



Jonna Pestrea
ACE465 urban prototypes
zone b

This project addresses pollution and eutrophication in the Göta River with floating islands and reed beds that filter water, reduce nutrients, and restore ecological balance, while enhancing both environmental health and the area's visual appeal.

WETLAND HARBOUR

WHERE REEDS AND KNOWLEDGE THRIVE

Where Reeds and Knowledge Thrive

Location: Ringön Waterfront, Gothenburg, Sweden
 Client: The Waterfront Ecosystem and the Future People of Gothenburg
 Architect Student: Jonna Pestrea

Response to the Current State of Ringön

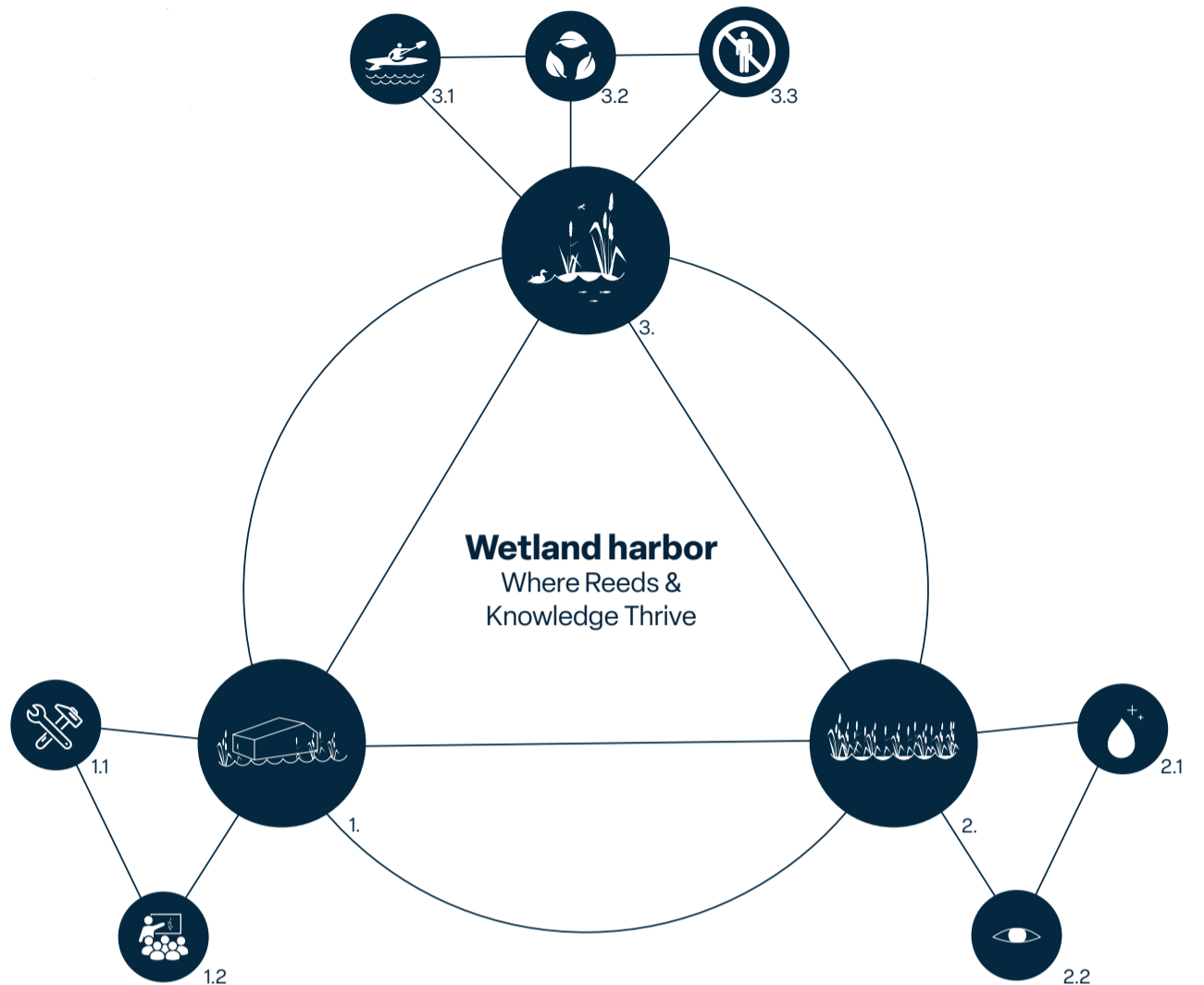
Ringön, known for its industrial heritage and unique identity, faces pressing environmental concerns due to both historical and ongoing activities. Pollution in the seabeds, soil, and water demands urgent intervention, particularly to combat the eutrophication of the Göta River caused by excessive nutrient loading.

