**BLOOM**

*“(...) Opening and closing of blossoms and the folding and unfolding of leaves is called nastic movements. Some flowers respond to day length. They open and close at different times of day depending on the hours of available sunlight. Other, in response to weather. This includes humidity, temperature, sunniness/cloudiness. Some open and close at the same time each day.”* https://journeynorth.org

Bloom is a power generating, adaptable,art installation that is inspired by those rules of nature. Same like flowers, it adapts and transforms itself following daylight and cycles of the earth. It works like a flower bud that closes and opens to the public and there are a number of reasons behind this transformation.

Opening adjusts solar panels tilt, according to the sun position to generate the optimum amount of clean energy. Same as flowers or plant leaves that are reaching for the optimum amount of sunlight.

On the other hand, it works as an element of surprise, revealing hidden, inner public space that users can discover and interact with. This flexible shaded outdoor “room” could be filled with various social functions from lunge area to market stand. Additionally, it will be filled with selected plants that will purify the air and create the atmosphere of a hidden winter garden.

Finally, when closing during the night or colder seasons, it protects physically and thermally its inner functions: public space/winter garden and compact greenhouse located in the upper module. Greenhouses, beside its productive role, will be visible from the outside, building knowledge and common understanding about the importance of sustainable and space efficient agriculture.

This transformational nature-like “behavior” changes our relation to public space and invites us to interact with it. In a subconscious way, it builds knowledge and awareness about more sustainable life.

**Modularity & scalability**

When thinking how to incorporate interactive, clean energy solutions in multiple scales: our cities, parks or our own small gardens we have to consider modular solutions. Solutions that from a small scale could grow into whole interlinked systems.

The Bloom project could work in a public and private space as a single piece of sustainable infrastructure or create a more complex, various “pattern clusters” that could grow fractally. Those fractal patterns have a number of advantages. They create a larger, shaded outdoor public space with a grid of open public “pockets” that influence each other.

Additionally, proximity of each module could connect them into one alternative energy infrastructure more easily. Depending on the desired layout and possible space, Bloom modules could be arranged in a variety of ways including, joining modules together to create larger spaces.

**Outputs**

Solar panels located on 4 walls of each Bloom module could provide around 2300 kWh of clean energy per year. Desired tilt angle for each season/month is calculated based on the location. In this case Mannheim Spinelli Park longitude and latitude.

Orientation could be defined in two positions:

A aligned with the sun position to have one panel perpendicular to the south, two east-west and on north oriented

B rotated 45 degrees so each panel will have a mix of two expositions: south-east, south-west, east-north, west- north. Final orientation will be based on specific location and further more precise calculations.

MWh per year:

* 1 module: 2,3 MWh
* 4 module pattern or separate modules: 9,2 MWh
* 9 module pattern or separate modules: 20,7 MWh
* 16 module pattern or separate modules: 36,8 MWh

One Bloom module could support 70% energy needs of a standard German 2 person household (3500 kWh) and 50% of energy needs for 3 and more person households (4500kWh). <https://www.destatis.de/>

Greenhouses will produce vegetables suitable for compact greenhouse systems like tomatoes, lettuce, spinach, onion, cabbage, peppers, lettuce, chard, cabbage, rocket, kale, collard greens.

**Social role & contexts**

Public space: park/square

Blooms in a larger public space could work stand-alone or multiplicated, creating a landscape of interactive patterns, where public hidden inside relate one to another.

Top greenhouse:

* educational role
* communal vegetable garden for local inhabitants
* source of agricultural workshops and events

Ground level public:

* shaded lounge area
* meeting space
* public winter garden
* kids play zone
* bicycle workshop
* sport equipment rental
* market stand
* mini cafe

Private space context: townhouse backyard/ schrebergarten

Bloom in house backyard could generate clean energy that will meet most of the energy demand for a 2 person household, plus serve as a garden pavilion that could be personalized into in terms of color and function.

Blooms in schrebergarten could be a private infrastructure or co-shared one, owned by multiple owners. Same as in the previous context it can be personalized in terms of function and color. Beside its function it could power up garden plots, store energy or sell it back to suppliers.

Possible functions for both private space contexts:

Top module could be still used as a greenhouse or adapted into other functions like:

* tree house
* garden office
* yoga room

Ground level module:

* kids summer house
* garden office
* barbecue space
* winter garden
* greenhouse
* garden shed
* workshop

**Sustainable strategies & technologies**

* rainwater collection system that could collect up to 400l used later for the greenhouse automatic drip irrigation system or us a support of public space below
* solar energy panels of one Bloom module will produce around 2300 kWh per year. Mainly will store clean energy in the batteries or return it back directly to the grid. Additionally they will power electric engines for foldable walls and inner night light system
* plants used in public space/ winter garden will be selected based on their air purification abilities
* compact, vertical greenhouse in top module will be able to produce vegetables in a efficient and sustainable way, supported by energy from solar panels and rainwater collection system

**UN sustainability goals**

Project supports UN sustainability goals in a variety of ways. It focuses mainly on alternative energy production and public space but also goes beyond those two topics and relates also to:

* sustainable agriculture
* efficient and low footprint food production
* self-sufficient infrastructure
* education and building awareness about sustainability
* accessibility and promotion of healthy living
* innovation
* water saving solutions
* sustainable consumption and more
* enhancing participation by taking care of shared infrastructure
* strengthening local communities by hosting shared events

**Inputs**

The Bloom project will be self-sufficient most of the annual life cycle. Main maintenance of the project will be related to:

* greenhouse maintenance and service checks either by local, social participatory system, by the sponsorship company or by the city
* water tank filling when rain collection won't be enough efficient
* periodical technical maintenance of the opening and closing mechanism, irrigation system and solar system
* general maintenance & supervision of the public spaces depending of their function

**Environmental impact**

Bloom project have low environmental impact in each phase from production to decommission, thanks to the following design decisions:

Production

* wood as a main structural element to reduce greenhouse gas emissions
* modular, prefabricated structure of each module is faster, more efficient and generate less emissions & waste during the production phase
* low impact fundations system that reduce or eliminate earthwork

Lifecycle

* during life cycle of the project it will not produce any greenhouse gasses
* only waste generated by the project will be compost generated by the greenhouse
* project will be energy self sufficient thanks to integrated solar system
* automatic irrigation system will reduce maintenance and reduce related emissions
* reduced water usage by rainwater collection and efficient irrigation system
* plants used in inner public spaces will be selected for their air purification abilities

Decommission

* structure will be designed to be easily dismantled into separate individual elements to be transported, reused or recycled
* polycarbonate used as a cover of the structure is easily recyclable, possibility to switch to bio-polycarbonate if it will be accessible
* low impact fundations system that reduce impact on local landscape after decommission