

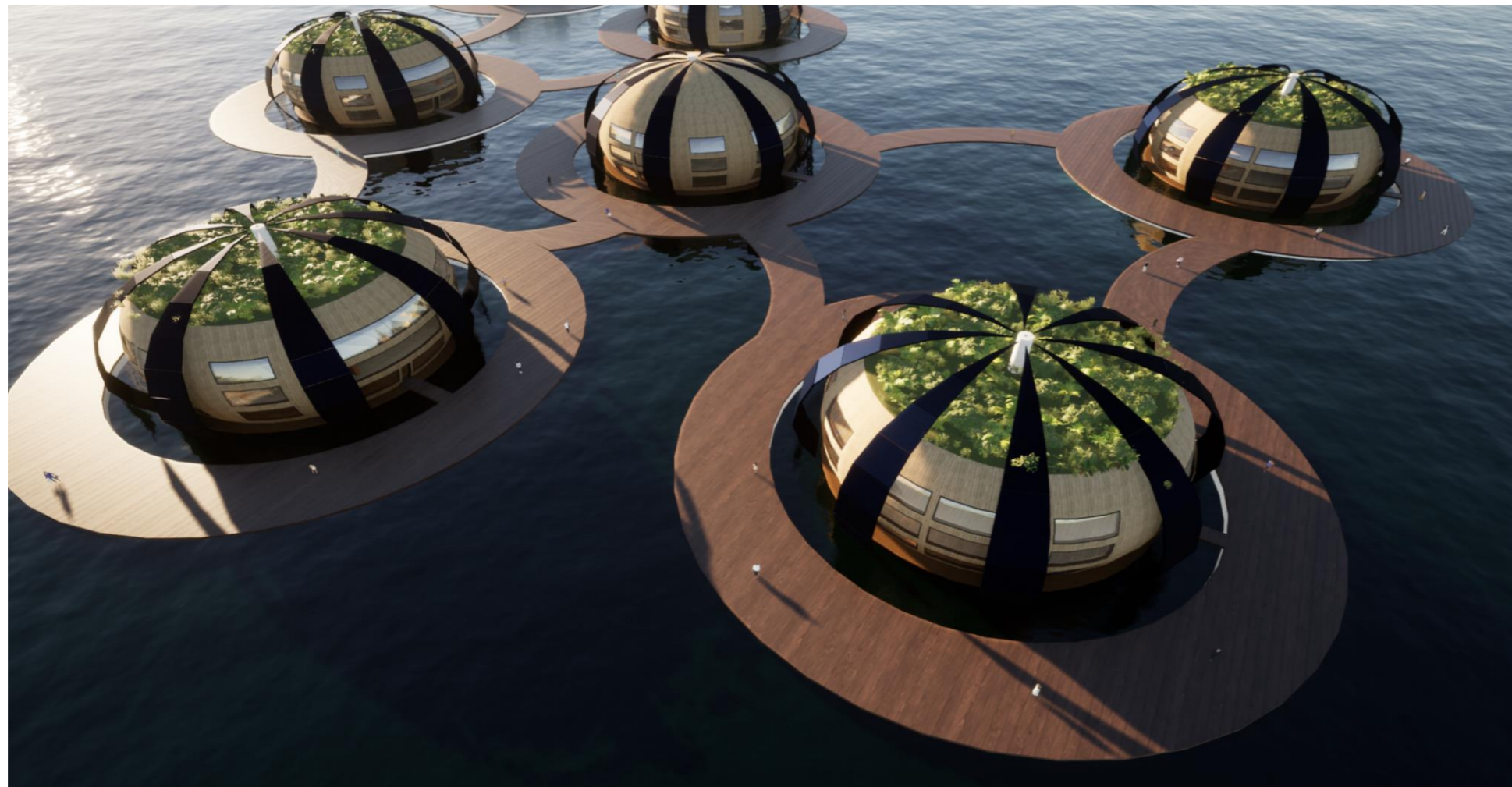
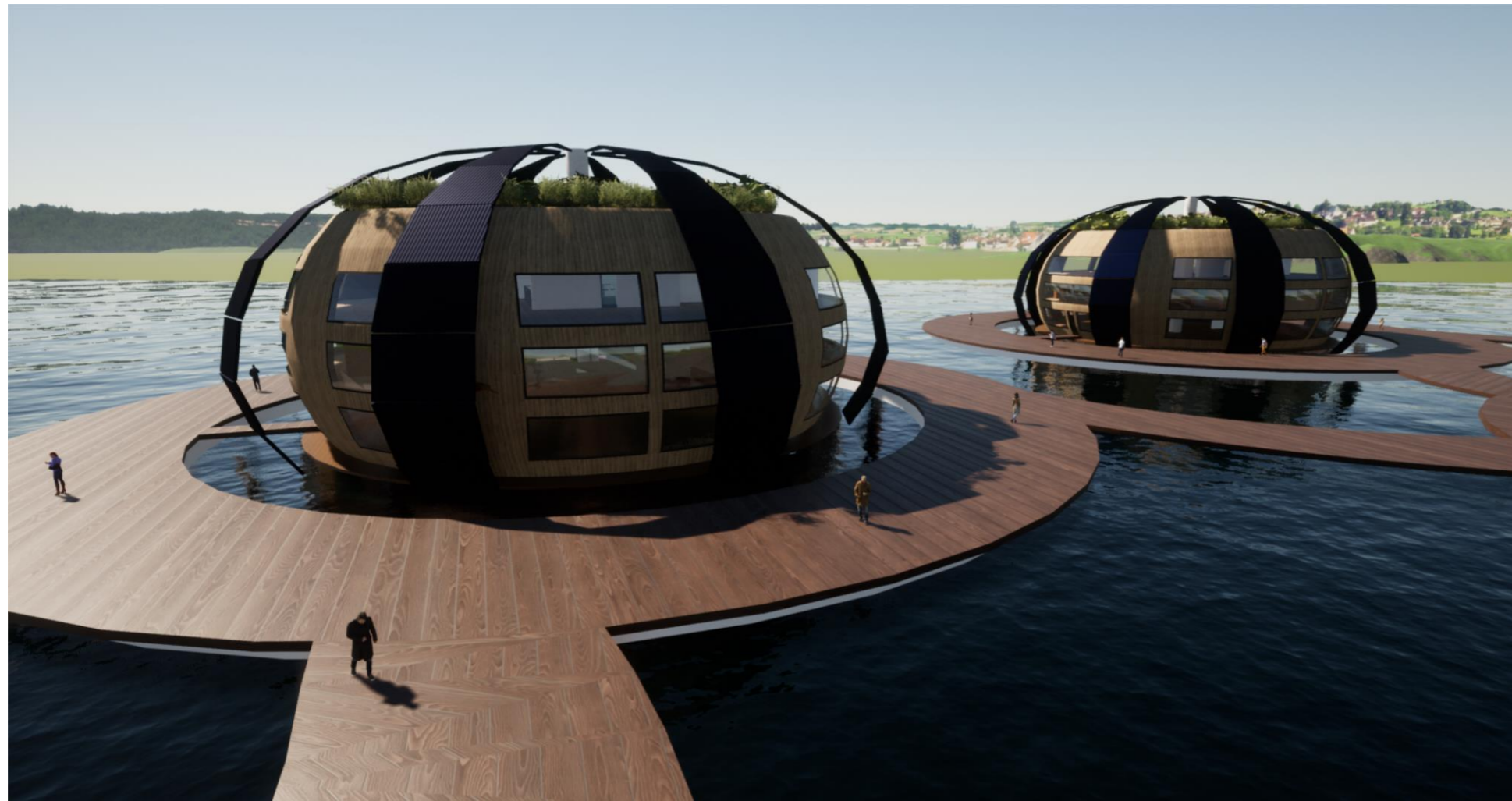
INFLUENCE OF PROGRESSIVE TECHNOLOGIES ON THE CREATION OF ARCHITECTURE



FLOATING APARTMENT COMPLEX **BERRIES**

Alžběta Kazičková
Professional management: Doc. Ing. M. Budiaková, PhD.

Dispositions used from my previous project ATII Urban Housing
Ružinov
Supervision: Ing. arch. Lubomír Závodný



MAIN IDEAS:

1. Rotation of the buildings on the water surface
- production of electricity by rotating motion

2. The Plant-Microbial Fuel Cell Technology -
Generation of electricity from organic matter
excreted from the roots of living plants

3. Photovoltaic cells on a turbine - curved -
capture of reflected sunlight from the water.

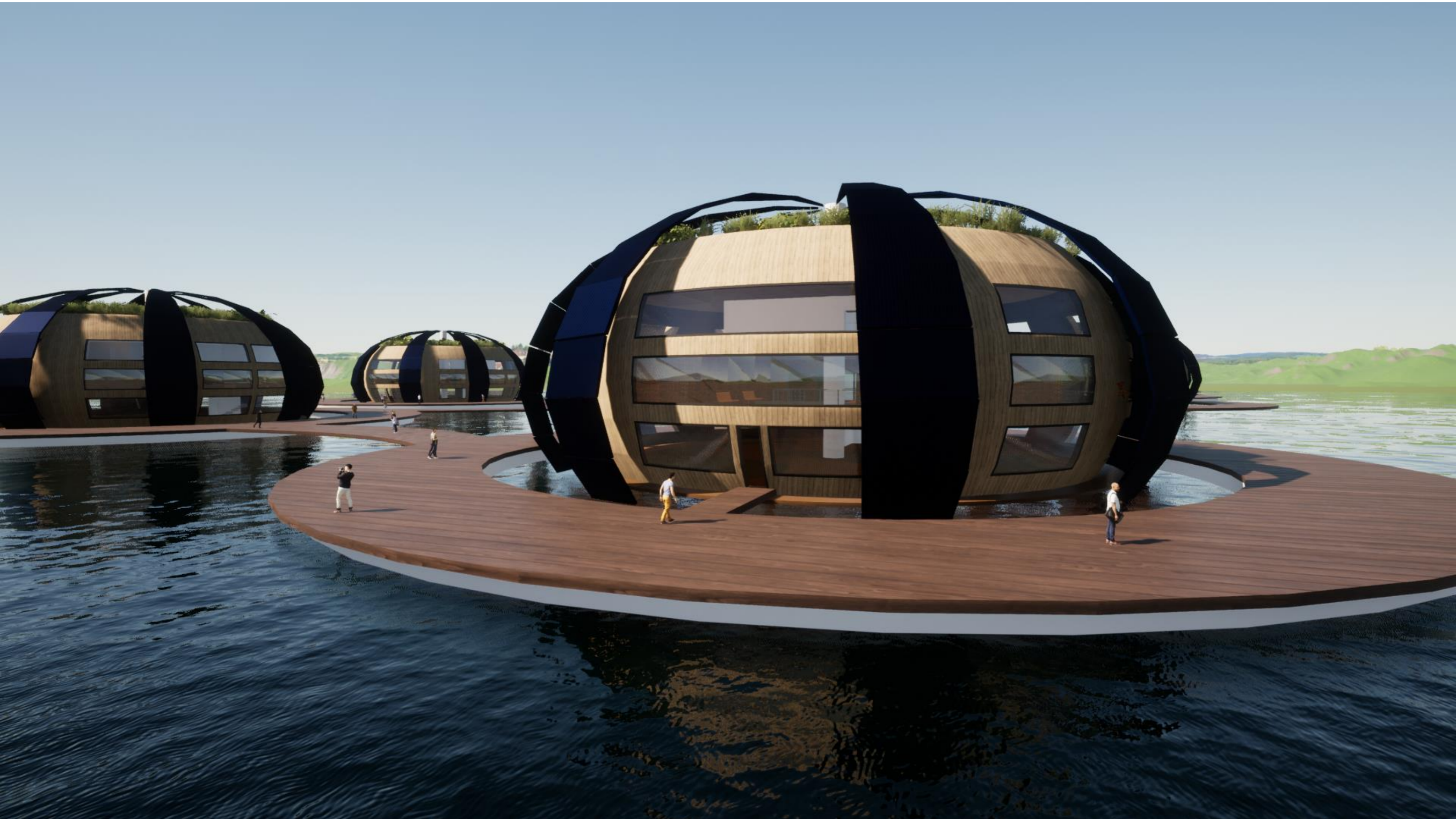
I created a residential complex of buildings, floating on water, which **rotate due to the wind and thus generate electricity**. Energy is also produced by **photovoltaic cells** located on the blades of the central turbine, which rotates the building. The third source of energy is provided by **plant power station** located at the first floor of each building and also by vegetation roof on top of the each building. In addition to producing energy, these green plant power stations also **clean the lake's water** and increases its quality.

