**treEcoTopia**

treEcoTopia incorporates the need for sustainability while also taking into account the flexibility required to make it available in different environments. There are various modules that can generate energy in different ways which allow our design to be deployed in specific locations such as private residential areas or even densely populated urban areas. The floral form our design takes on allows for a forest like representation and creates a connection to the environment and the topic of energy production.

Every single module in treEcoTopia is an independent tower-like structure that is perfectly capable of functioning on its own, with a dedicated function assigned to it. A forest of other modules, each similar in appearance span across our intended area of service and add to the beauty of their surroundings. There are two main types of modules in our design that are aimed at taking natural events and turning it into energy we can reuse. The first module is focused on collecting energy from the sun. The supporting structure, or trunk, of the module is made mostly from corten steel and incorporates some wooden support beams to help keep the structure stable. The top of the solar module consists of a stainless steel support structure which is covered with solar panels. These panels will shine different colors, such as yellow, orange and shades of red to collect the sun's energy. The other module will focus on collecting the different forms of water in the environment such as rainwater during a storm or even morning dew from a humid night. The top of the module consists of a stainless steel base that is coated with a bluish colored membrane to help differentiate between the two designs. The trunk of the water module will be the same as the one from the solar module except for the addition of a water tank below the membrane to collect and store the water. While these are the two main modules in our design it does not mean that we are restricted from collecting other forms of energy. The modular principle of our design means that add-ons are a welcome and easy addition to any of the modules. For example, the solar module can be fixed with outlets for people to charge a wide variety of items such as mobile phones, E-scooters, etc. There is also an option to attach streetlamps to the trunk to help illuminate paths at night. Other add-ons include attaching a wind turbine to the trunk of the module allowing access to more reusable energy without the need for more space to set up the new structure.

When designing a structure like this the functionality of the design is very important but in order for this to be a successful project it needs to look like it belongs. The aesthetic of designs in today's world can make or break a project. If people don't like the way something looks, why would they be inclined to build it? Yes, the moral aspect of building something that will help the environment is a motivating factor but if you design something that is aesthetically pleasing as well then it makes that decision even easier. The inspiration for our design came from the Angel’s trumpet flower. We artistically merged the design of the flower into a structurally stable tower that gives us the ability to collect renewable energy all the while being a visually stunning implement to spectators. The design of treEcoTopia allows us the ability to not only incorporate this structure into everyday spaces but also the option to create a space devoted just to the forest. While we know it is not a bad idea to just have this renewable forest by itself, we thought it would be a good idea to add in another opportunity for energy production in a fun and playful way. There is an integrated playground below the structures for children of all ages to enjoy. We attached generators to the playground equipment and connected it to the power grid associated with the solar module so that children are able to have fun and produce renewable energy at the same time.

“Edit: measurements used in our project based on masterplan from March, 14.2022”

**Technology used**

The solar module will use consumer grade solar panels that are individually placed on the curved surface. These solar panels convert sunlight into electricity.

The water module will use membranes that are able to filter out the different types of water in our environment and transports it to the tank below.

Industrial vertical wind generation modules are also used to generate electricity from wind. These panels are aerodynamic and are specifically engineered for maximum efficiency while fitting into our design constraints.

It is estimated that the entire system will generate around 2366 MWhof electricity per year, and around 6.87 million litersof water per year.

**Public activities and social co-benefits**

Apart from being a very nice visual spectacle the treEcoTopia modules will convert the space where they are built into a particularly nice park for people of all ages to enjoy. Playgrounds scattered across the area will keep children occupied and entertained while producing extra energy. Adults can take advantage of exercise equipment provided in the park which in turn also provides extra energy back to the power grid. In addition to the energy offset provided by treEcoTopia, it will also prove to be a beneficial community park where people can freely come visit to play, exercise and interact with one another.

**UN sustainable development goals**

Our project is expected to support and add to these sustainable development goals set by the UN through its various features:

UN Sustainable development goal 6

Ensure availability and sustainable management of water and sanitation for all.

UN Sustainable development goal 7

Ensure access to affordable, reliable, sustainable and modern energy for all.

UN Sustainable development goal 9

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

UN Sustainable development goal 11

Make cities and human settlements inclusive, safe, resilient and sustainable

UN Sustainable development goal 13

Take urgent action to combat climate change and its impacts

**Per year calculations**

2604.49 hours of sunshine per year.

1200 KWh/m^2/year or horizontal solar irradiation

306mm of rainfall per year.

Total number of modules: 1655

SOLAR

Large: 629 modules with 28,3m2 surface

Medium: 344 modules with 18,1m2 surface

Schrebergarden: 178 modules with 3,5m2 surface

Total surface area: 24654 m^2

Estimated efficiency of solar panels: 8%

Total Energy generation potential per annum: 2366 MWh

WATER

Large: 148 modules with 60,4m2 surface

Medium: 320 modules with 38,6m2 surface

Schrebergarden: 36 modules with 7,4m2 surface

Total Surface area: 22483 m^2

Estimated water collection potential per annum: 6879 m^3 = 6.87 million liters

Estimated energy collection from playground equipment per year = 10,000 Kwh

**Environmental impact**

There is very little modification to be done to the plot of the land itself. The construction of the treEcoTopia and the various modules are expected to be net carbon positive at the end of their life span and have a positive impact on the environment as a whole. The various other equipment, including playground equipment will generate some carbon emissions during construction however, due to their energy generation potential, they are estimated to offset whatever carbon footprint they generate through the sustainable electricity they will create over their lifetime. The treEcoTopia project keeps the idea of simple manufacturing at heart and puts an emphasis on using as little resources as possible while offsetting much of what it costs in carbon footprint. It is safe to say that this project will have a net positive impact on the environment and also does not require a significant amount of restructuring within the design area so as to not change its environmental signature.