Outline of the future project:

Microalgae in Landscape Architecture

Jordi Ma Lu

My experiences, working in two different landscape practices in China and UK, have been nurturing me a particular interest in the potential of the use of live microalgae growing in building facades to generate renewable energy and provide shade at the same time. I find this concept very interesting because it takes the best of two current trends in making architecture environmental-friendly: the implementation of solar panels and the transformation of facades into green walls.

By using live microalgae growing in glass louvres or flat panels we can produce heat and biomass from light, as well as control external light, provide shade, and absorb CO_2 emissions. Therefore, this source is half given by mother nature and half made by mankind's technology.

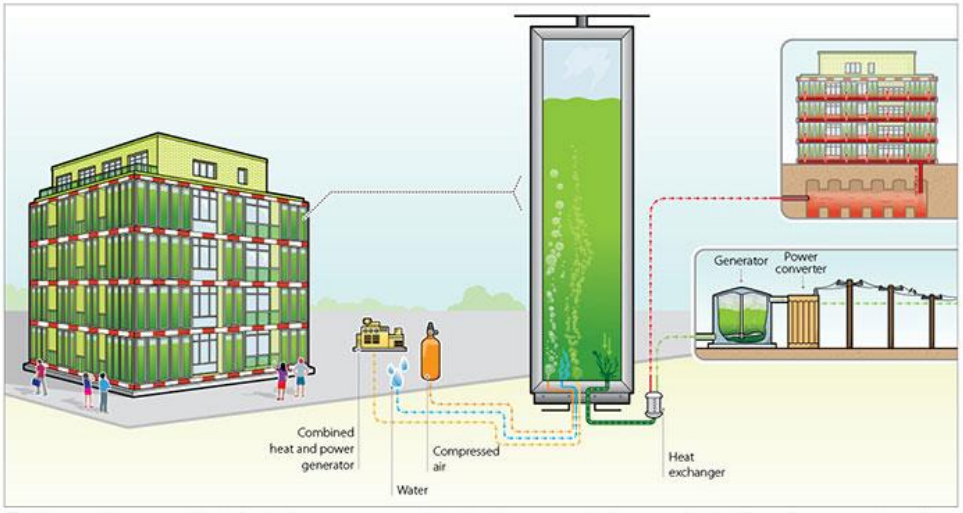


Figure 1: Microalgae architecture diagram.
Taken from www.ingenia.org.uk

The implementation of the landscape onto our buildings in sort of green roofs and tree planting is becoming a well-known practice for architects nowadays, although it was probably quite sceptical 10 years ago because of its complexity in tectonics. Trees and vegetation provide shades, transpiration, and they are visually attractive for a healthier lifestyle. These advantages have faded out the boundaries between landscape and architecture, combining them to become one field.

However, algae and microalgae are still a field to explore. Instead of relying on the soil to grow up, as trees and plants do, water is the only setting they need. This feature gives them flexibility and freedom to be easily implemented in any part of the building, vertically or horizontally, requiring much less

planting area than overground vegetation. While water is less dense than soil, the overall installation will be much lighter in weight.

Inside this installation, microalgae will absorb the light and accumulate carbohydrates that can be used as biomass to produce electricity or heat, and therefore, contributing to achieving zero-energy houses.

Another potential of using microalgae in landscape architecture is that this resource can be used for human consumption and has a current demand in the pharmaceutical and food industries. Under optimal conditions of light and temperature, microalgae have a fast speed of growth which can turn this bio-adaptive facade into an urban farm where microalgae can be harvest periodically.



Figure 2: Microalgae flat panels and louvres.
Taken from Algae Architecture by Fong Qiu

Applications of microalgae can be further extended to landscape and urban design. Examples of these can be found in sort of street lamps, like the one developed by French biochemist Pierre Calleja, which uses bioluminescent algae to soak up sunlight, absorb carbon dioxide, and in return, breathe out oxygen while emitting a soft fluorescent glow.



Figure 3: Microalgae lamp and Pierre Calleja.
Taken from www.smithsonianmag.com

Other examples can be the use of these glass louvres filled by microalgae to build landscape installations on the street, where pedestrians can interact. Structures providing shade and shelter, such as pergolas, combined with the electric colour of the microalgae can be easily arranged to create interesting designs and give identity to public spaces in the city.

A consideration of microalgae implementation in landscape architecture that still needs to be studied is the cost of installation involved, which is higher than solar panels. However, it is surely a matter of time and deeper study to further understand and deliver an optimized overall system ready for serial production.

Heat and electricity generation, biomass, microalgae production for consumption, light control, carbon dioxide absorption, green energy, unique aesthetic, and so on, these are benefits that make this system a big potential for a pending field to explore in landscape architecture.

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