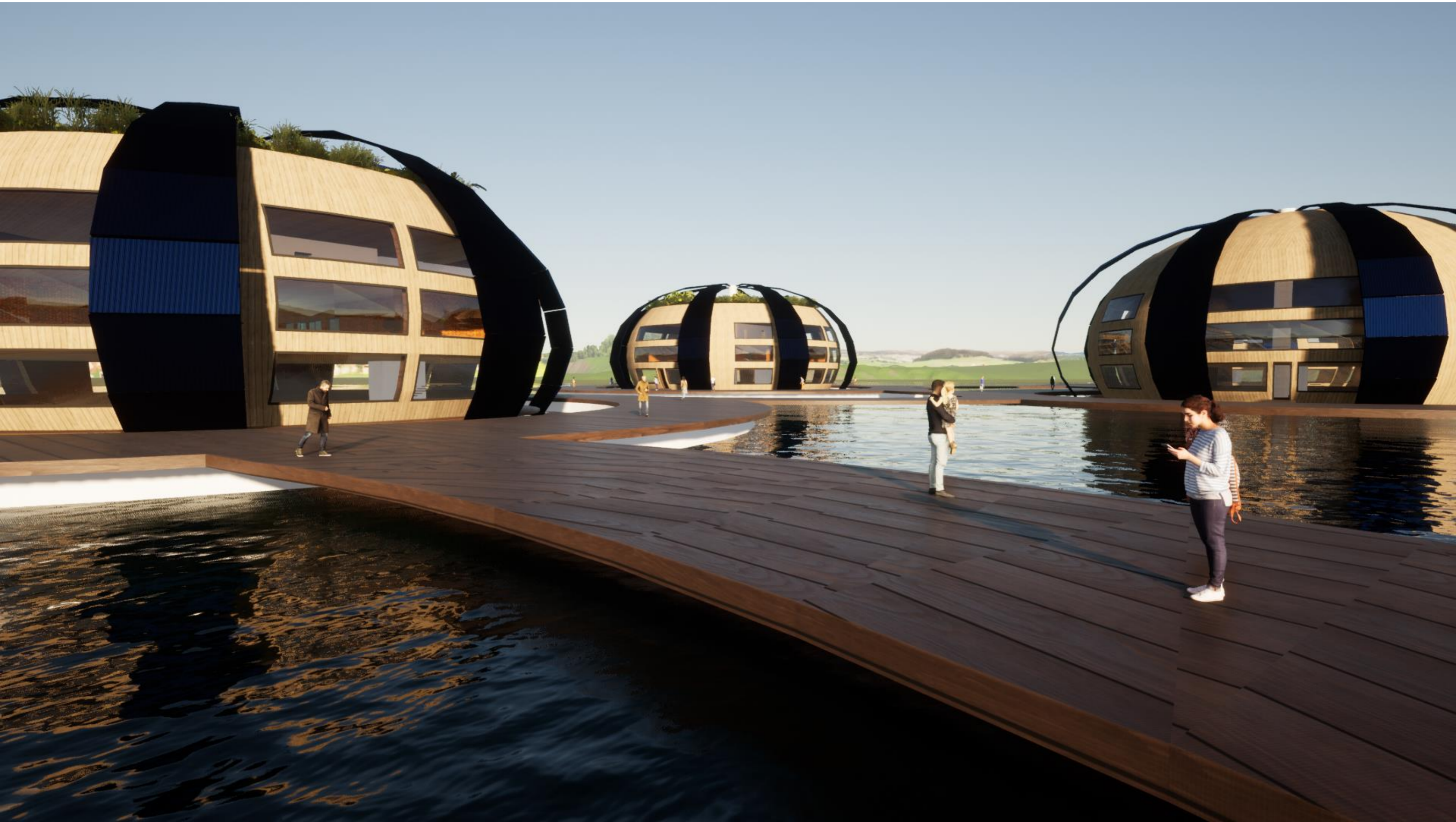
The heat source is obtained by watert-to-water heat pumps .

In addition, the spherical shape of buildings minimizes the amount of heat loss.

Each apartment unit has a community garden on the 1st floor, which also serves as a plant power station, on the 2nd floor there is housing equipment such as the YOGA Center, the Community Swap Library and a social room for games and social events. On the 3rd floor, there are individual apartments themselves with an inner gallery, which frames the central atrium passing through the entire building.

