

Urban living organism

Copenhagen is taking part in some of the most recent innovations for ecology, which are now representing the city's identity. This project is aiming at entering this landscape of sustainable innovations that are bringing this city to its special aliveness.

Facing the air degradation in our cities, cars being one of the main sources of air pollution in urban areas, this project proposes to use the living plant *Spirulina* as a simple and clear solution to clean the air. This competition for the creation of a parking's envelope offers the opportunity of using a centralized building to input a sustainable system at an urban scale: with no need of isolation inside the building, the *Spirulina* system is installed as a light structure skin all around the concrete parking. Low cost and easily build, the envelope is composed of thin tubes in which runs the water and the algae. The opened exposition of the facades of the building is giving a maximum exposure to natural lightening, feeding the *Spirulina*.

Spirulina: this living organism produces its own food by photosynthesis. That process can reduce carbon dioxide (CO2), nitrogen oxide (NOx) and/or sulfur oxide (SOx) in the polluted air and generate oxygen (O2). These algae are cultivated in photobioreactors, which exploit natural lighting to enable the photosynthesis. The photobioreactors are composed of different parts:

1. Culture tanks, filled with a culture fluid including the algae.
2. Air supply units, forcing the polluted air into the culture fluid to dissolve CO2 with the algae.
3. O2 and CO2 filters, extracting the new oxygen in the air.
4. Pumping units, to maintain a continuous flow in the tanks.

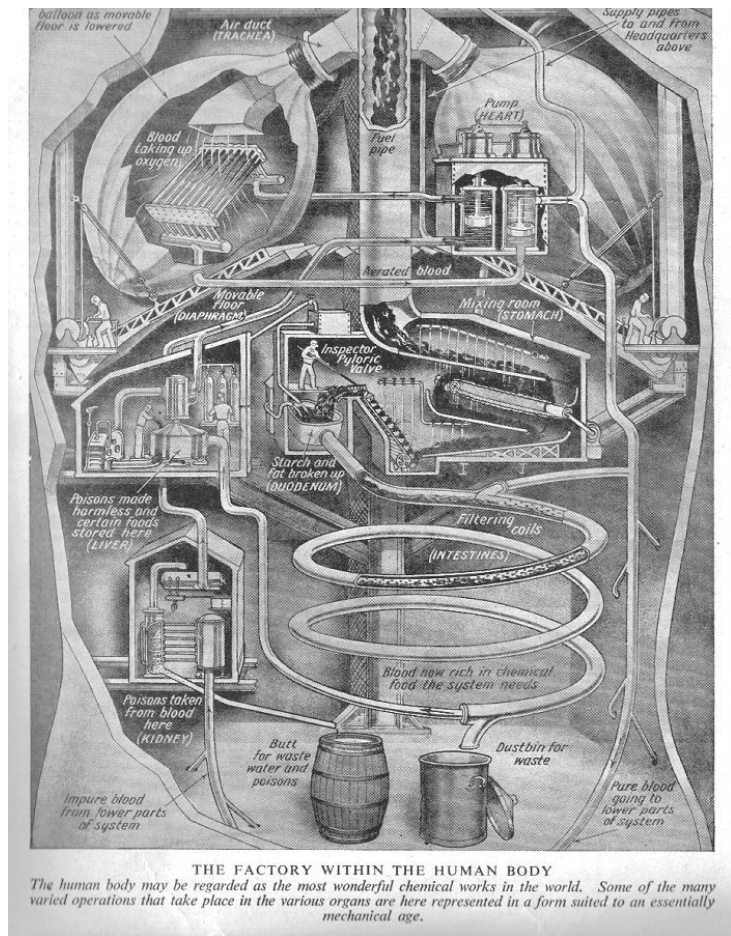
All these units are using light energy and have a very reduced footprint on the environment. They interact with the natural elements and the seasons, also in their aesthetical and atmospheric aspects: maintaining a natural ventilation inside the parking, the bright green color envelopes the building from the beginning of spring to mid-autumn, after which the building turns to a translucent white in the winter, while the algae in the pipes are getting emptied and renewed. The green colors in the bright seasons are marking the building as a notable landmark in the neighborhood and penetrates the inside of the parking levels by filtering the natural light. During the winter, the presence of the building's pipes tends on the contrary to disappear and reveal slightly the concrete structure of the parking.

Following this image of a living organism, active in the summer and hibernating in the winter, the pipes are forming altogether a thin membrane softly waving around the more rigid body of the structure. Just as the sea vibrations changes through the days and seasons, the colors of this living organism can change from light yellow to dense green and will offer to the stroller or the drivers a curious object to observe from far or from close distance.

This project design was driven by the necessity of developing stronger actions, starting from the heart of our cities, to protect the environment. The characteristics of this algae are offering far more than air purifying, as we can find the *Spirulina* used in biofuel, medicine and food, among others. This is how the spare area of the ground floor is coming as a complementary opportunity for the exploration of *Spirulina*: becoming a source at disposition for the inhabitants of the city, people can come to enjoy the peculiar atmosphere of the building in a free space, which functions can change and evolve, such as cooking experience around *Spirulina*. Copenhagen needs an ongoing innovation project to maintain its status as one of the most exemplary cities moving toward clean energy, and needs to keep giving the chances for that happening.