This project directly addresses these challenges by introducing floating islands and reed beds that filter water, reduce nutrient levels, and restore ecological balance. The design respects Ringön's industrial legacy, incorporating its character into a new vision that prioritizes environmental health and long-term sustainability. By blending ecological restoration with the area's industrial identity, the project bridges the gap between the past and the future, offering a sustainable path forward.

1. Urban naturrum house **1.1** workshop space **1.2** Educational space

2. Constructed Wetland for pollution and eutrophication **2.2** Treating pollution and eutrophication **2.3** creating Visual attraction to the waterfront

3. Prototyped floating reed islands **3.1** kayak zone **3.2** Non human zone



The prototyped floating reed island

island is a non-human, biodegradable structure that supports and strengthens ecosystems both above and below the water. It is constructed entirely from natural, decomposable materials.

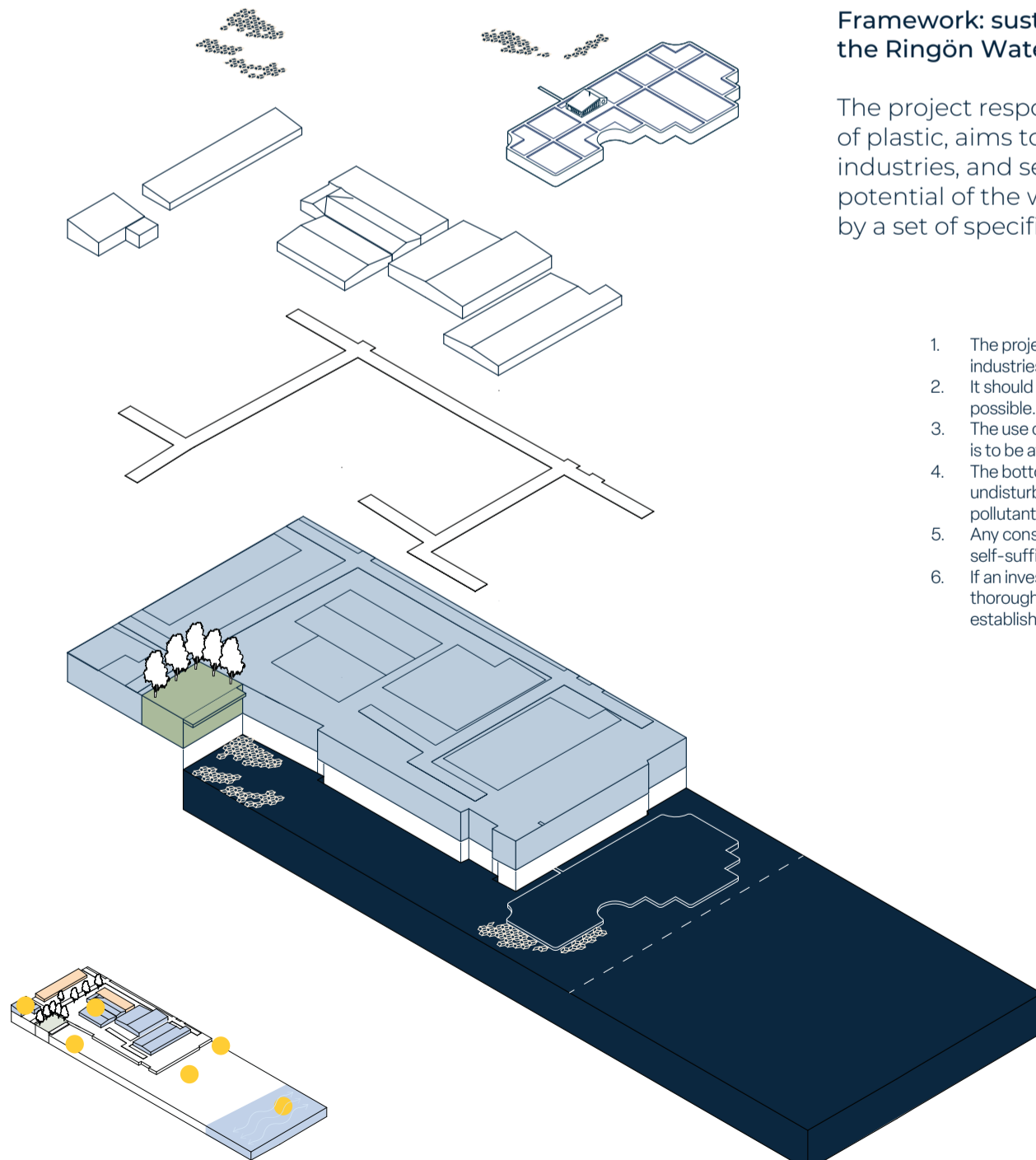
The production island includes a constructed wetland to treat pollution and eutrophication, creating a visually attractive waterfront. It also features the Urban Naturrum house with workshops, highlighting sustainability and community engagement