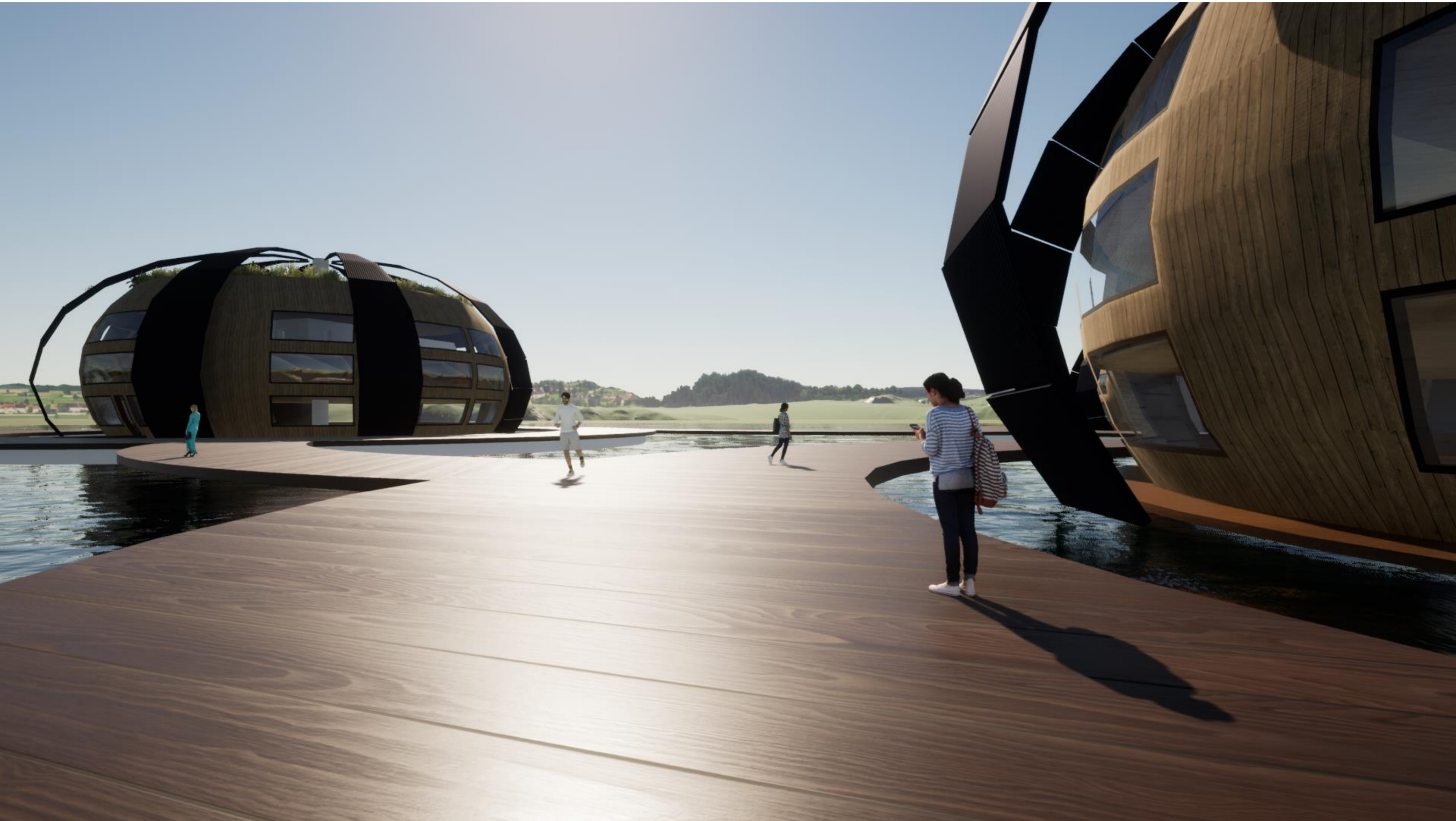


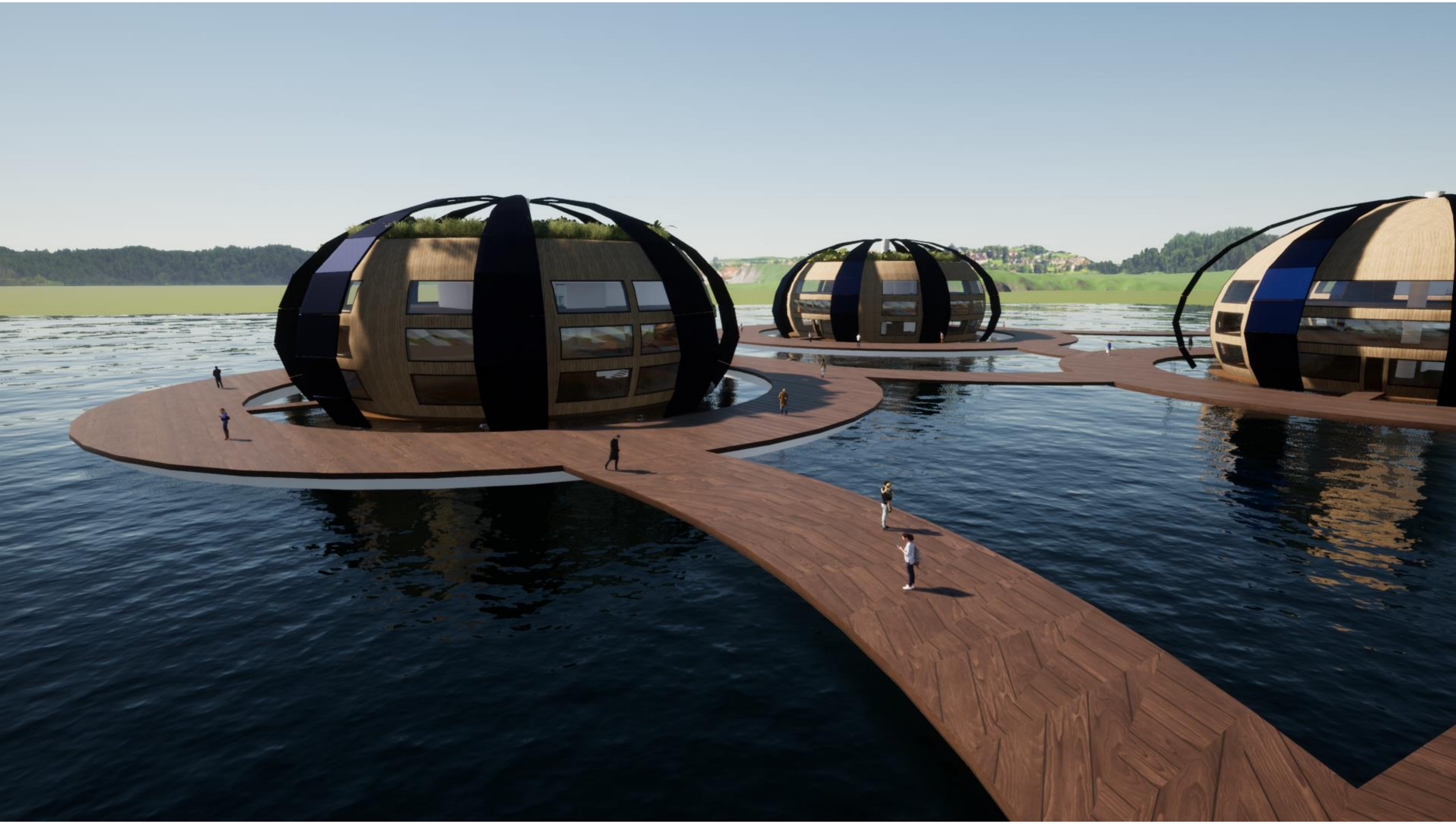


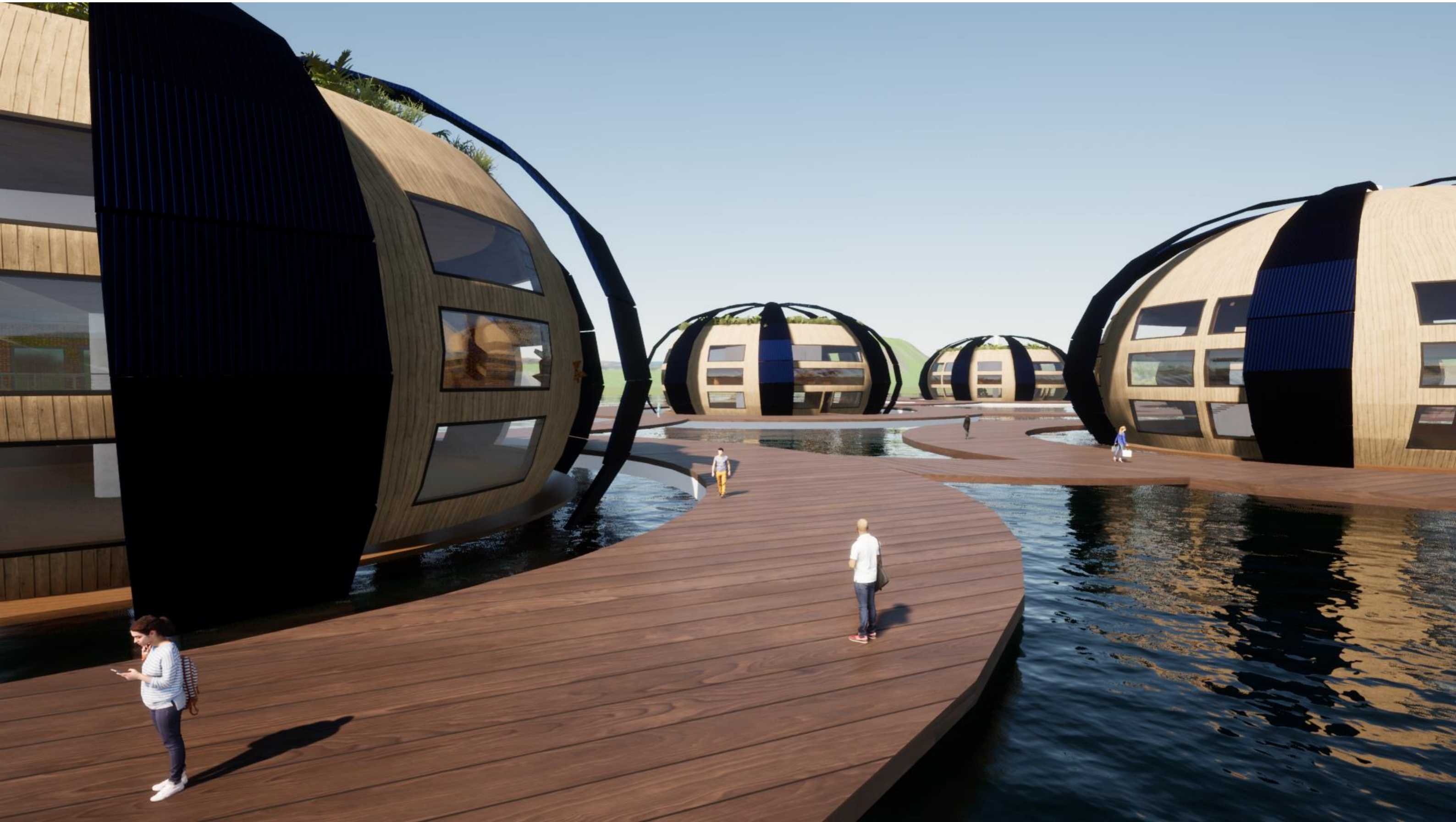






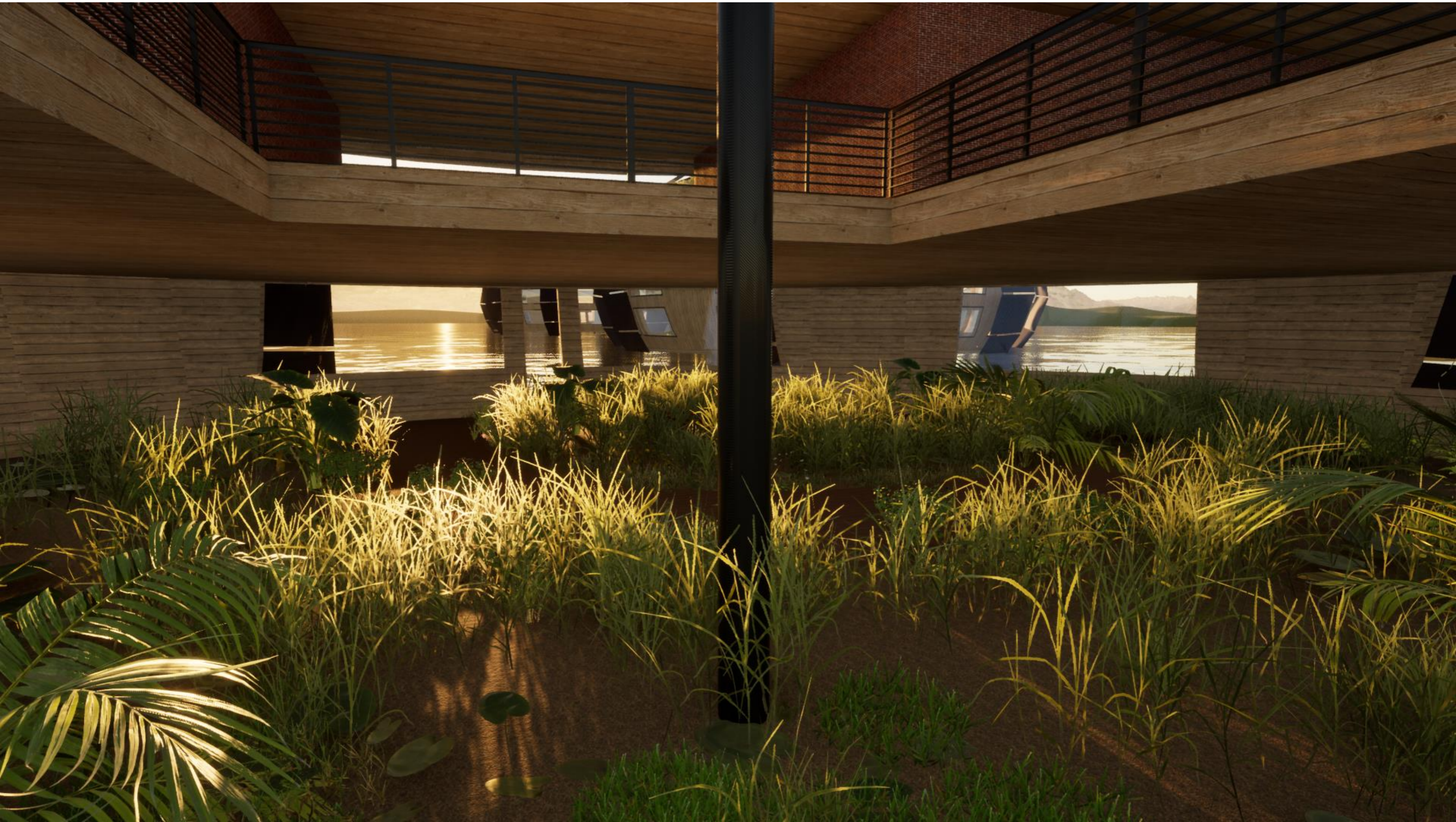




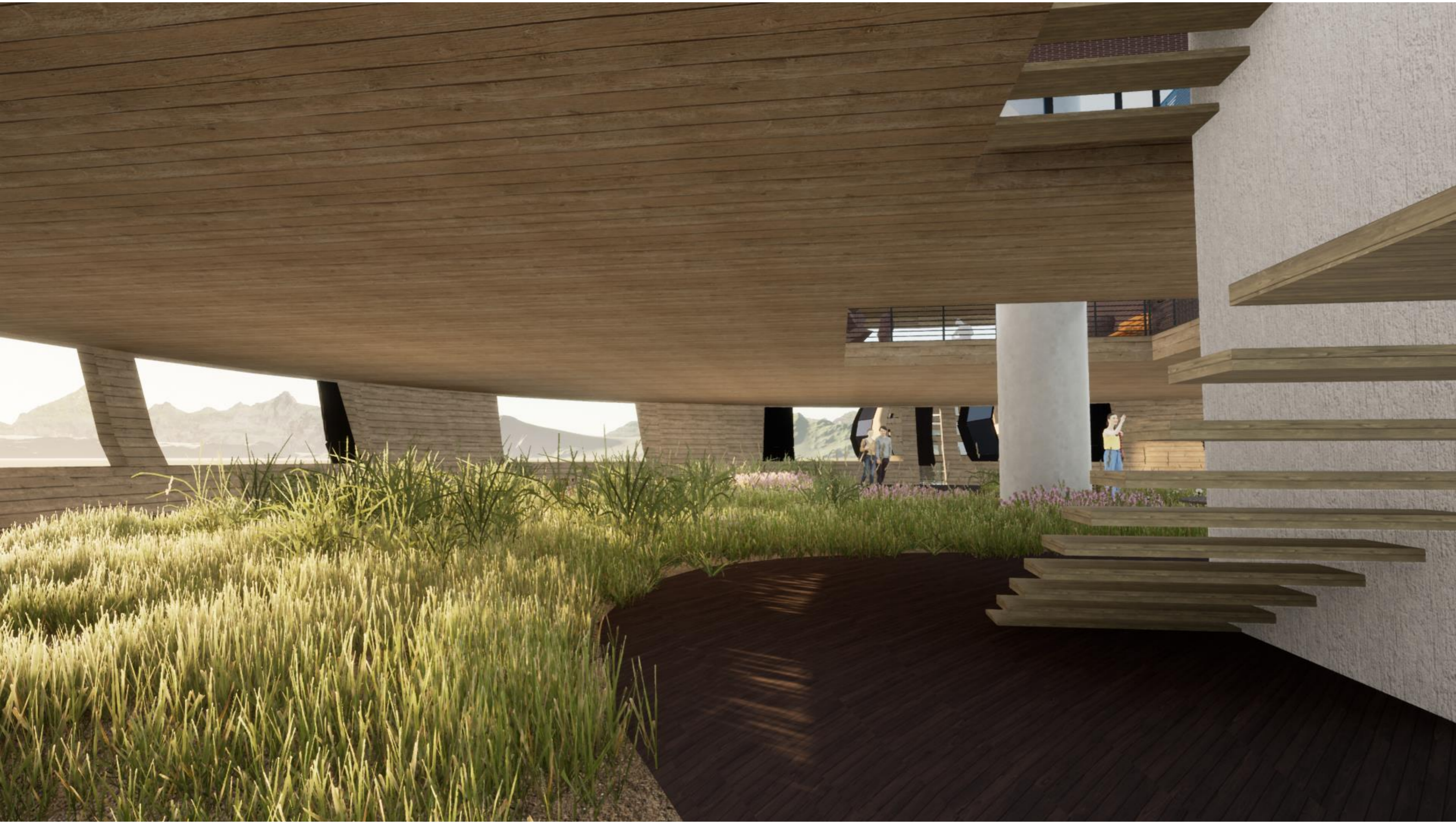




























4 ELEMENTS



EARTH



WATER



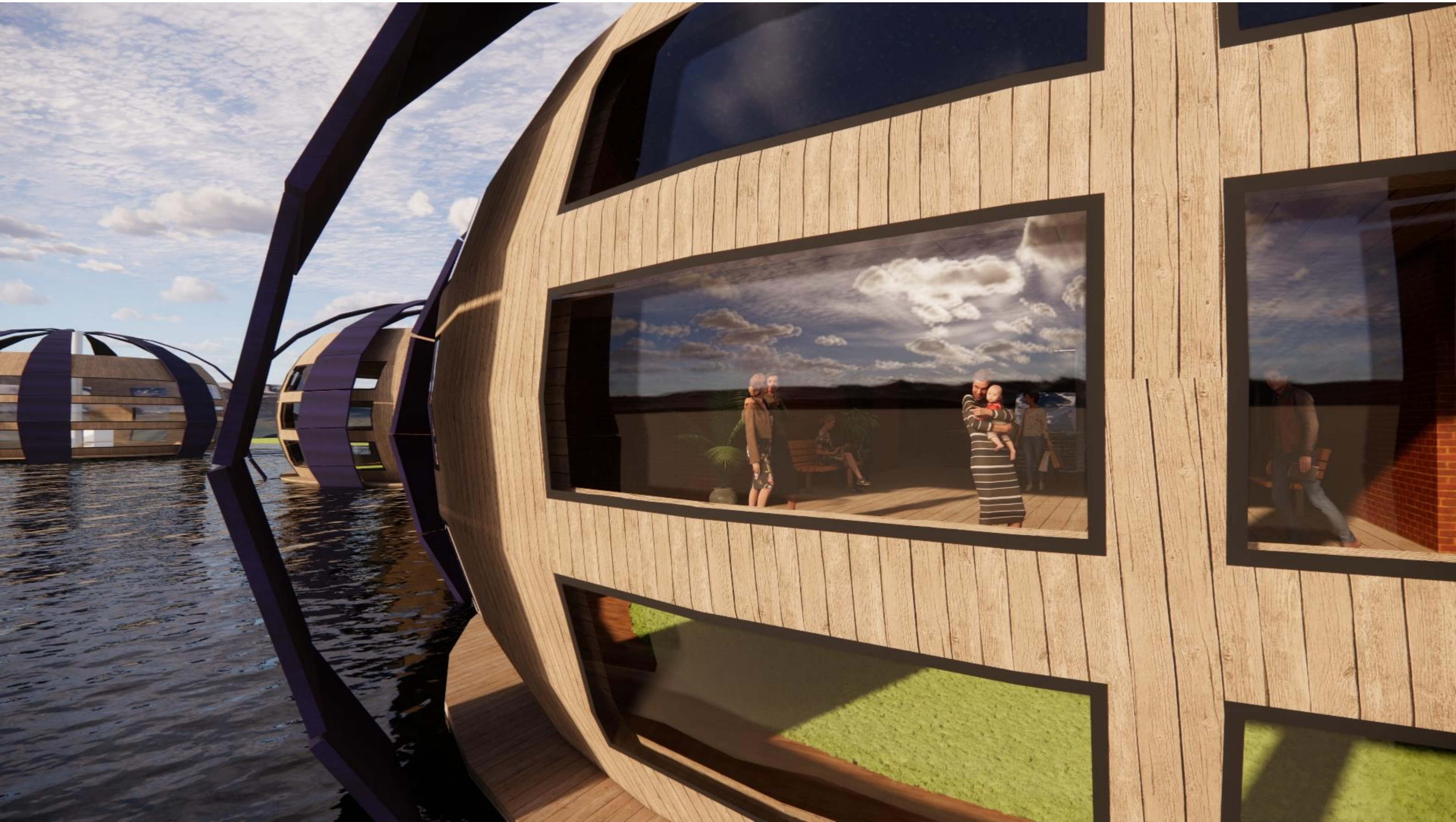
AIR



FIRE



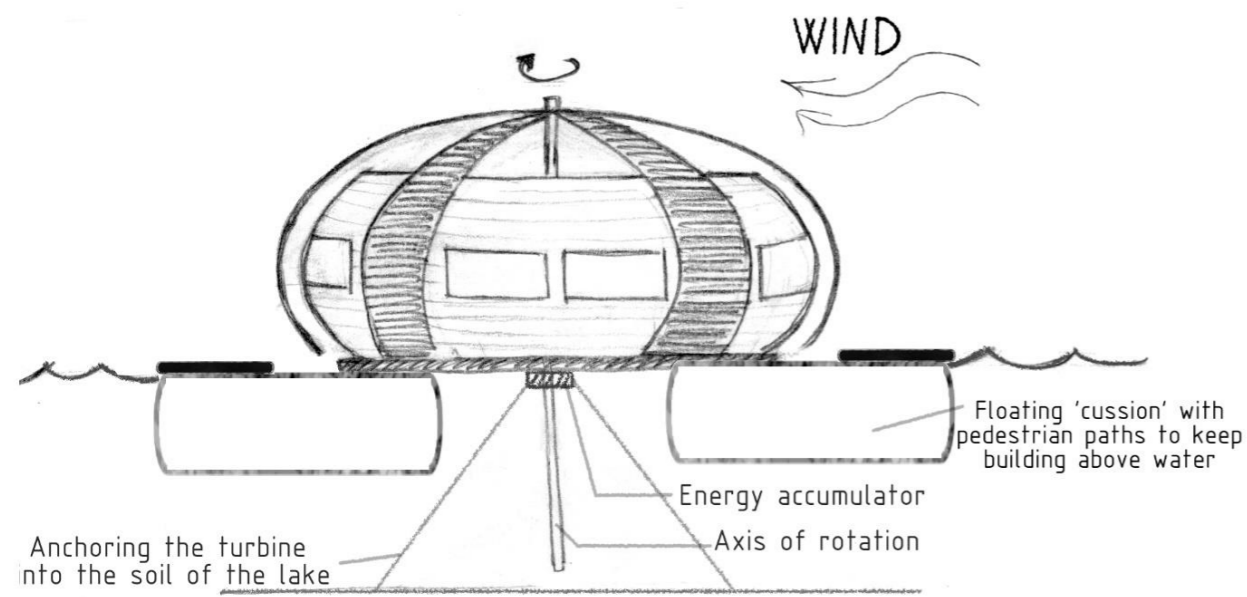




MAIN IDEAS:

1. Rotation of the buildings on the water surface

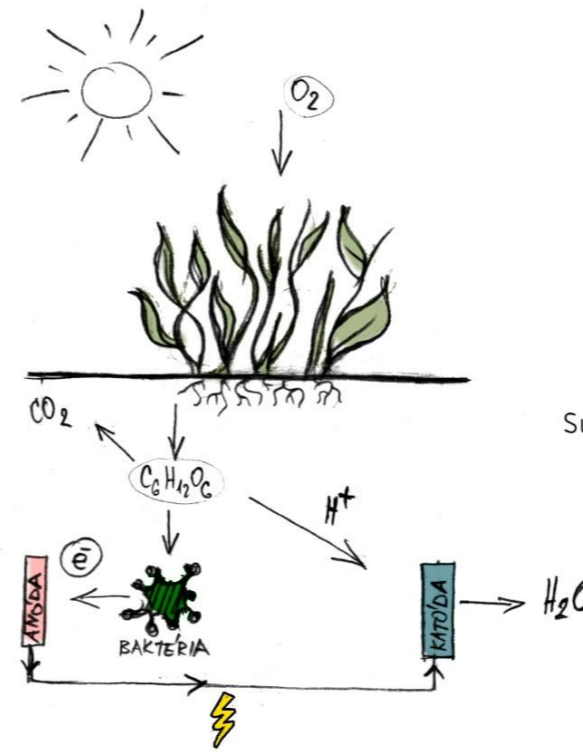
- production of electricity by rotating motion



A turbine with a vertical axis passes through the center of the building. The current of the wind gets under the blades, and they rotate the building, which generates electricity. Viessmann photovoltaic cells are placed on the turbine blades for further energy gains.