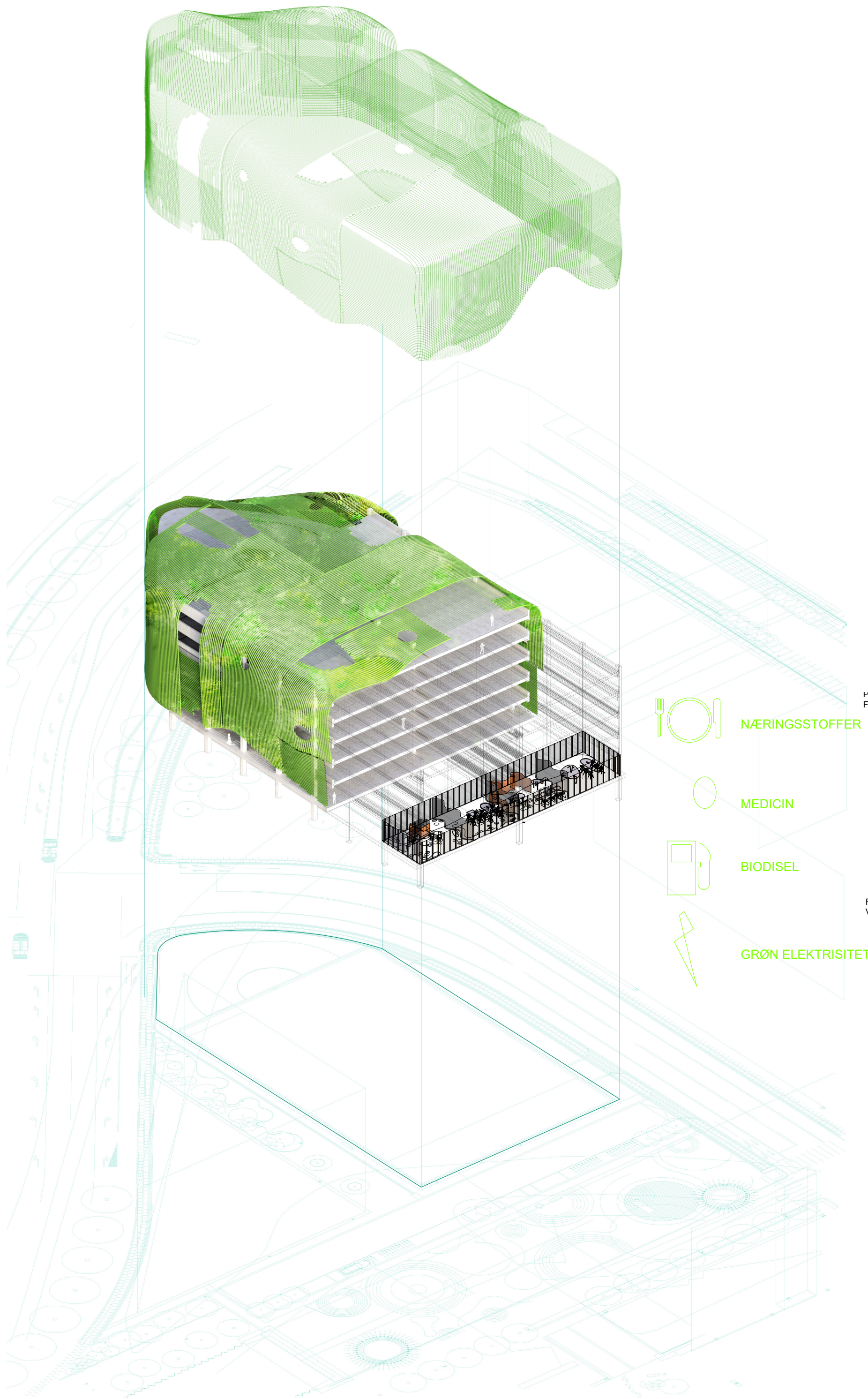
Rows of tubular photobioreactors



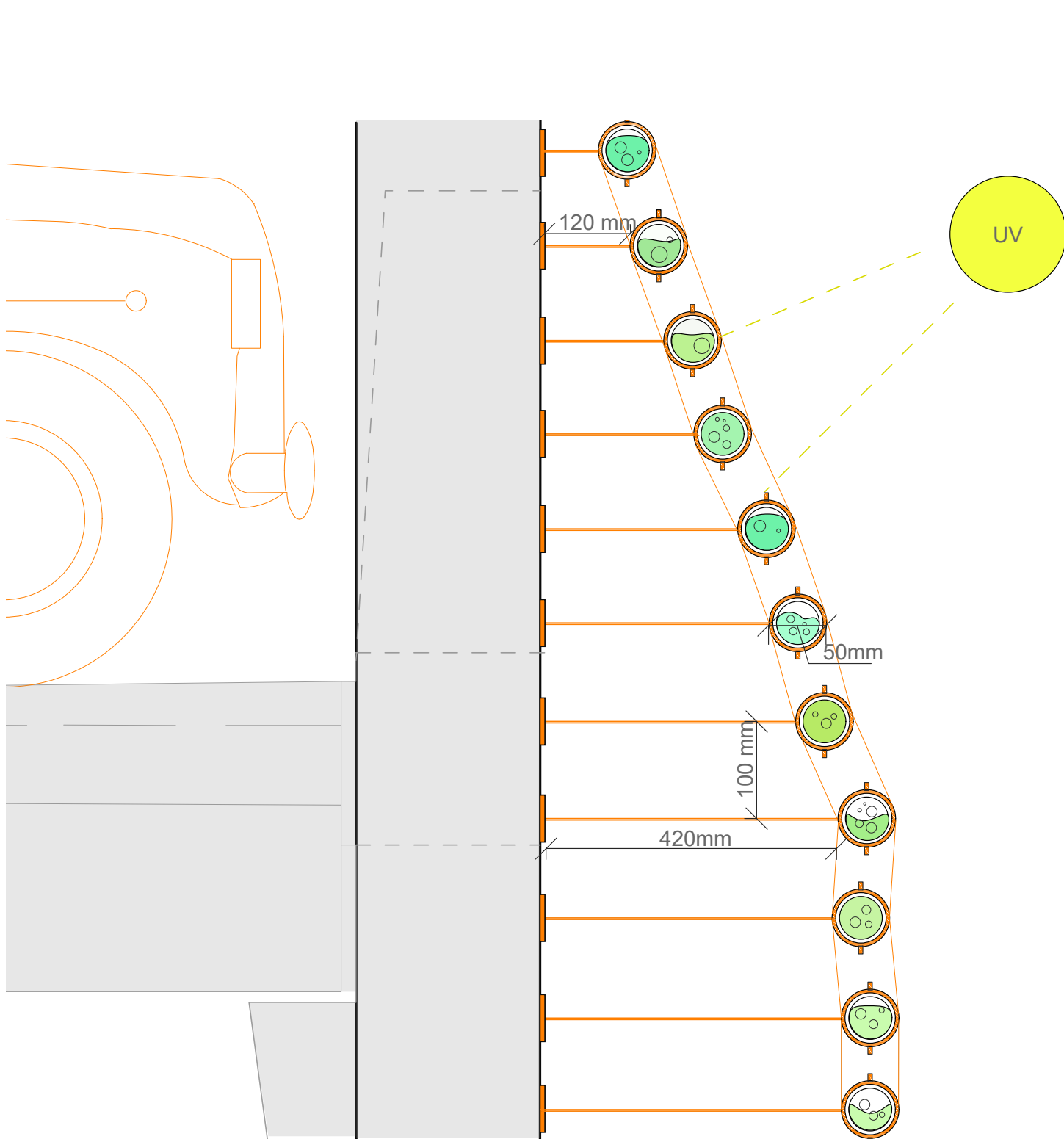