The current buildings of the site are mainly used for industrial purposes.

Ringön's road network is primarily used by cars and industrial vehicles, making it less pedestrian-friendly

The ground is primarily composed of asphalt and gravel, interspersed with limited patches of greenery. Evidence, along with some speculation, suggests contamination of both the soil and seabed from decades of industrial activity

The Göta River is polluted and eutrophication, with a contaminated seabed. It also accommodates both industrial and private boat traffic at varying scales.



Framework: sustainable revitalizing of the Ringön Waterfront

The project responds to the limitations of plastic, aims to preserve local industries, and seeks to unlock the potential of the waterfront. It is guided by a set of specific principles:

1. The project must not disrupt existing industries.
2. It should utilize local materials as much as possible.
3. The use of plastic and other harmful materials is to be avoided entirely.
4. The bottom of the Göta River must remain undisturbed to prevent the risk of releasing old pollutants.
5. Any construction should aim to be reasonably self-sufficient.
6. If an investment is required, it must be thoroughly justified in alignment with the established principles.

Casestudies



World water Atlas, Islais Hyper-Creek



Amorim cork solutions

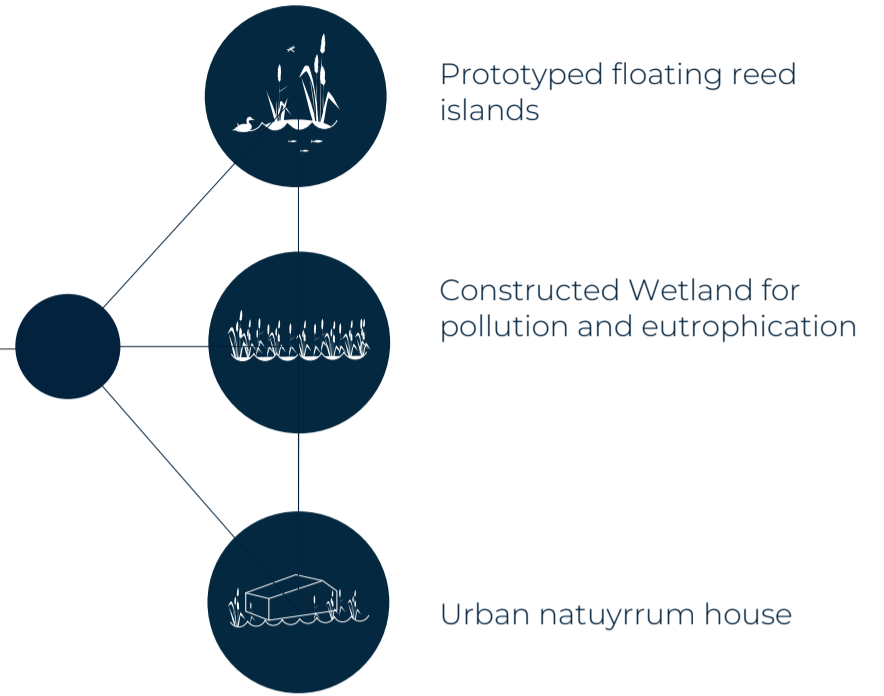


Wakeunion floating island



Uros Floating Islands of Lake Titicaca

Functions

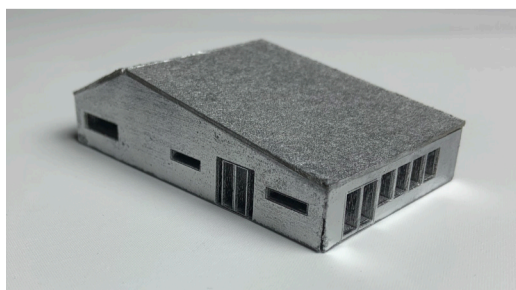
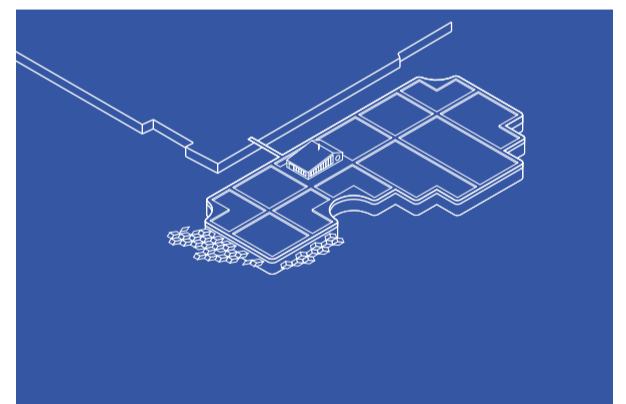
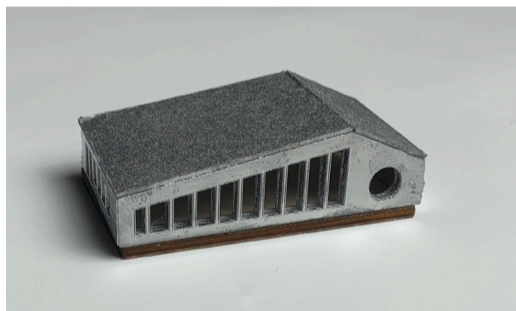
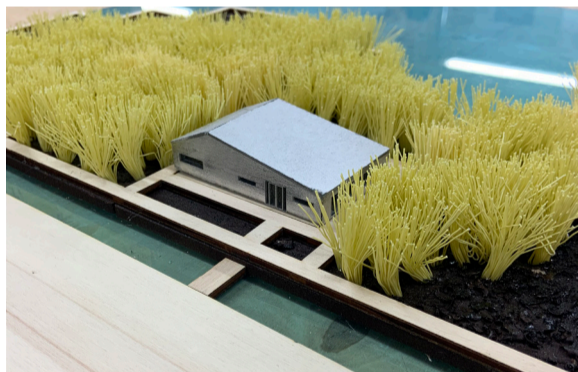


Project process

With a defined framework and set of rules, the project began by analyzing various case studies. These studies explored different forms of floating islands, innovative techniques for their creation, and the regeneration of ecosystems and their services.

