**Planktonic Synergy**

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**Environmental Resilient Mechanism**

The area of the Spinelli Barracks in Mannheim is located in the middle of the city, a green open space responding to the urban context, which provides important urban climatic and bioclimatic functions, the “fresh air green corridor” for the city.

The proposal consists of a resilient environmental design and the dynamic climatic devices. The parametric pattern in the landscape is generated by the climatic analysis of the site, the gradient multi-size round areas are elements such as grass, local plants, or water retained ponds, those landscape elements are surrounded by a series of dynamic climatic devices. The responsive environmental mechanism not only resonates with the surrounding environments but also actively enhances the natural condition.

Temperature

The mechanism consists of the climatic devices to release cold air from underground to cool down the environment when the temperature is high.

Wind

The climatic devices release the controlled air to steer the airflow, lower the impact of the urban context, and retain the environment wind condition to its natural state.

Water

The gradient patterns include several water ponds, which cool down the area and also retain water for a more biodiverse ecosystem.

**Climatic Responsive Device**

Planktonic Synergy is creating a series of dynamic climatic devices throughout the landscape, they are responding to weather-changing conditions, and the devices store and release fresh air dynamically to create a beneficial microclimate. The parameter of this dynamic mechanism consists of the amount, velocity, and temperature of the air, thus becoming an active equalizer to the micro-climate.

The floating structure is acting as an indicator to the device, it is around 10-20m in height, made from ETFE and inflated with Helium, it is held by wire cables, attached to the ground. Beneath the structure sits the wind turbine outlet uplifted from the ground. The floating structure stays low when the device is sucking air and rises to the sky when the compressed air is released from the wind turbine beneath.

The release of fresh air generates power and lights up the LED disks attached to the wire cables, creating not only a futuristic yet poetic spatial experience but also an interacting space for visitors to engage with and enjoy the beautiful nature.

**Powered by Air**

Planktonic Synergy is powered by air, inspired by the compressed air energy storage(CAES) technology.

Annual Capacity: 3,450 MWH

Energy storage provides a variety of socio-economic benefits and environmental protection benefits. Technologies have their advantages and disadvantages, the differentiating characteristic of the different technologies is the amount of energy the technology can store and another is how fast this energy can be released.

The technological concept of compressed air energy storage (CAES) is developed more than 40 years ago. The term compressed air energy storage outlines the basic functioning of the technology. In times of excess electricity on the grid (for instance due to the high power delivery at times when demand is low), a compressed air energy storage can compress air and store them underground. At times when demand is high, the stored air can be released and the energy can be generated.

Due to the electricity stored at low demand times, and electricity is generated through releasing the stored air, storing energy is not only motivated by environmental protection benefits but also strongly motivated by economic benefits the technology provides. In addition, the technology provides energy market support and socio-economic benefits.

Reference: *The Climate Technology Centre and Network (CTCN), UN Environment Programme*

**Activities:**

- Recreation area

- Farming area

- Wild life observation

- Stargazing area

**System inputs:**

- low maintenance device, mostly autonomous operating.

- Inspection for the turbine once per year

- Inspection for the underground equipment once per year

- Inspection for the inflated structure regularly

**System outputs:**

- Approximately annual capacity of 3,450 MWH will be generated by those devices throughout the landscape

- Compressed air

- Some heat will be generated underground by the equipment, will be regulated by nature soil

- Cut-Fill balanced construction

**Primary Materials:**

- ETFE inflated balloon

- Wire cable

- LED lighting strip

- LED lighting disk

- Turbine

- Compressed air energy storage (CAES) equipment

- Soil foundation

- Grass and plants

**Conceptual Cost Estimate (per unit):**

- Inflated Structure € 20,000 - 30,000

- Cable Structure € 10,000 - 30,000

- Base Structure € 40,000 - 60,000

- LED Lightings € 20,000 - 30,000

- Underground Construction € 60,000 - 80,000

- Compressed air energy storage (CAES) System € 80,000 - 120,000

- Miscellaneous Works € 10,000 - 20,000

Total € 240,000 - 370,000