The body as a machine



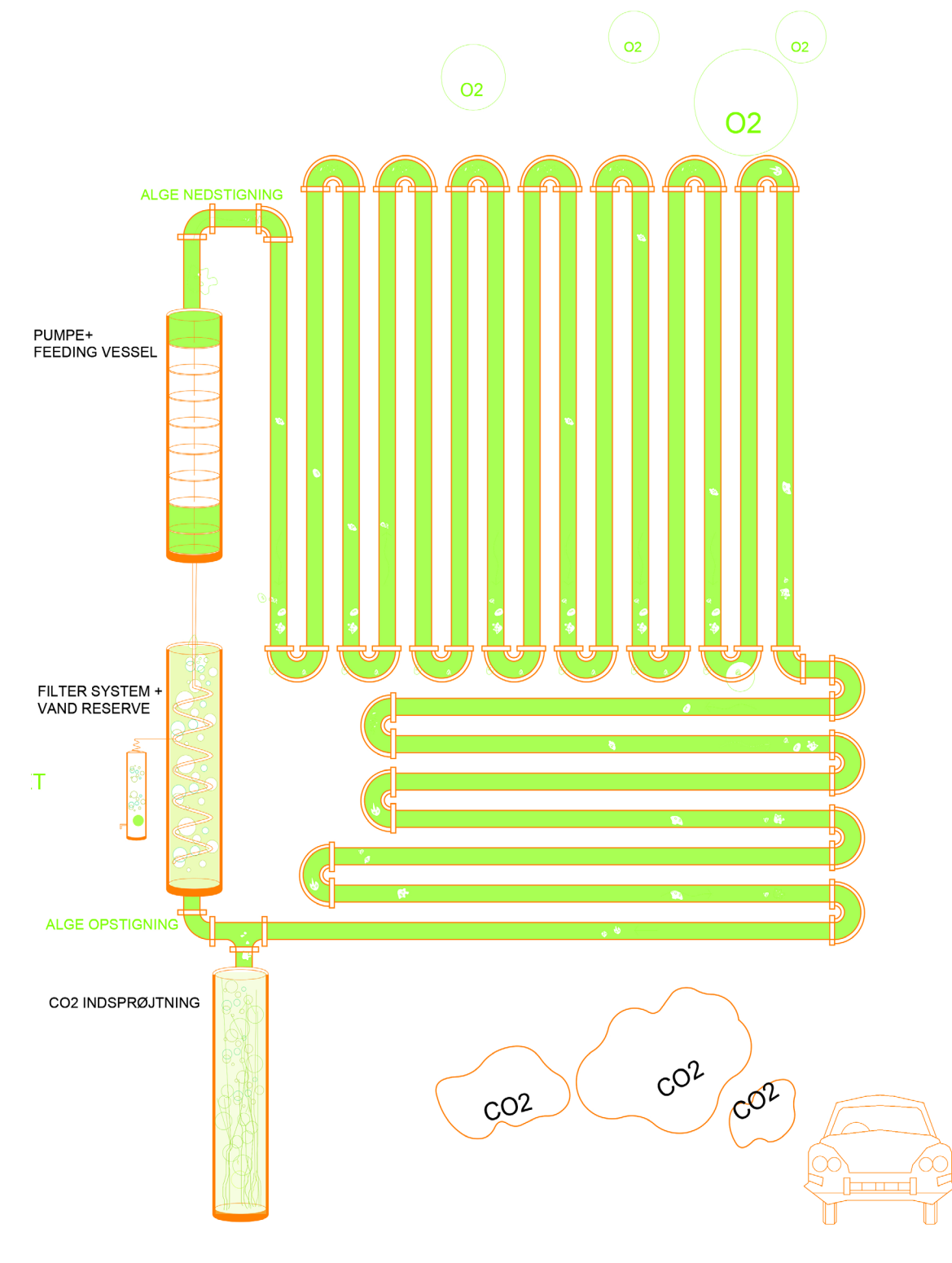
Man at the swimming pool
David Hockney



