**Superseed**

*In 1942, American writer Jack Williamson publishes short story “Collision Orbit” in a magazine called “Astounding Science Fiction”. He describes the life of a community living on a moving asteroid that suddenly goes off its routine orbit. This short story had been forgotten for many years, but a term coined by Jack Williamson to describe how life on the asteroid was possible suddenly became relevant and interesting when man started to explore space: Terraforming. It wasnt a fully original idea, since the concept has been used before in other science fiction books like H.G. Wells’ “The war of the worlds” (1898) or Olaf Stapledon’s “Last and first men” (1930). But never had the concept of ‘Earth Shaping’ been given a name quite like terraforming.*

*Terraforming evolved an became part of a contemporary ambition. The idea to shape a planet, a moon or another body to deliberately modify its atmosphere, temperature, surface topography or ecology in order to mimic the conditions we enjoy on Earth.*

*Terraforming the Moon, Mars and even Venus has long left the realm of science fiction, and as it often happens, moved on to the realm of science and technology. Large teams of brilliant scientist work tirelessly across the globe with versions of this concept, and now, even more so because of the effects of Climate Change upon Earth, living on other planets slowly converts from a dream to a necessity.*

*Superseed is a proposal that looks back towards our own planet, through alien lens. We are living the consequences of the Anthropocene age, with unprecedented ecological turmoil. The behaviour of our on homes ecology is slowly becoming alien to us, unsustainable and barren. Superseed proposes a terraforming of sorts of our own planet, blending technology and ecology in a seamless entity that aims to recreate in its own way the environment we have destroyed over the centuries. The basic elements that helped us and every other species thrive are represented and connected in a closed cycle: energy, food, water and shelter. Mobile and nomadic, it works to heal and protect our planet, and in doing so has a double agenda. Its adaptive and local nature hides the fact that Superseed is in fact an algorithm that works with local parameters like wind, solar radiation, temperature and rainfall in order to generate the most productive version of itself. It is an idea that can replicate itself and adapt in order to create a global productive network in the form of artificial ecology acupuncture.*

LOCAL AND GLOBAL STRATEGY

*Superseed* is a responsive system. A tower, a pixilated productive platform and solar balloons. The components are always the same and yet it is always different. The prototype is adaptable to different locations: Addis Adaba, Anchorage, Beijing, Cape Town, El Paso, Helsinki, Melbourne, Nairobi, Ottawa, Punta Arenas Quito and Wellington are some examples.

The platform shape and profile reflects wind conditions. It is elongated in alignment with the principal and cross wind vectors and reduced in size where there are strong wind conditions. Balloon geometry responds to the sun path. Balloons get wider and flatter in locations closer to the equator, maximising photovoltaic gain while protecting the platform from solar radiation; and they get taller and more spherical at higher latitudes, optimising photovoltaic gain while allowing solar radiation to heat the platform. Each configuration generates different shading conditions for the productive platform, thus constructing a different artificial landscape: crops and greenhouses are situated on the side receiving most sun, while wetlands, fish farms and hydroponics systems are protected in the shaded areas.

*Superseed* is intended not only as a closed cycle productive system, but as a biodiversity trigger, helping local ecosystems to engender richer and more hybrid human/non-human modes of coexistence.

SHELTER

*Superseed* is a living lab. Researchers from all over the world might spend weeks studying circular processes for self-sufficient living. Additional capsules can be plugged in to accommodate new researchers. All domestic functions are served and solved within the central core: a vertical structure built out of recycled scaffolding components. Both kitchen and bathroom composts are used for the edible gardens. Thermal blankets are formed by the balloons when they deflate at night.

ENERGY

*Superseed* is an autonomous solar machine. A set of solar balloons gets inflated during the day. Sun heats the air and the balloons start to lift in the air. The upper skin of these balloons is covered with fresh microdomes, generating photovoltaic energy. Energy that is stored in hydrogen cells, activating the water pump and powering the *Superseed* wheels. The prototype moves from time to time across the desert plain in search of a better place.

FOOD AND WATER

*Superseed* is a living machine. Water is filtered through an artificial wetland with hanging ponds. Water plants filter the water and sustain fish. Clean water and compost are used to water and feed crops, some of which are protected from the desert winds by agrotextile impregnated with moss and algae. They capture the desert dew when the balloons are deflated, producing a humid microclimate.