2. The Plant-Microbial Fuel Cell Technology

Generation of electricity from organic matter excreted from the roots of living plants

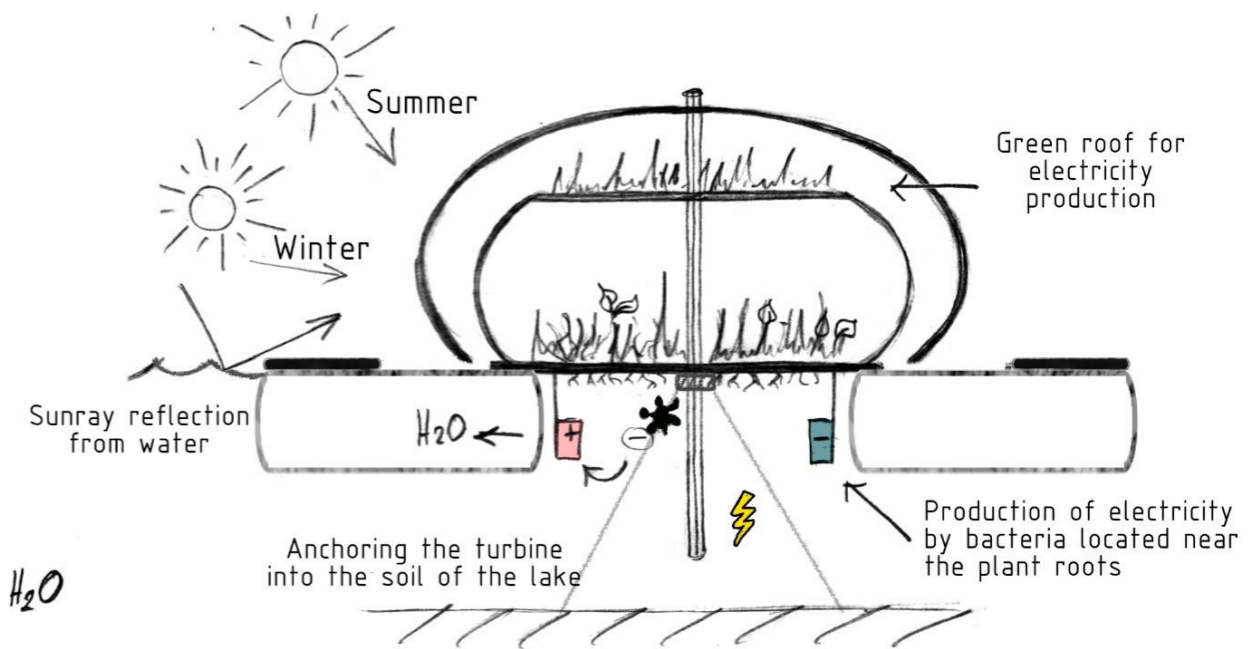


Creating electricity using plant-microbial fuel cells

During photosynthesis, plants produce organic material $C_6H_{12}O_6$ and secrete it through the roots. As naturally occurring bacteria around the roots break down this organic residue, electrons are released as a waste product. Placing electrodes close to these bacteria creates the movement of cations and anions and generates electricity. This process also releases hydrogen, which binds to oxygen, creating water. Thus, we can not only obtain ELECTRICITY, but also CLEAN THE WATER.