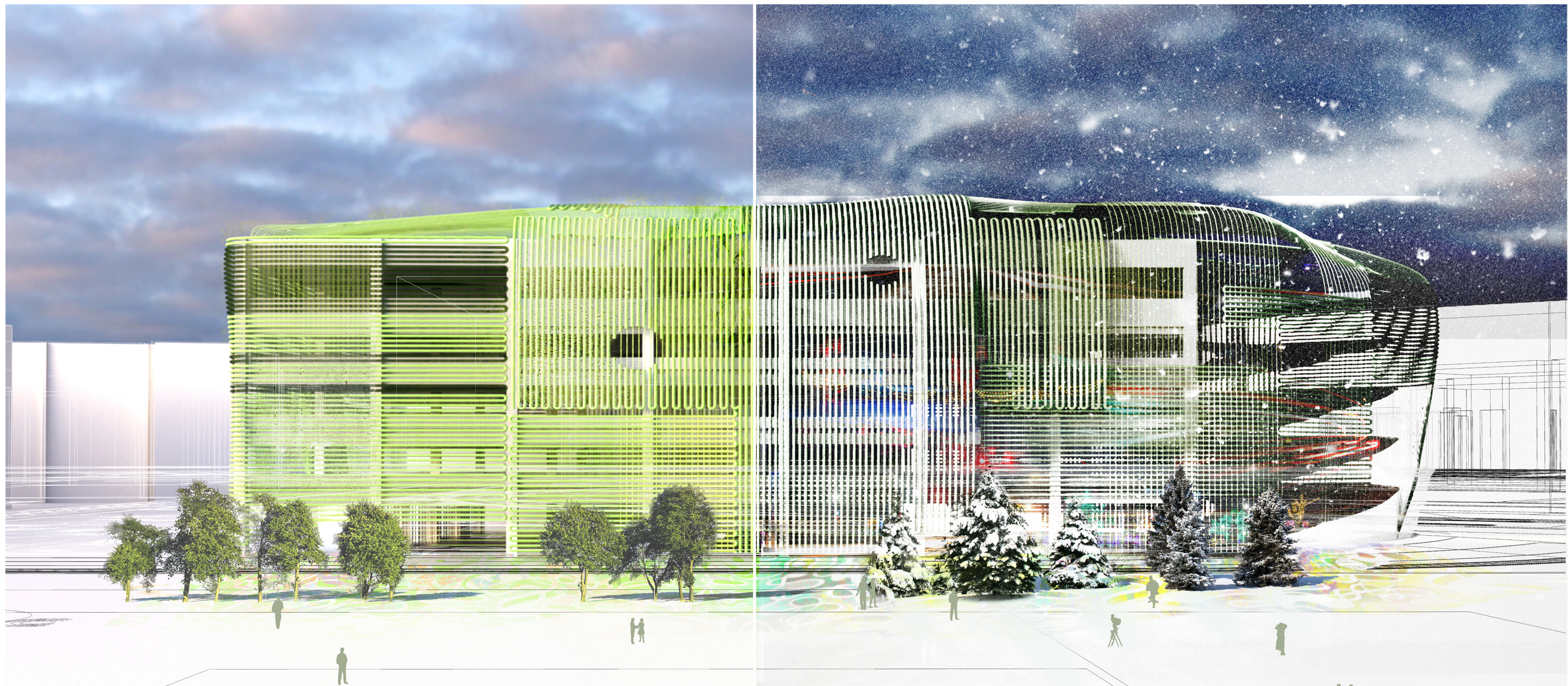
Three elements of the building :
parking, free space, and pipes.



