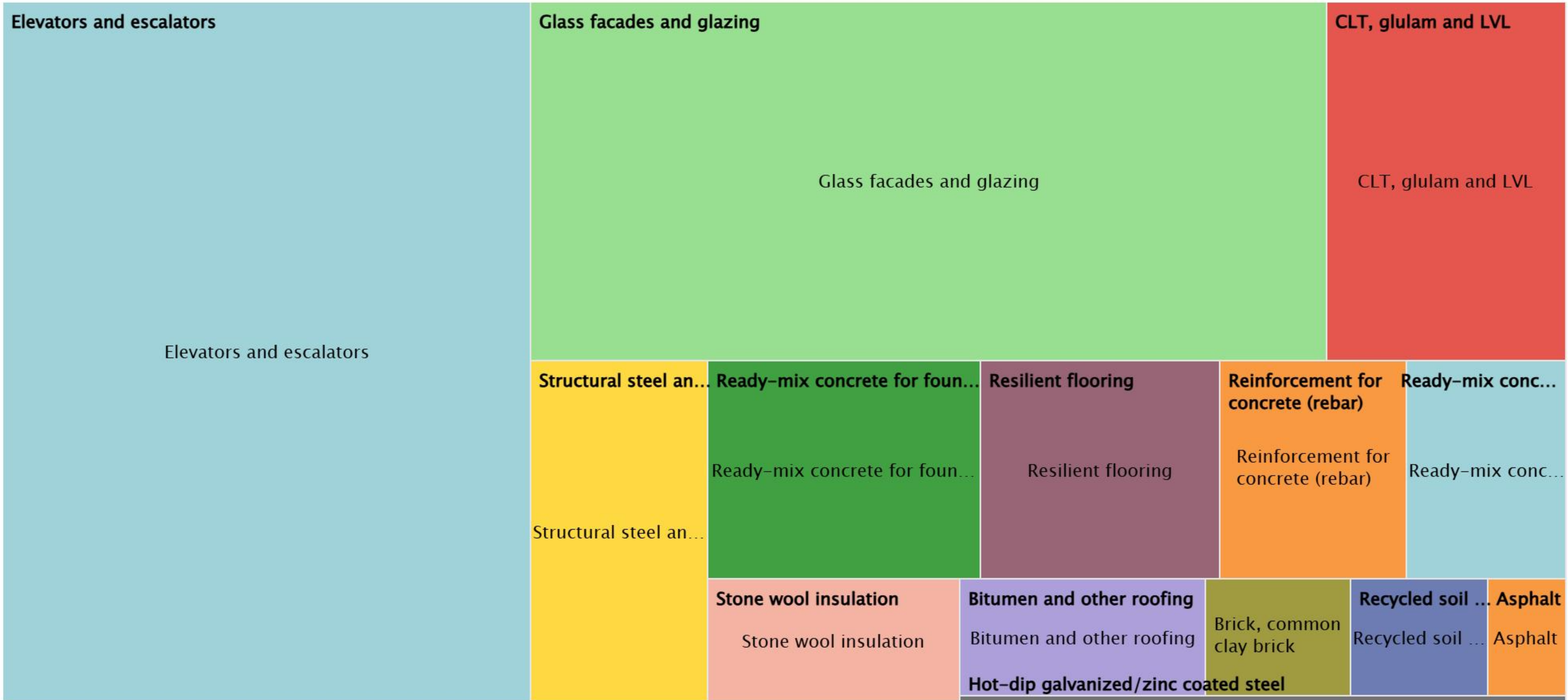


Carbon flow of retrofit intervention



Sankey diagram, Global Warming Potential total

Carbon contribution by material type