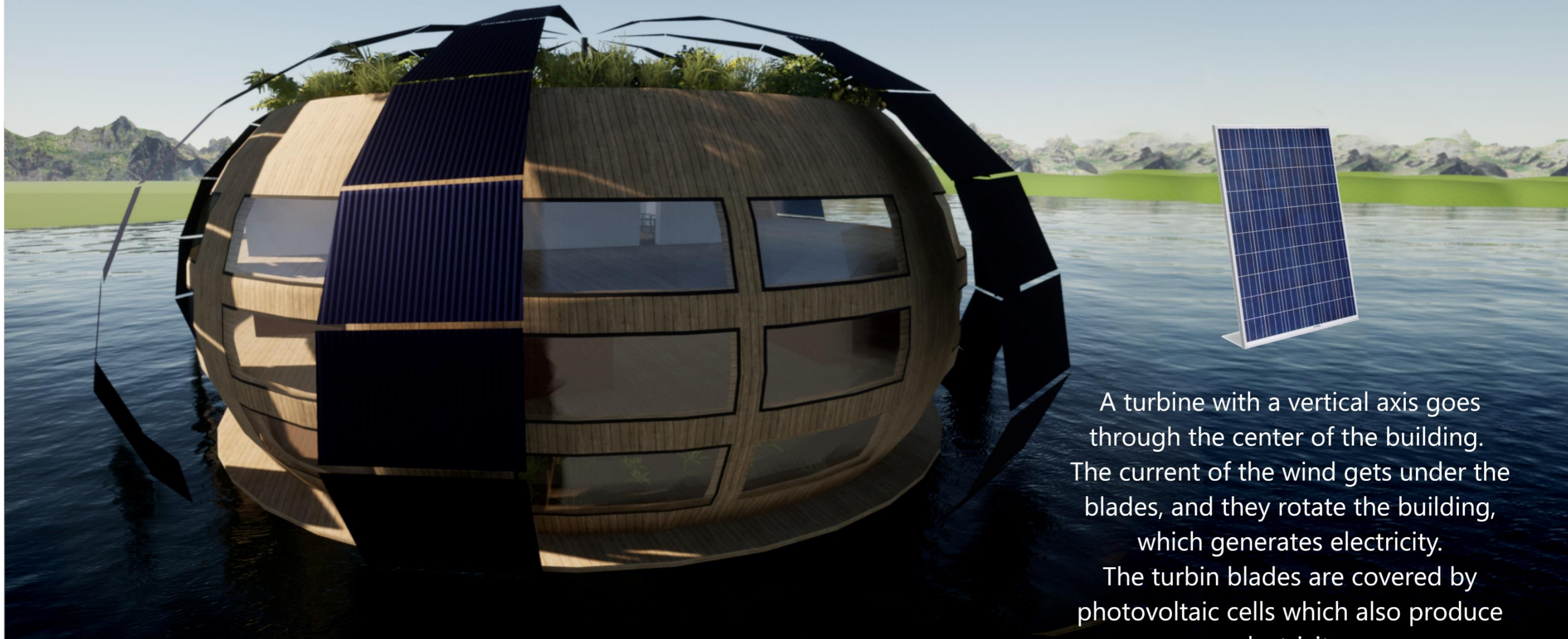
2. Photovoltaic cells on a turbine - curved - capture of reflected sunlight from the water

- production of electricity by reflected sunlight from the water



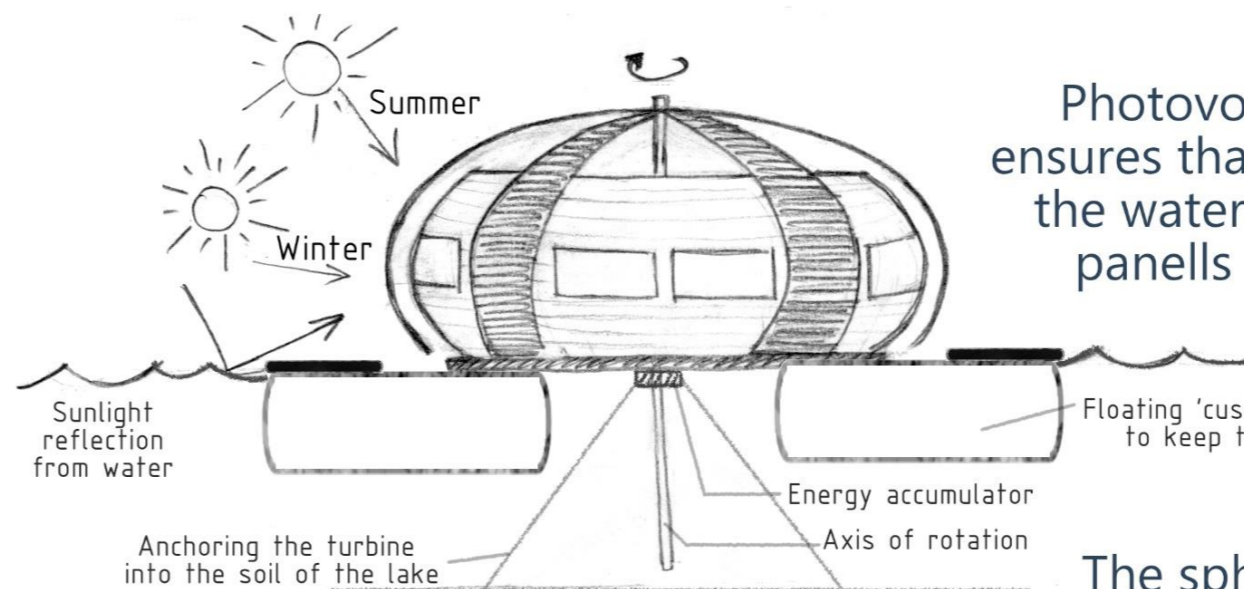
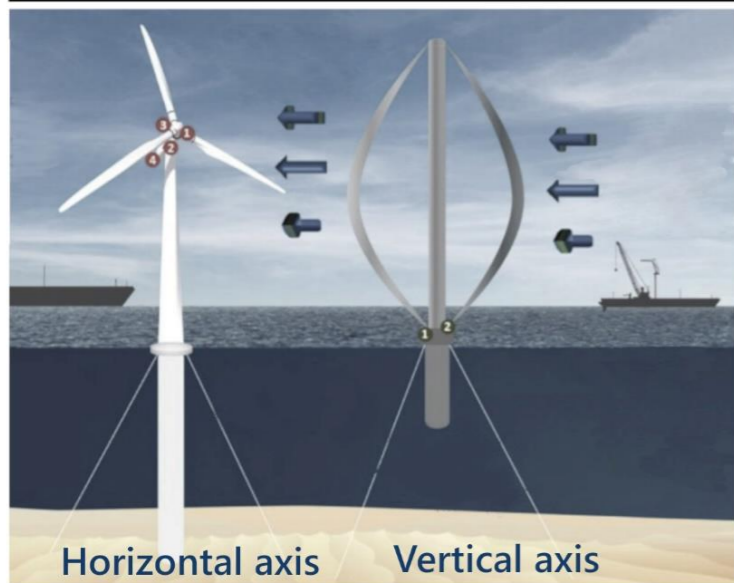
Photovoltaic cells are placed on the blades of a turbine, which is driven by wind and rotates the entire building - **CREATING ELECTRICITY**

1. Main idea



A turbine with a vertical axis goes through the center of the building. The current of the wind gets under the blades, and they rotate the building, which generates electricity. The turbine blades are covered by photovoltaic cells which also produce electricity.

Shape Inspiration

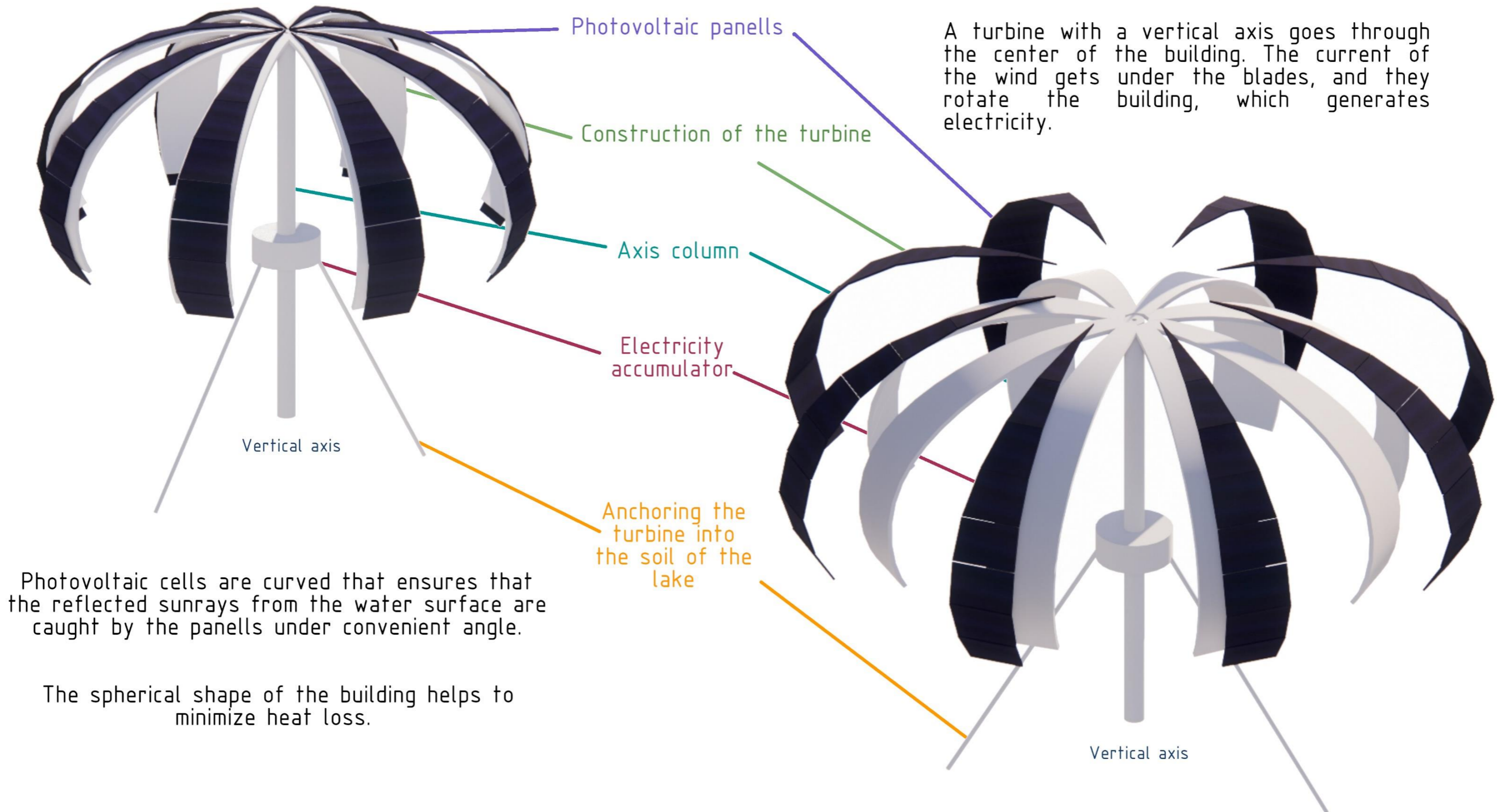


Photovoltaic cells are curved that ensures that the reflected sunrays from the water surface are caught by the panels under convenient angle.

The spherical shape of the building helps to minimize heat loss.

1. Main Idea

INSTALLATION OF PHOTOVOLTAIC CELLS ON TURBINE BLADES



Photovoltaic cells are curved that ensures that the reflected sunrays from the water surface are caught by the panells under convenient angle.

The spherical shape of the building helps to minimize heat loss.