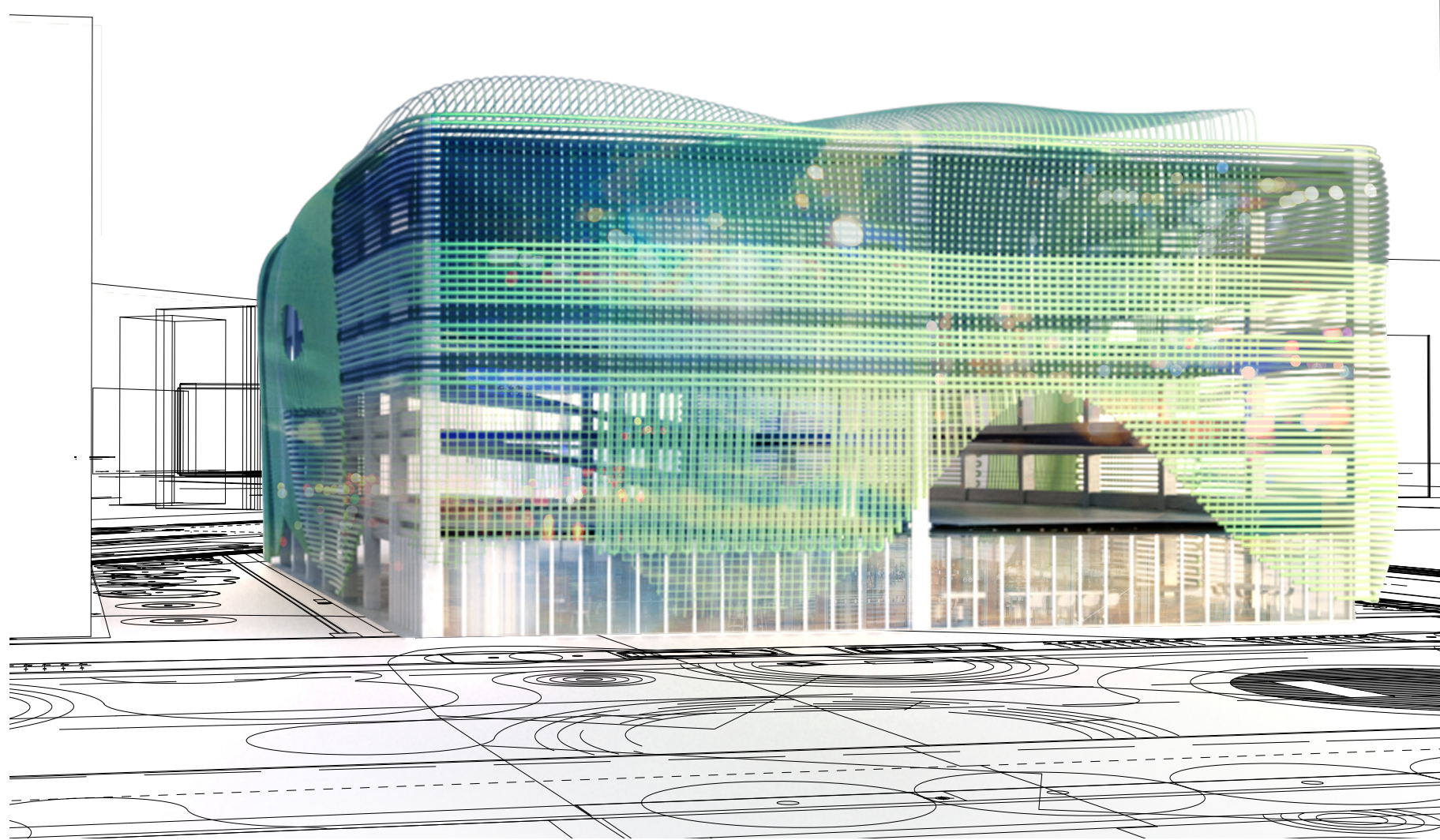
Clips holding the tubes in place



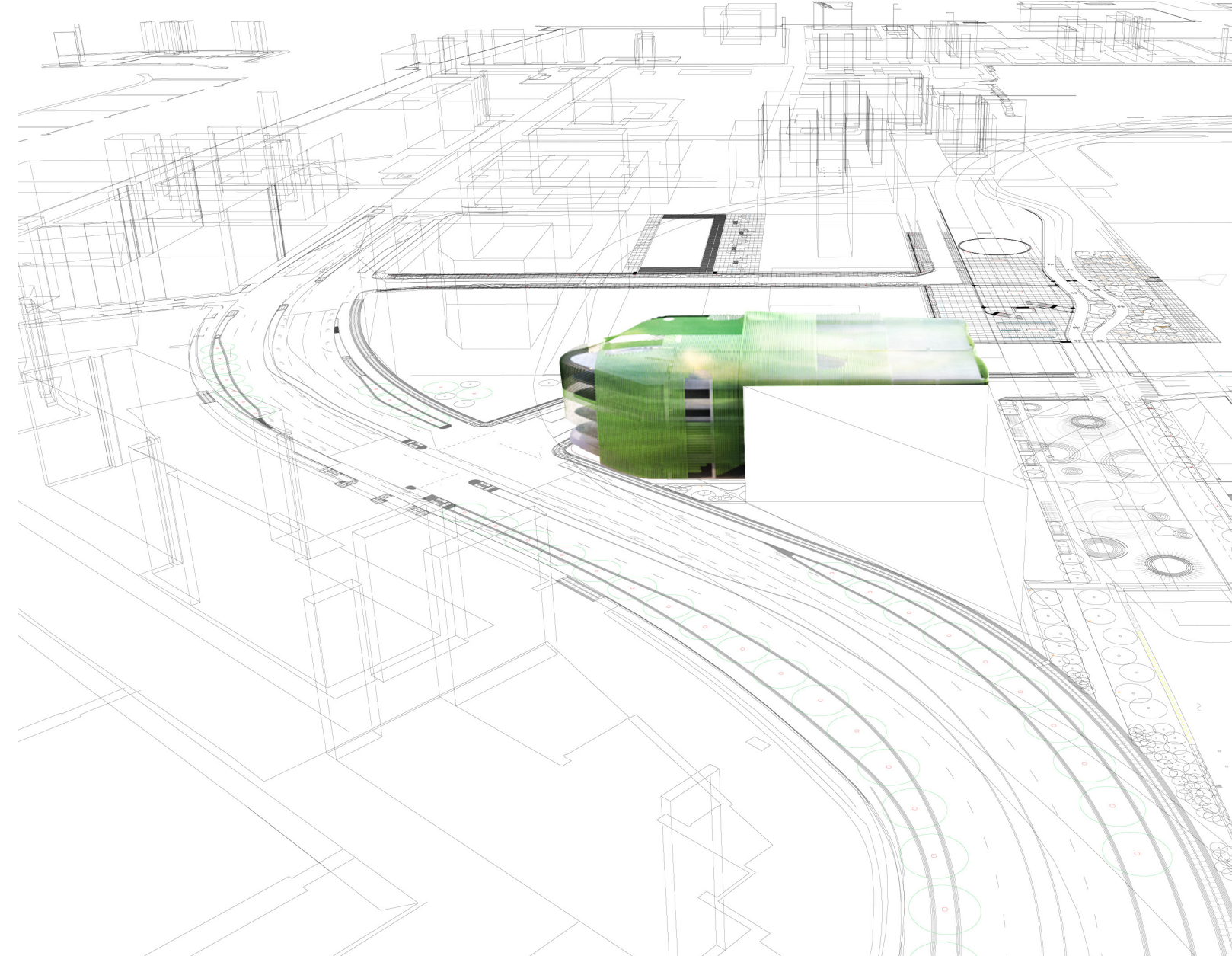