Models

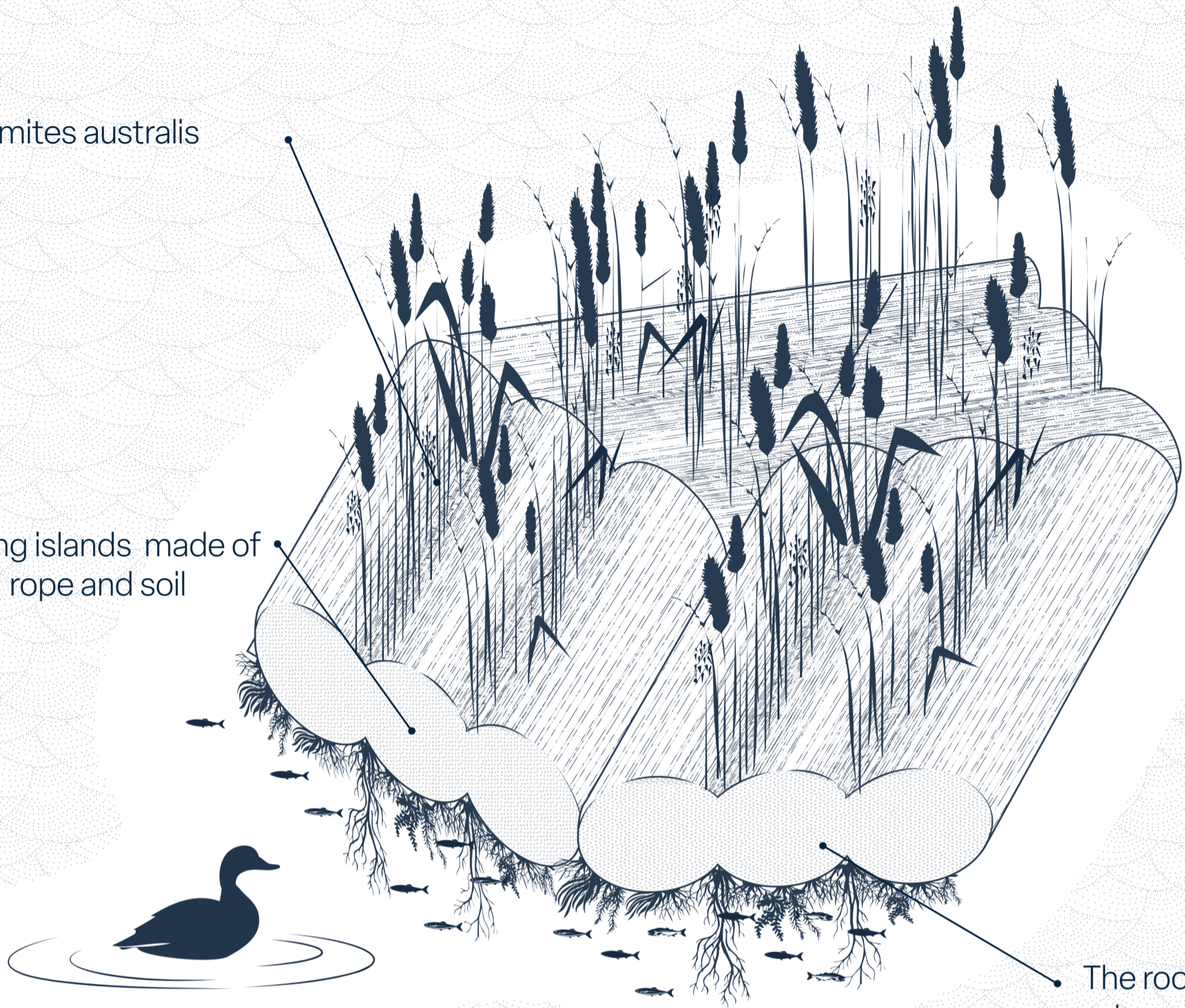
Creating a project that was both realistic and impactful for the Ringön waterfront was essential. Equally important was presenting the project through a detailed model that illustrated its appearance both above and below the water's surface. Below are images of the project's 1:200 scale model build.



Where Reeds and Knowledge Thrive

Phragmites australis

Floating islands made of reeds, rope and soil