SUMMARY

Superseed is a modular system composed out of plug-in components. The big majority of them are standard components readily available. Structural components are made out of retrieved scaffolding. Platforms used recovered wood elements. Micro-greenhouses and shelter capsules are made of recovered agro-textiles. Shelters furniture are proposed to be second-hand retrieved. Balloons are made out of recycled transparent plastics. Photovoltaic micro-domes are made of pool solar heaters and high efficiency PV cells.

Superseed is a living lab platform to research on self-sufficiency and circularity. Researchers will stay here a minimum period of a season, measuring and monitoring environmental parameters, and qualitative and quantitative values of energy, water and food production. All systems are functioning under low-tech / open source hardware logics so that maintenance can be resolved always locally, performed by the hosted researchers themselves.

The system’s overall logic is a combination of (1) solar balloons (equipped with photovoltaic concentrators on the upper side and with a moss and algae as bio fog catchers), plus (2) a living machine cycle (an artificial wetland for water purification and pisciculture combined with a selected array of different crops). Food production oscillates between 200.000 and 500.000 Kcal per season. Energy production oscillates between 50 and 100 KW of average instant production. Organic waste produced in kitchen, dry-toilet, productive pools and crops is used to generate compost in a biodigester attached to the dry toilet module. A cost estimate of the installation of a small functional version of the prototype would stay around $50.000. Partnerships and collaborating companies and an accurate plan of retrieved/recycled materials could considerably reduce the cost.

ON-SITE DEVELOPMENT STRATEGY

Step 1. Regional analysis for recovering materials (scaffolding components, wood planks, agro-textile and recycled transparent plastics). Scanning for possible green companies partnerships (high efficiency photovoltaic cells and solar mini-domes).

Step 2. Environmental modelling (humidity, wind and sun) and on-site hi-res mapping of the site (accessibility, flora and fauna) in order to optimise location. Development of the optimisation software and definition of the optimised geometry of balloons + platform.

Step 3. Construction of a minimum version of the prototype (one or two shelter units, three to four component scaffolding tower, one solar balloon, and twelve platform units: 4 decks, 4 artificial ponds, and 4 micro-crops, two of them protected).

Step 4. Mapping and monitoring the development of self-sufficient and circular life-styles for two researchers staying on-site during a period of three months. Measuring efficiencies and optimisation protocols for each system and developing a best-practices guide.

ENVIRONMENTAL IMPACT SUMMMARY

The environmental impact analysis has considered both the potential local and global impacts. It considers the impact which Superseed might have over its operational lifespan, in addition to the environmental footprint from the production of construction materials, and their disposal following decommissioning. During its operational lifespan, local impact could result from microclimatic changes (increased shade and humidity), water capture, waste generation and changes to biodiversity. Global impact considers energy consumption and greenhouse gas (GHG) emissions resulting from operation, in addition to the environmental footprint created during the lifecycle of the construction materials.

Superseed functions as a closed-loop system, in which water, energy, food and shelter are provided for habitation while not generating external waste. As it is adaptable, in terms of size and dimensions, to local conditions and requirements, the scope for mitigating environmental impacts is increased.

**Construction**

Superseed has no foundations and has a "touch lightly" philosophy regarding the surrounding landscape. It is mobile and easy to deploy and dismantle in order to limit the direct physical impact on the site where it is located. The structure is made primarily from pre-used steel scaffolding, wood (platforms), agro-textiles (shelter units) and recycled plastics (balloons), in order to limit the impact of its construction and give a second life to disposed materials that would otherwise become waste.

Everywhere possible, the structure has been built using recycled and reused materials, ensuring minimal levels of waste and GHG emissions.

**Metabolism**

**Energy**. Solar balloons that inflate with the heat of the sun form part of this installation. In this sense the installation rises and sets with the sun. They have a triple function. One is providing shade during the day, to the crops and human activities. Another is being the home of photovoltaic disks that take advantage of the best position in order to receive maximum solar radiation. Third is becoming a protecting blanket at night, shielding the shelter and production area from winds, rain and low temperatures.

**Food and Water.** The aquaponics system is a closed loop, ensuring that waste generated is fed back into production, while the human, animal and plant waste produced is compostable, providing a source of nutrients for cultivation and avoiding exterior waste production. Water is provided by rainwater capture. Microclimatic changes created from Superseed’s presence will be limited to the immediate surroundings and increases in shade and humidity levels, in addition to increased vegetation, may increase local biodiversity.