Photobioreactor diagram system



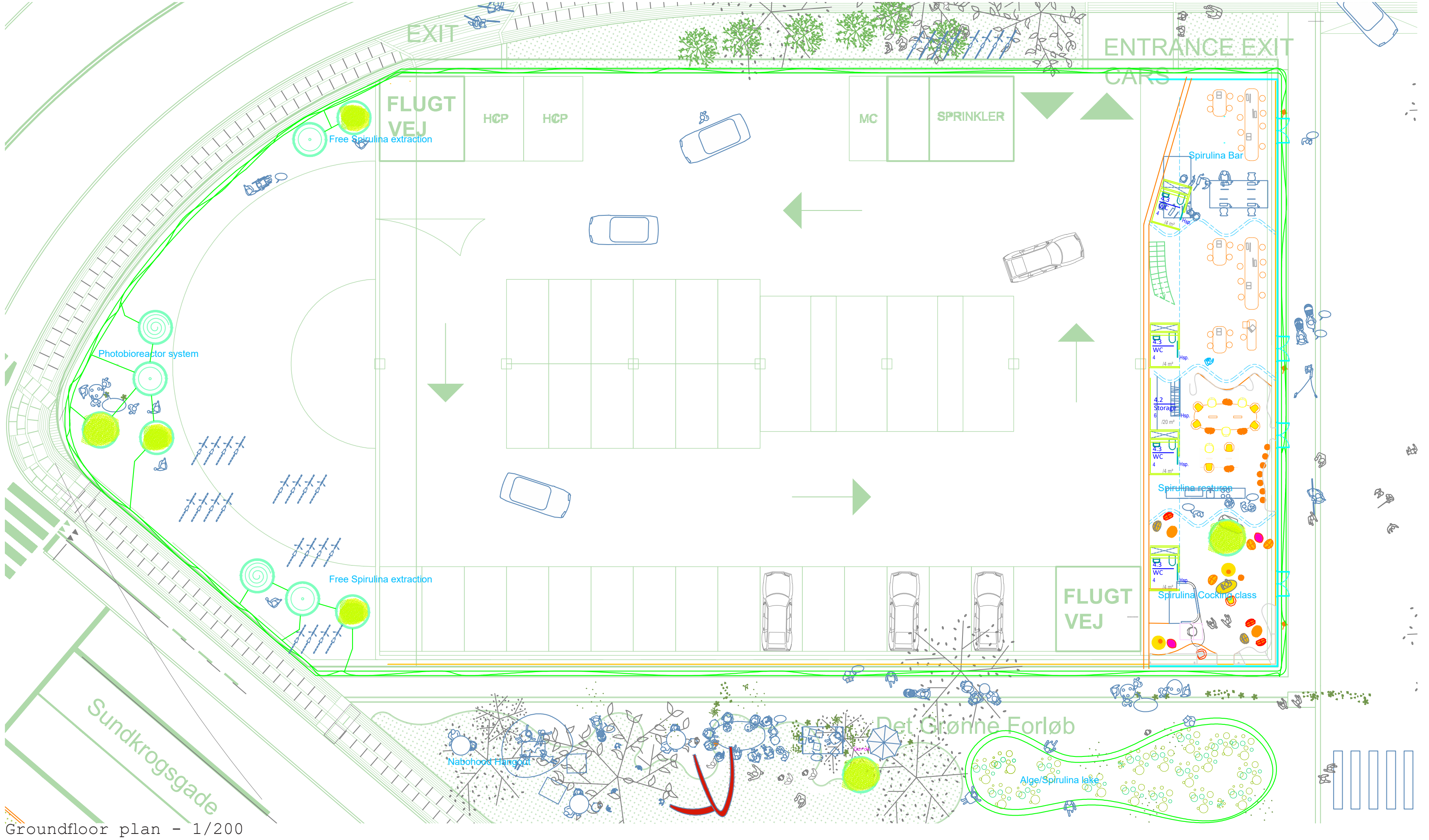
North facade - summer and winter