2. Main Idea

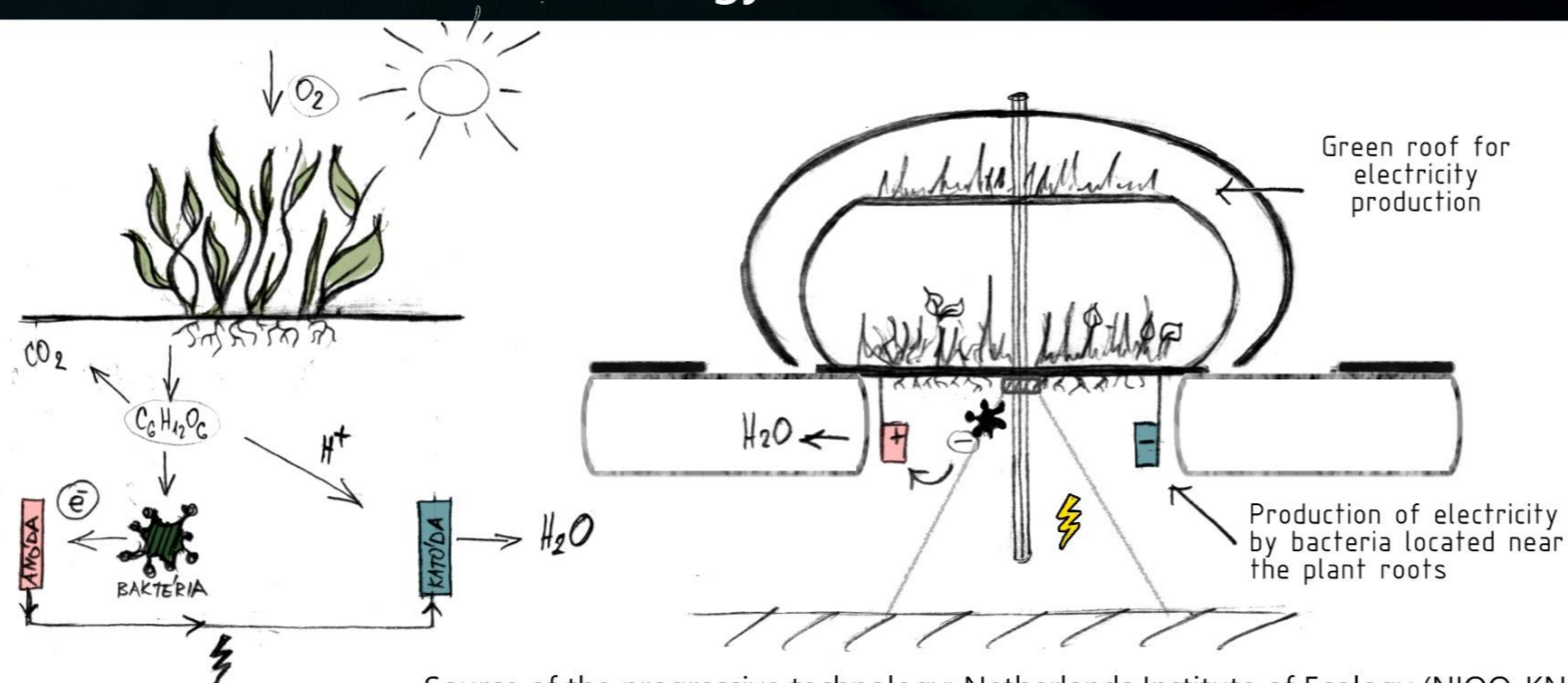


Creating electricity using plant-microbial fuel cells

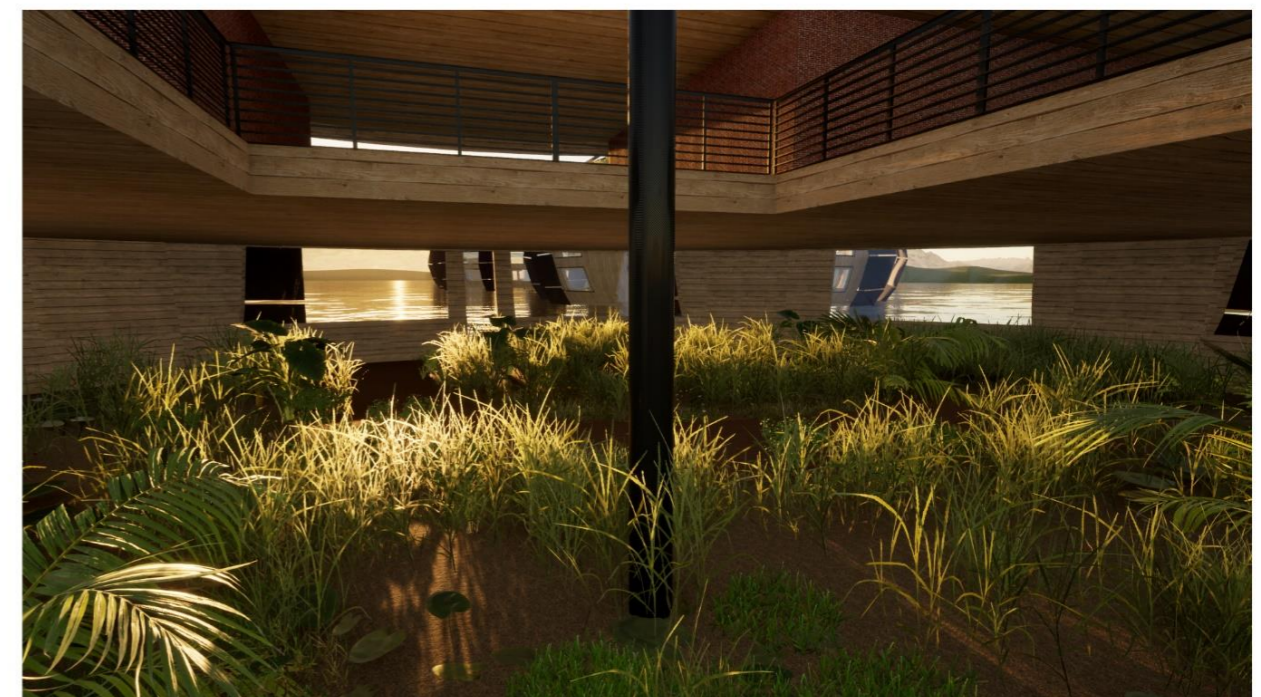
During photosynthesis, plants produce organic material $C_6H_{12}O_6$ and secrete it through the roots. As naturally occurring bacteria around the roots break down this organic residue, electrons are released as a waste product. Placing electrodes close to these bacteria causes the movement of cations and anions and generates electricity. This process also releases hydrogen, which binds to oxygen, creating water. Thus, we can not only obtain ELECTRICITY, but also CLEAN THE WATER.

Such a plant power station is located on the 1st floor in a form of a social garden and also on a green roof.

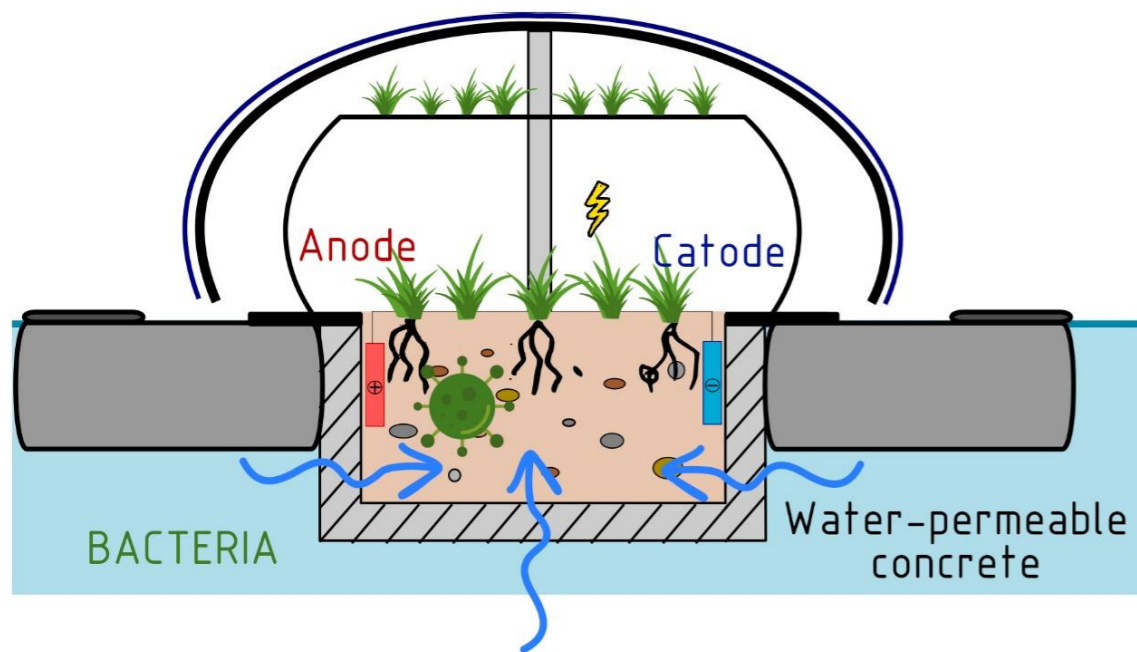
Plant microbial fuel cell technology



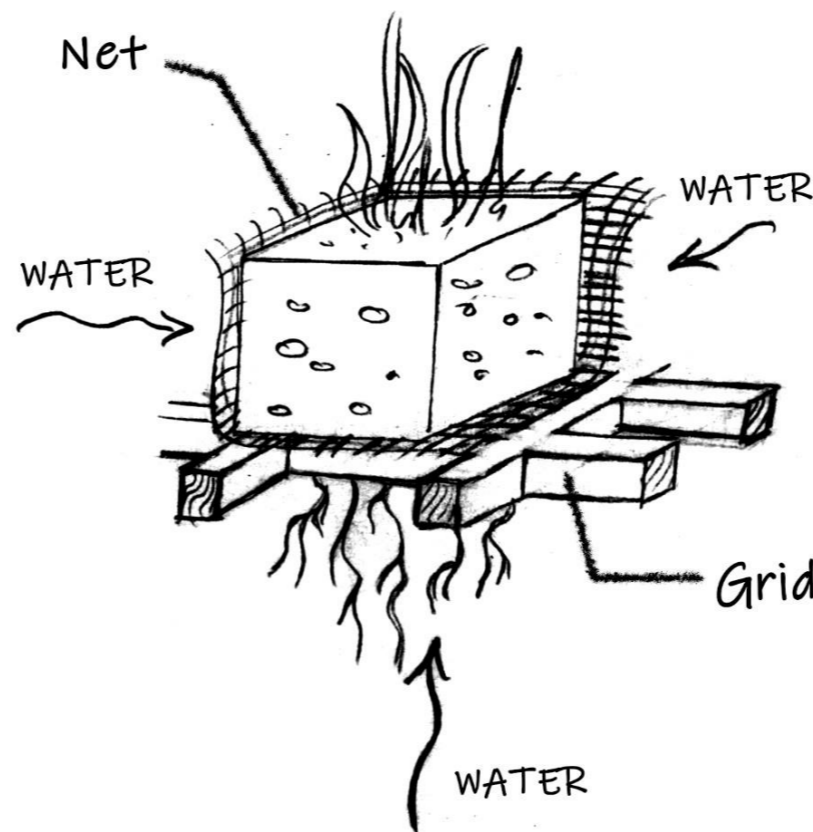
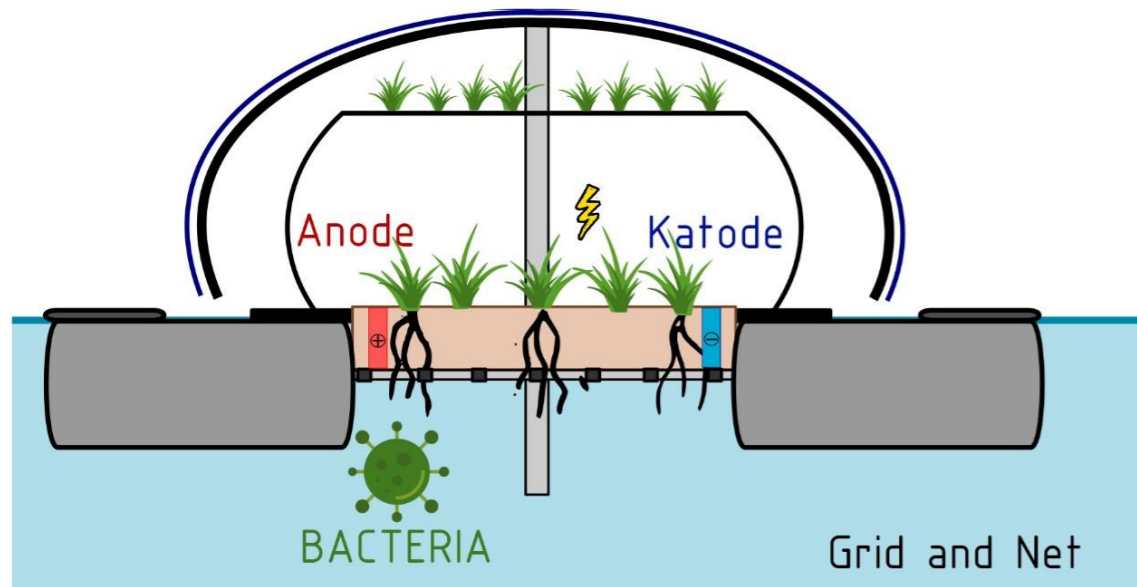
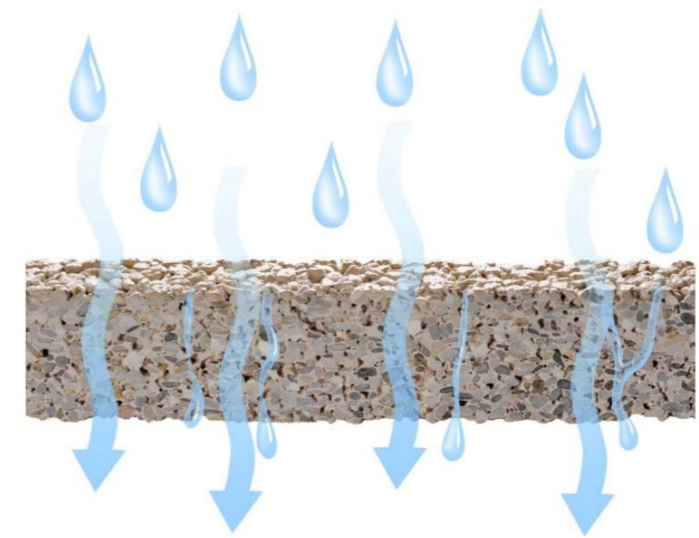
Source of the progressive technology: Netherlands Institute of Ecology (NIOO-KNAW)
<https://newatlas.com/plant-microbial-fuel-cell/25163/>