Resource type treemap

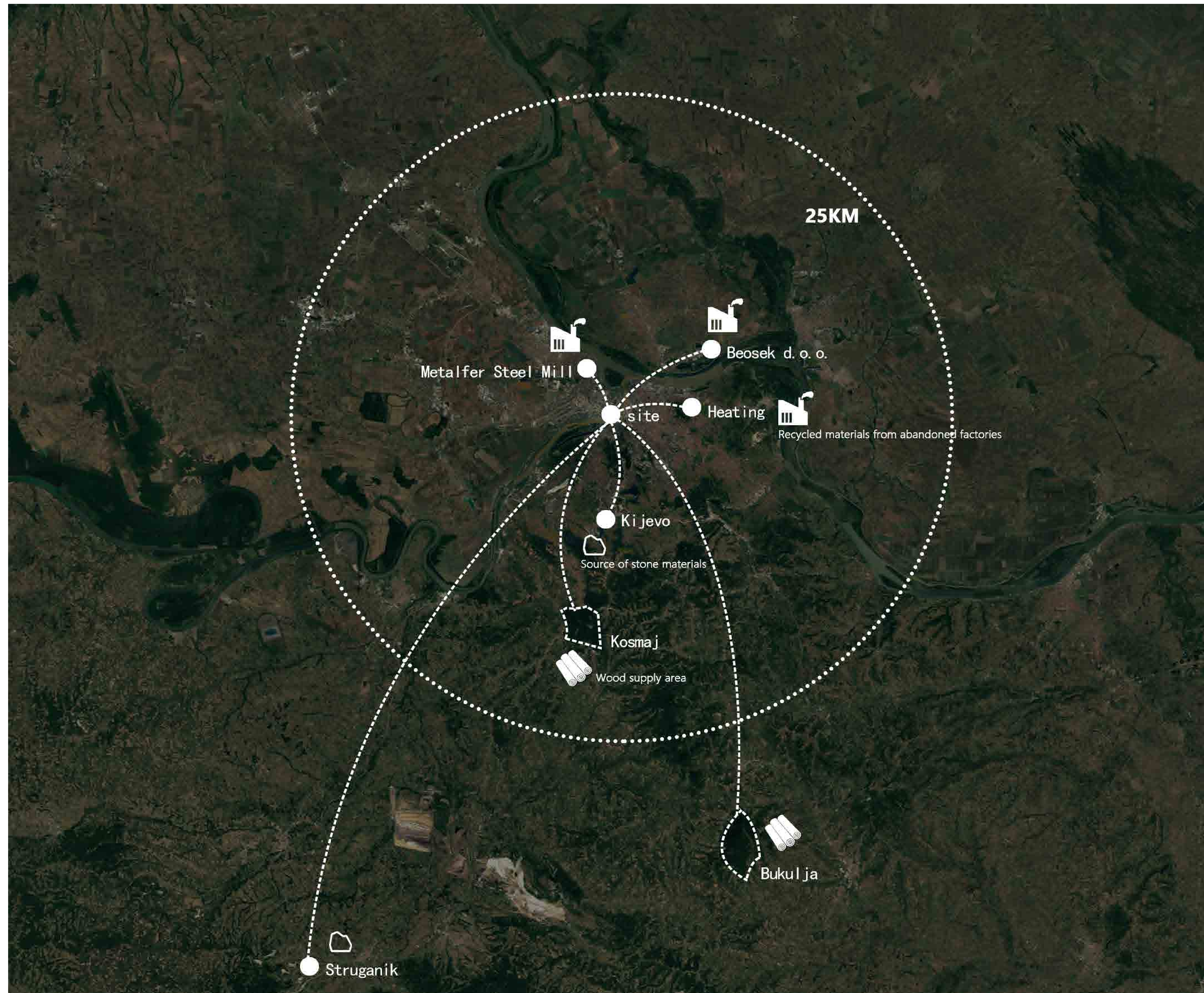
One Recovery, Two Roles

The strongest connection is not infrastructural, but ecological.