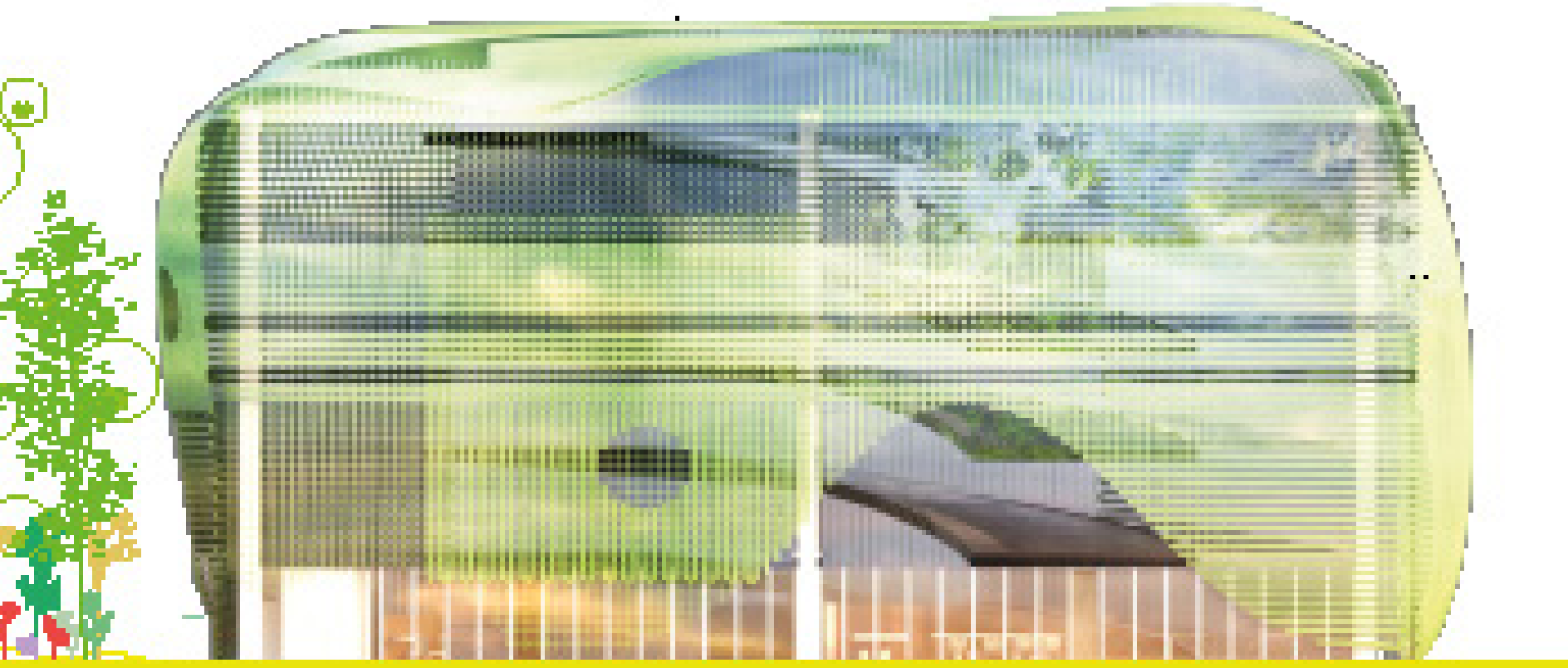
Ground perspective



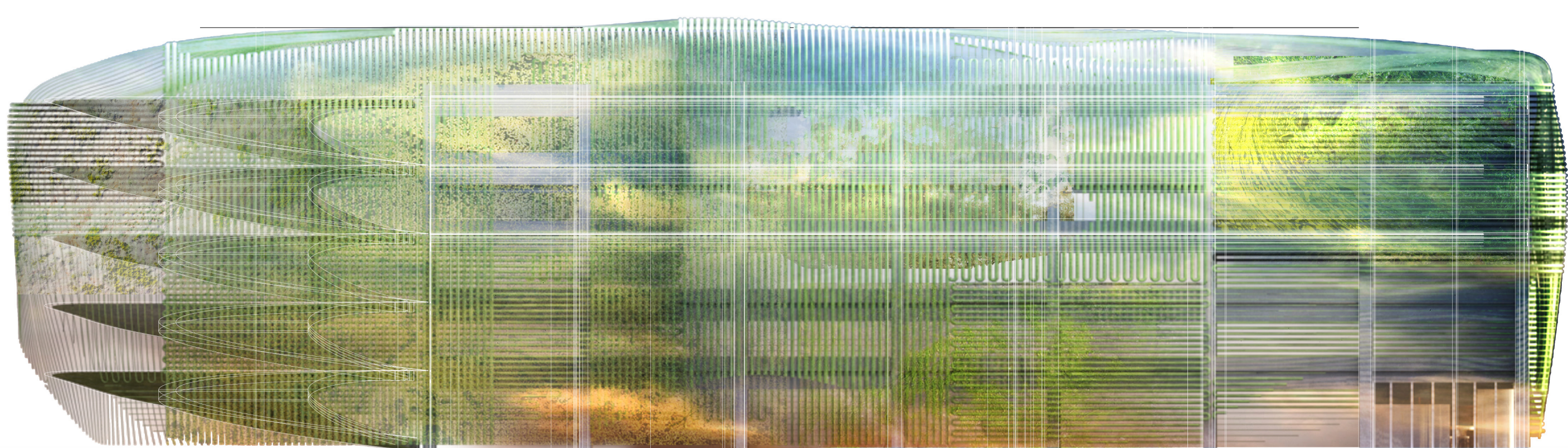
Ground perspective