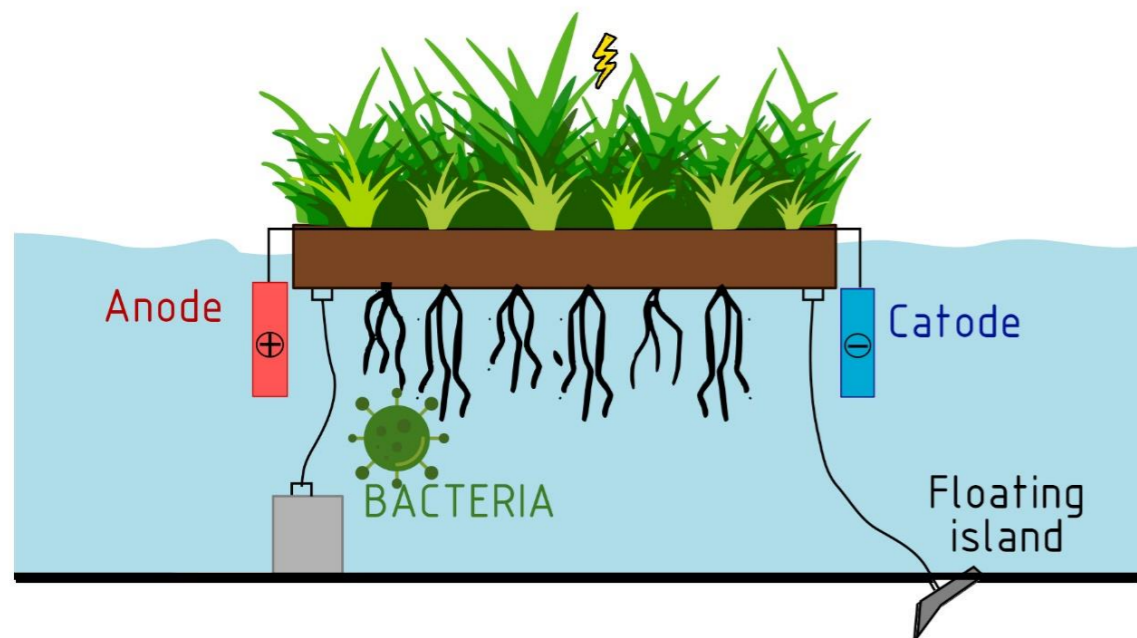
POSSIBILITIES OF APPLYING THE GREEN PLANT POWER STATION ON WATER



WATER-PERMEABLE CONCRETE
 Creating a subfloor under water out of a water-permeable material that lets water to the roots of plants



GRID + NET
 Creating a structural grid supporting the soil, which is embedded in the fabric / mesh to prevent the soil particles from washing out. The roots grow in the water. They receive nutrients and also purify the water.



FLOATING WETLAND ISLAND
 It is a man-made raft that floats on the water's surface and houses native wetland plants, which provide homes for water-cleaning microorganisms. Floating wetland islands are anchored to stay in one area of the pond but can rise and fall as the water level in the basin changes. There are microbacterias which produce biofilm, reduce nitrogen and phosphorous levels in water. The material of the islands is a dense mesh PET fibers which have been recycled from plastic waste such as soda bottles. It is an inert material but provides the substrate for biofilms, populations of microbes which directly influence water quality.
<https://tcwp.tamu.edu/floating-wetland-islands/>



Additional ideas



HEMP CONCRETE = HEMPCRETE

Excellent thermal insulation properties -
 $R = 2.4$ to 4.8 (ordinary concrete $R = 0.2$)

Balanced internal humidity - absorbs water when there is high humidity in the room, releases water into the air when it is dry.

569 kg of water can be accumulated in 1 m³.

Antibacterial, antifungal effects-

It is combined with lime that has a high pH which makes it extremely resistant to microbes and fungi. Molds do not form on it, even in an highly moist environment of 90% humidity.

Air purification -

Hemp absorbs CO₂.

Up to 110 kg in 1 m³

Lightness of the material - 6 times lighter than concrete

High strength in frame constructions

Non-combustible material

Hemp can grow very densely

Less pesticides to grow

It grows anywhere - autochthonous material



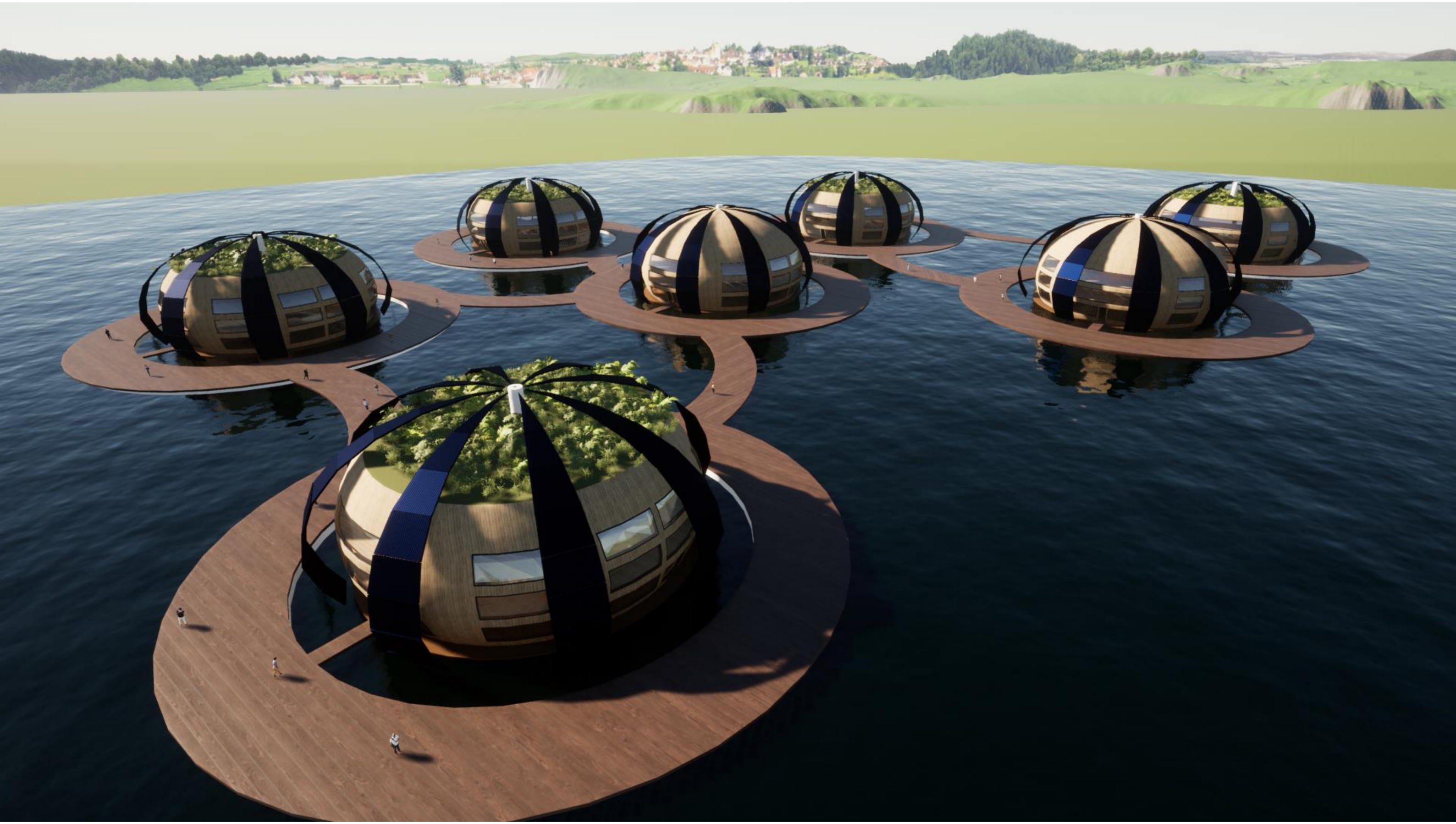
www.healthstronghold.com

GEOVITAL electromagnetic shielding paint

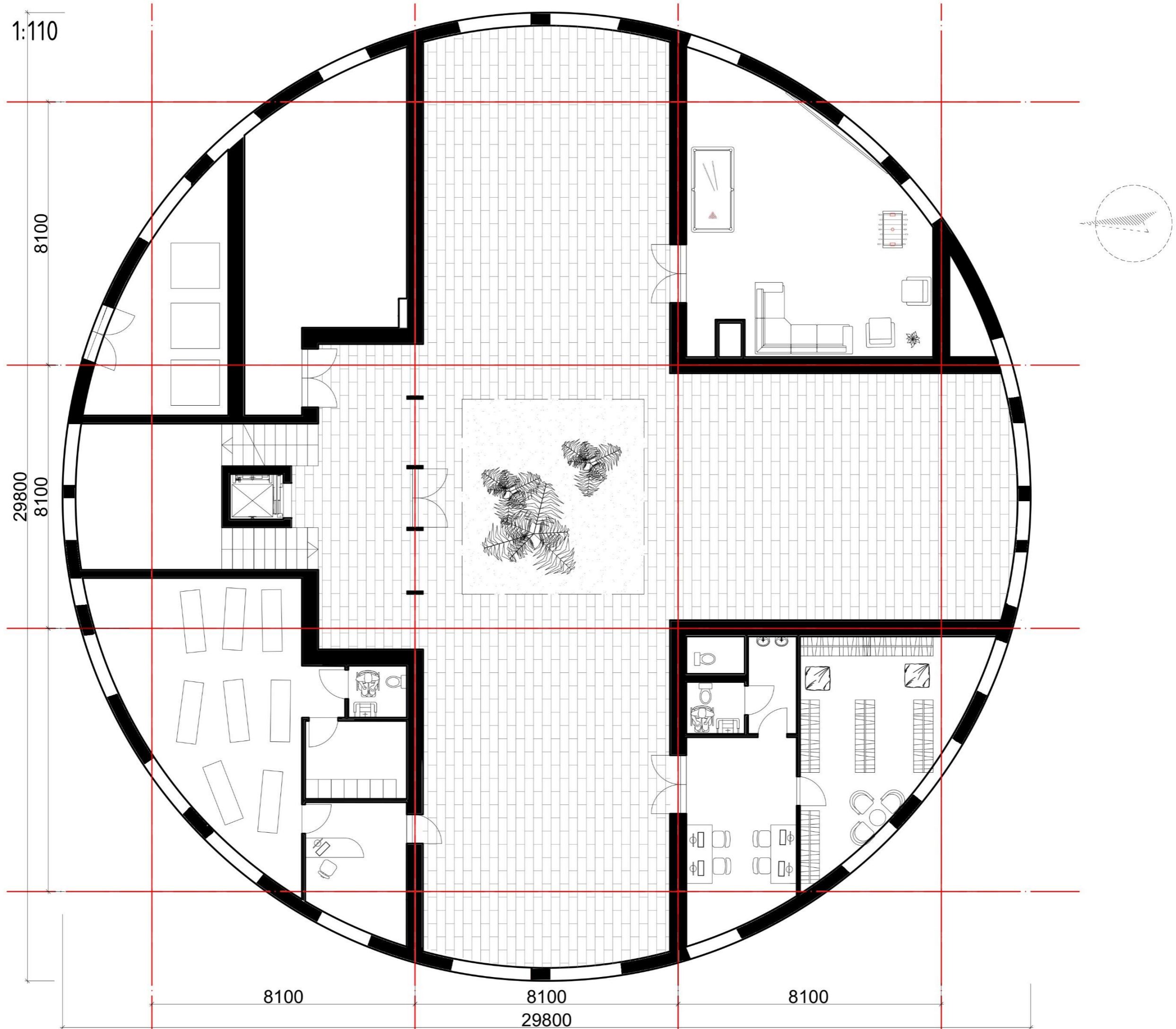


GEOVITAL electromagnetic shielding mesh in walls, ceiling, floor...