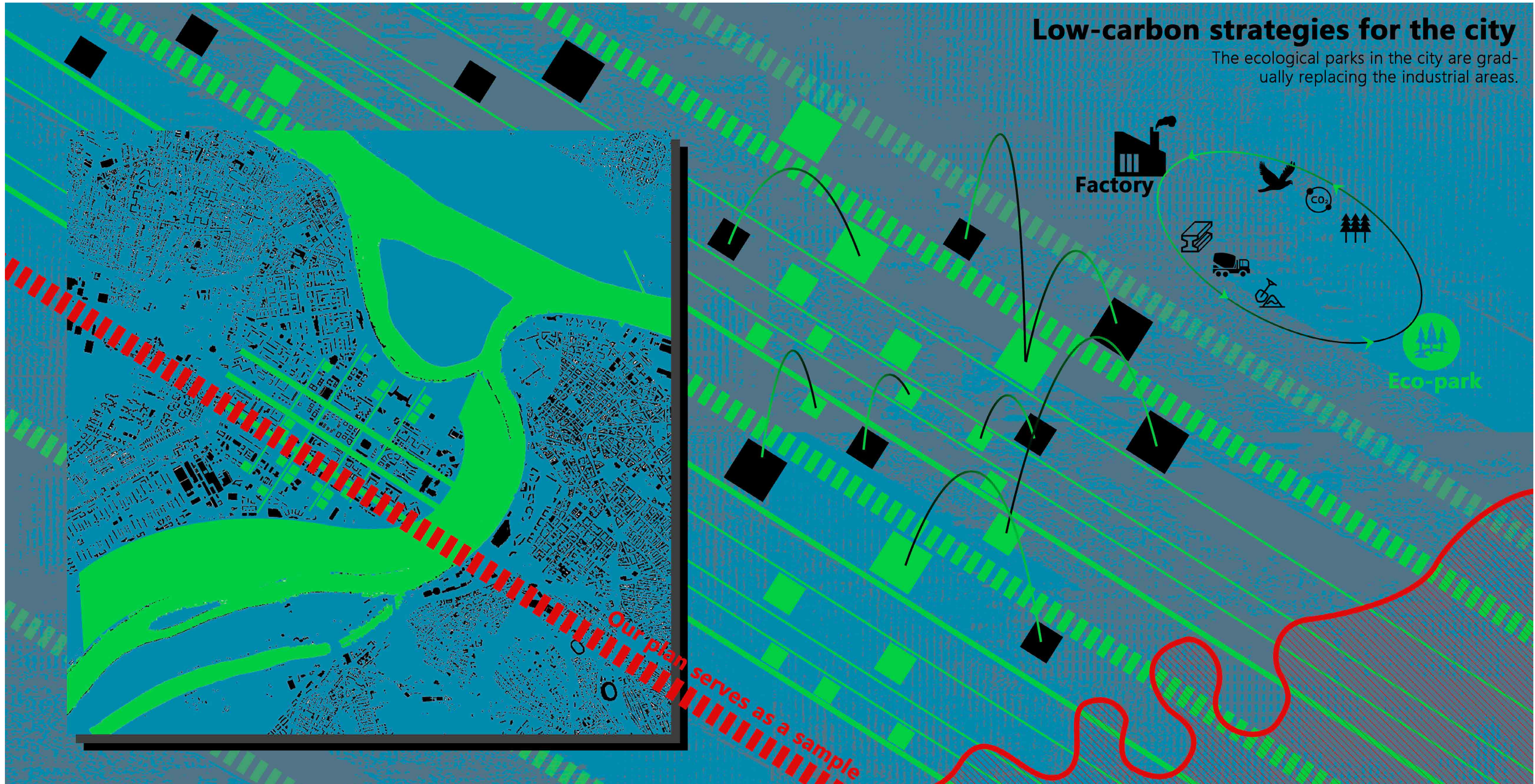
Zone A restores the river edge.

Zone B allows the city to see, understand, and value that restoration.



Low-carbon strategies for the city

The ecological parks in the city are gradually replacing the industrial areas.



Our plan serves as a sample

Team 26 - China

Meandering Confluence

A Living Interface between city, river and habitat