The roots of the reed create a new ecosystem.

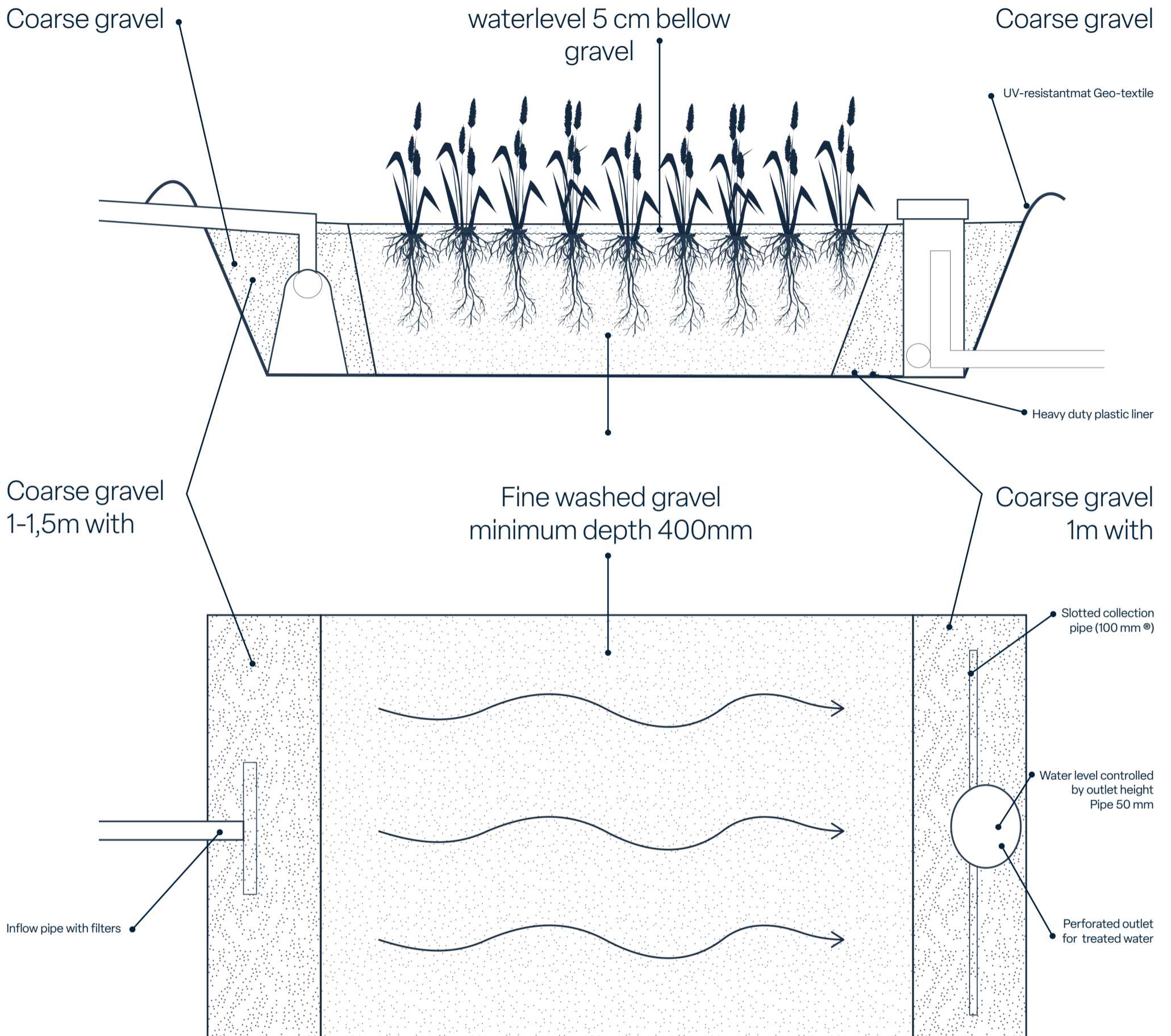
The project prototype features floating **reed islands** that can be cultivated on a dedicated production island. Each floating island consists of a base made of reeds and a thin layer of soil, with a thickness of 5–10 cm. The islands are designed to support smaller animals, such as ducks or seagulls, with a maximum weight of 10 kg.