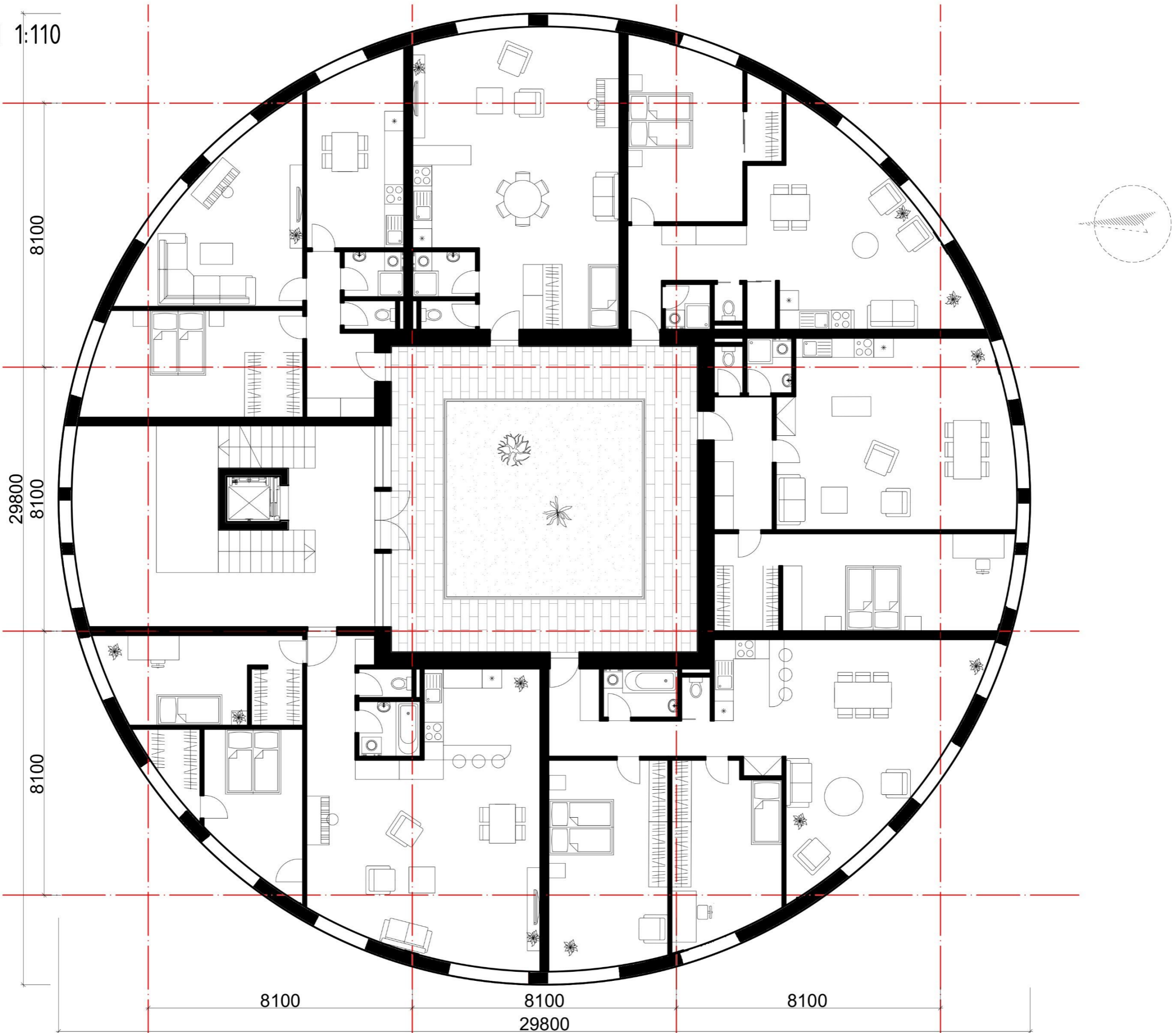




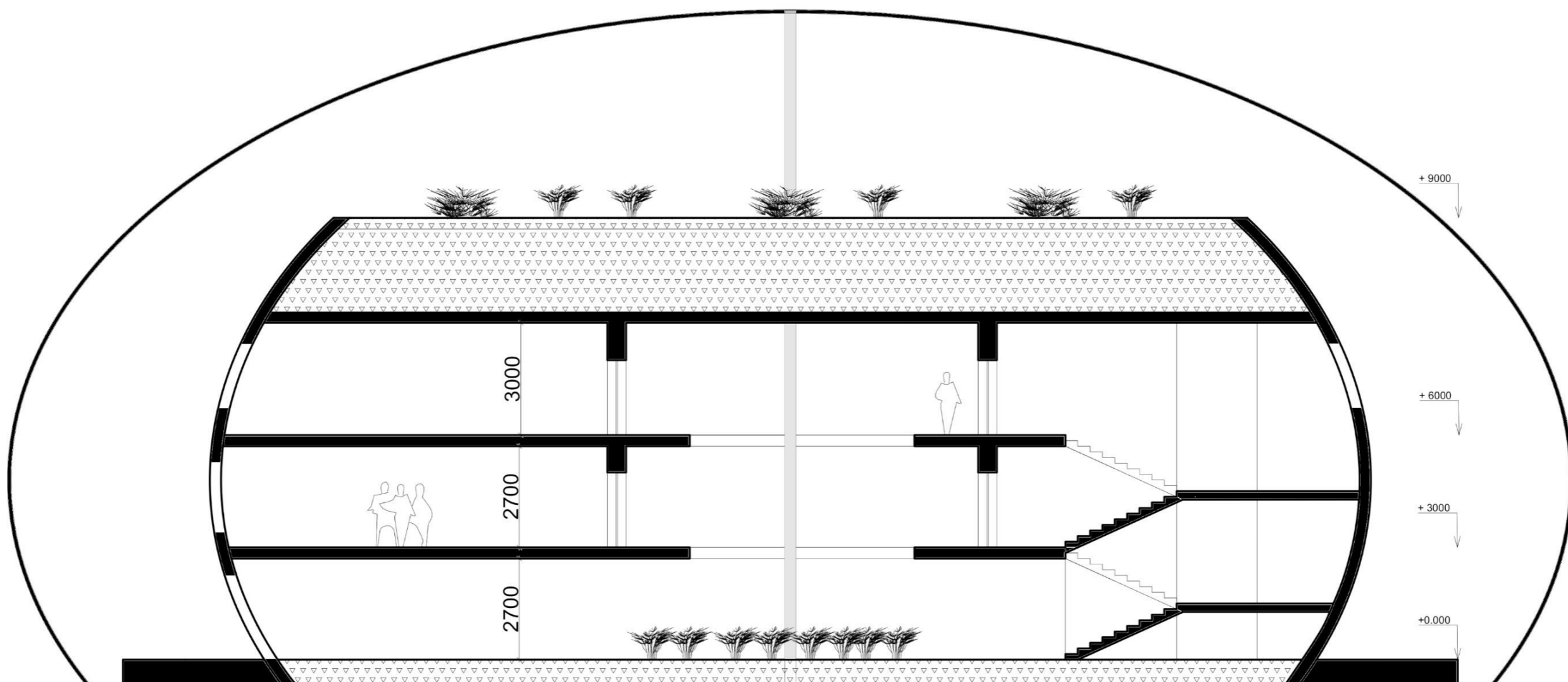
2. FLOOR M 1:110



3. FLOOR M 1:110



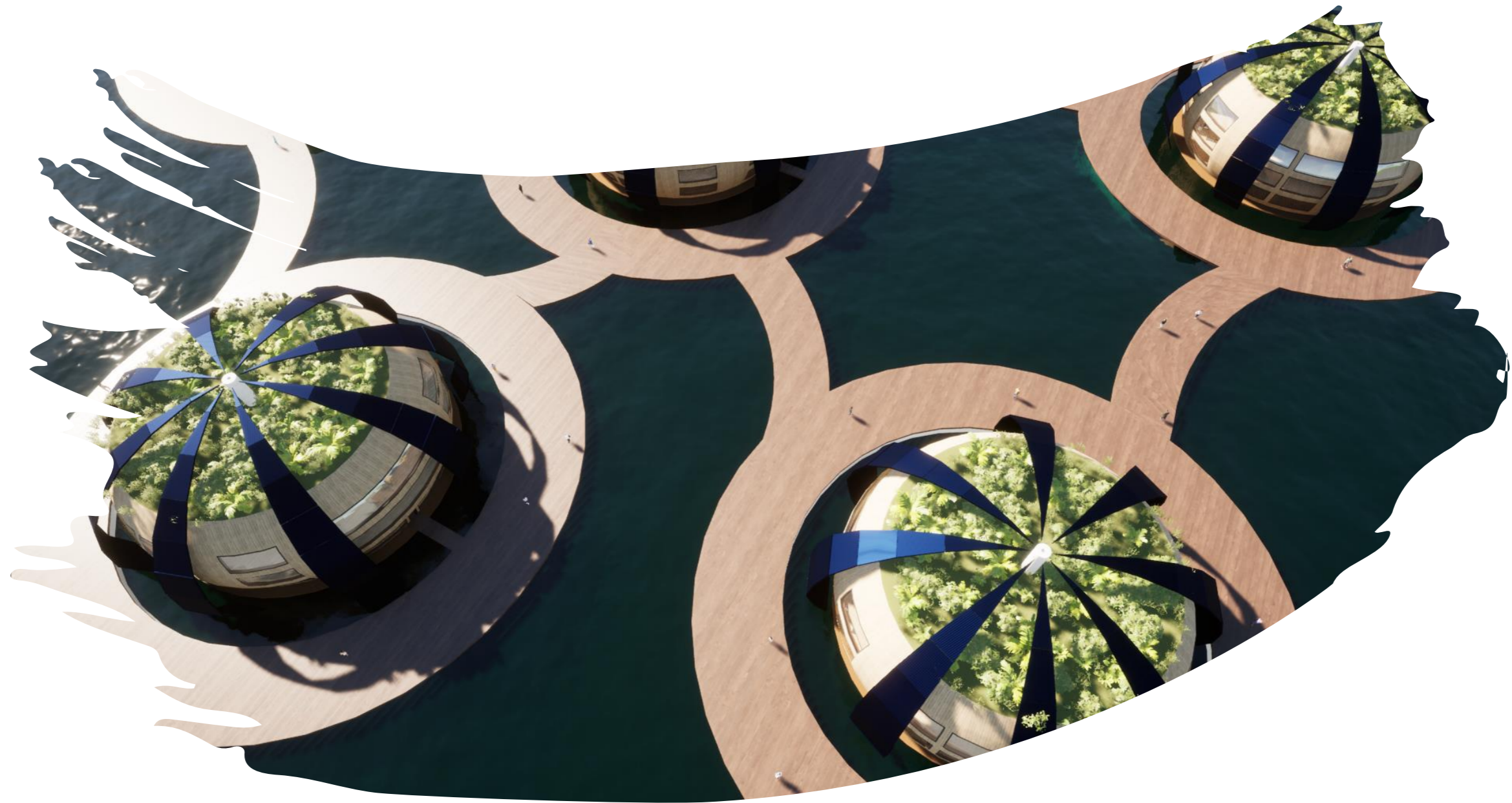
Green electricity roof - Microbial fuel cell



Microbial fuel cell - production of electricity by plants thanks to bacteria near the roots

- Hempcrete =
- ECO
 - air clearing (CO2)
 - regulation of air humidity
 - light & solid
 - remarkable insulation features

Central column with accumulator of energy - vertical axis of the building rotation



Faculty of Architecture and Design
FAD STU

Alžběta Kazičková