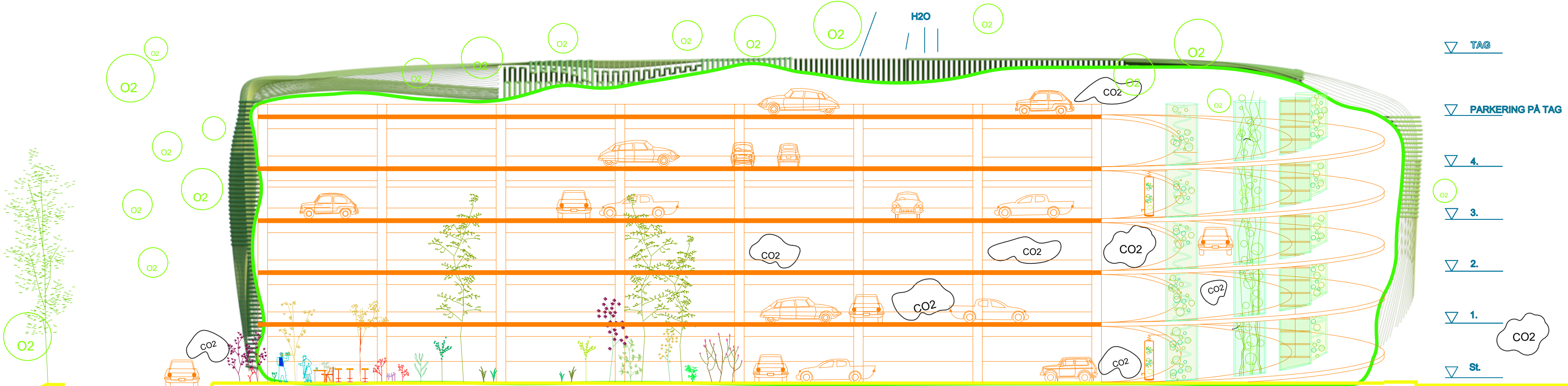
Groundfloor plan - 1/200



East facade - 1/200



South facade - 1/200



Section - 1/200