For a one-square-meter island, the required materials include 80–185 kg of reeds and 60–160 kg of soil, along with an additional 10 kg to account for the animal weight. For a 1.5-square-meter island, the total weight is estimated to range from 220 kg to 527.5 kg, depending on material density.

To produce sufficient reeds for one island, a much larger production area is required, as only 30–50% of the total reed production is usable.



1:2000



Constructed Wetlands for Wastewater Treatment: Horizontal Flow Wetland Design
 Constructed wetlands are a sustainable and proven solution for wastewater treatment, designed to replicate natural processes. Horizontal flow wetlands are particularly effective, guiding water through a gravel or sand substrate planted with reeds (*Phragmites australis*). As water flows horizontally, pollutants are removed through sedimentation, microbial activity, and nutrient absorption by plants.

This system is commonly used in areas without centralized sewage systems, such as properties reliant on septic tanks. It effectively reduces organic matter, suspended solids, and nutrients, improving water quality

before release into the environment.

The Dual-Purpose Reed Farm
The reed farm integrates two functions:

Reed Production: Reeds are cultivated to produce material for floating islands. Since only 30–50% of the reeds are usable, a larger production area is required.

Pollution Control: The wetland helps clean the Göta River by removing excess nutrients and pollutants, addressing over-fertilization and restoring water quality.

A Movable Floating Island
 An innovative feature of this project is the creation of a movable floating island using the reed farms. This

design offers the flexibility to relocate the wetland when space along the water's edge is needed for other purposes. By anchoring the island between boat parking pillars and the harbor of Ringön, it remains stable while effectively performing its dual functions of reed production and wastewater treatment.

This mobility adds a significant advantage, ensuring the wetland's adaptability to changing spatial needs while maintaining its environmental and ecological benefits. The system demonstrates how floating reed farms can combine sustainable water purification, reed harvesting, and practical design to enhance urban water ecosystems.

Wetland harbor

Where Reeds and Knowledge Thrive

A05

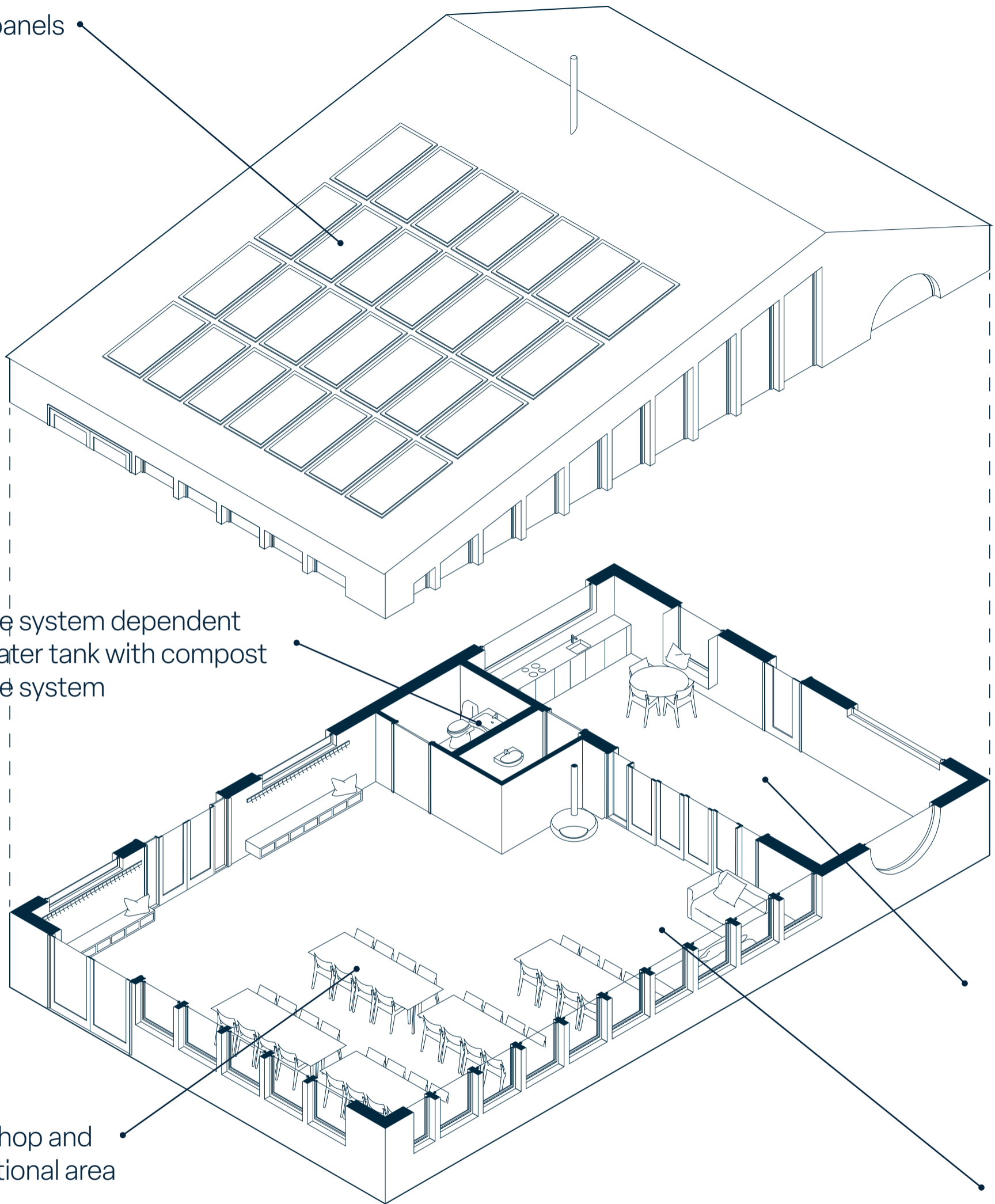
Solar panels

sewage system dependent on a water tank with compost sewage system

Workshop and educational area

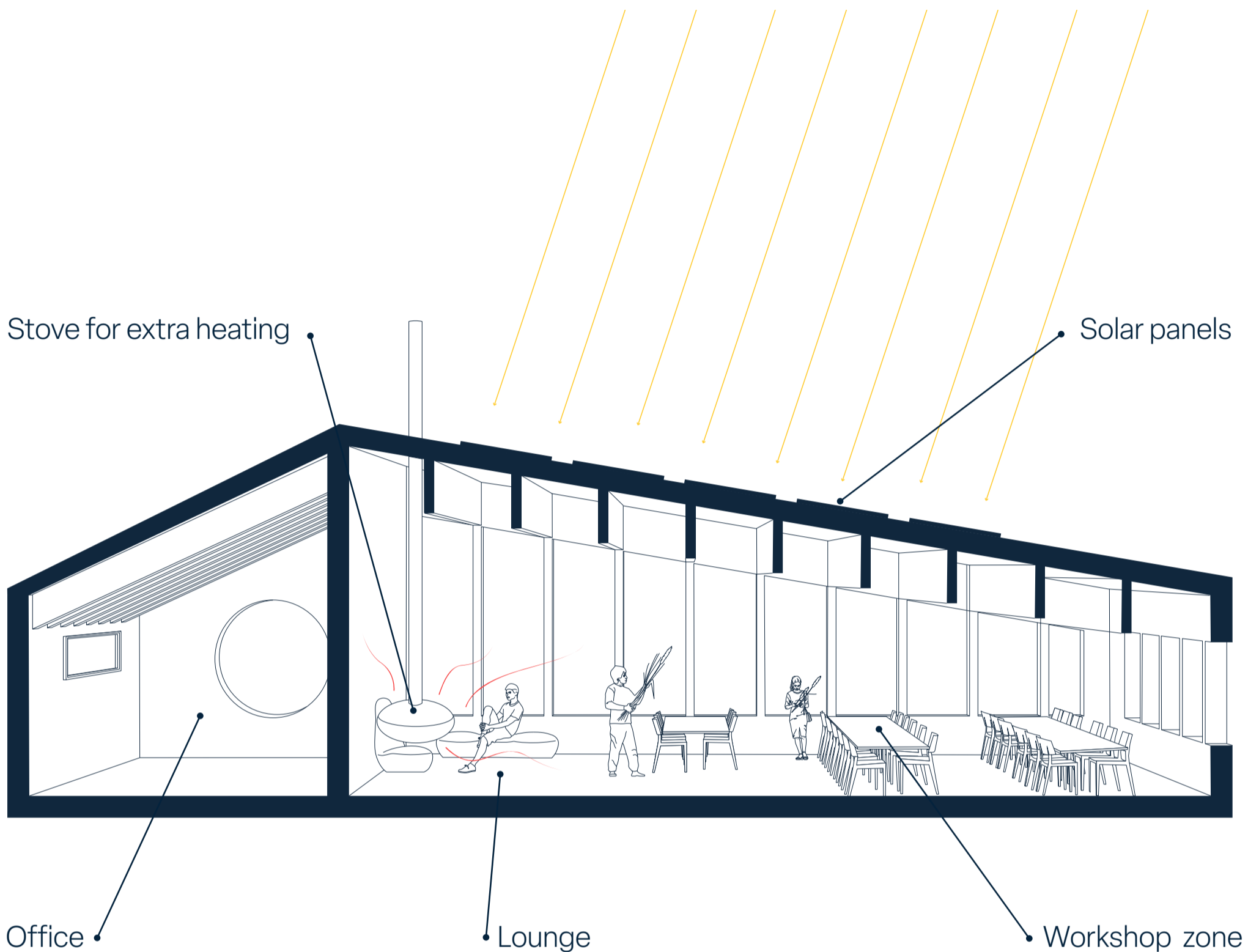
Office

Lounge



The **Urban Naturrum Center** The heart of the project, offering a flexible space for environmental education and community engagement. It hosts workshops, exhibits, and guided tours to raise awareness about sustainability and ecological restoration, with periodic displays on Gothenburg's ecosystem and local species. The center encourages hands-on participation in the waterfront's restoration and fosters connections between residents and nature. It also serves as a community hub, available for rent for public events.

The center provides immersive experiences designed to inspire and educate visitors about water filtration and ecosystem regeneration, particularly through reed farming and floating islands. These hands-on activities help visitors understand the natural systems being restored in the surrounding environment.



The Urban Nature Room

The Urban Nature Room serves as a hub for workshops, reed island production, and rentals. The reed island production process involves several key steps:

1. **Growing Reeds:** Cultivating reeds specifically for the creation of floating islands.
- 2.
3. **Harvesting Reeds:** Cutting and preparing the reeds for construction.
- 4.
5. **Constructing the Reed Island:** Bundling the harvested reeds together using non-toxic, biodegradable rope to ensure stability and sustainability.
6. **Planting and Soil Preparation:** Planting young reed seedlings into the island structure, ensuring they are rooted in a 5–10 cm layer of soil.

Once completed, the reed islands can be transported to the water's edge and securely attached to shorelines, other islands, or fixed structures using additional rope.

To ensure the islands remain functional and buoyant for their intended lifespan of approximately 10 years, regular maintenance is required. This includes monitoring the reeds' growth, repairing any structural damage, and replacing degraded components as needed.