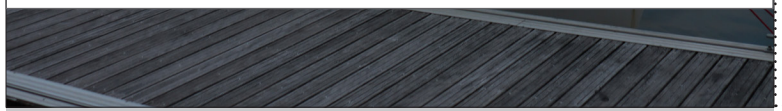

STUDIO
JOURNAL
SUSTAINABLE SYSTEMS
S.Luna Van Arsdale
DESIGNING
SUSTAINABLE
NOMADIC
STRUCTURES

GLUE STRIP

SOCIAL & SYSTEMS



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The Fibonacci sequence is one of the most famous formulas in mathematics.

Each number in the sequence is the sum of the two numbers that precede it. So, the sequence goes: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, and so on. The mathematical equation describing it is Xn+2= Xn+1 + Xn

A mainstay of high-school and undergraduate classes, it‘s been called „nature‘s secret code,“ and „nature‘s universal rule.“

From there, mathematicians can calculate what‘s called the golden spiral, or a logarithmic spiral whose growth factor equals the golden ratio.

Ghose, Tia. “What Is the Fibonacci Sequence?” LiveScience, Purch, 24 Oct. 2018, www.livescience.com/37470-fibonacci-sequence.html.

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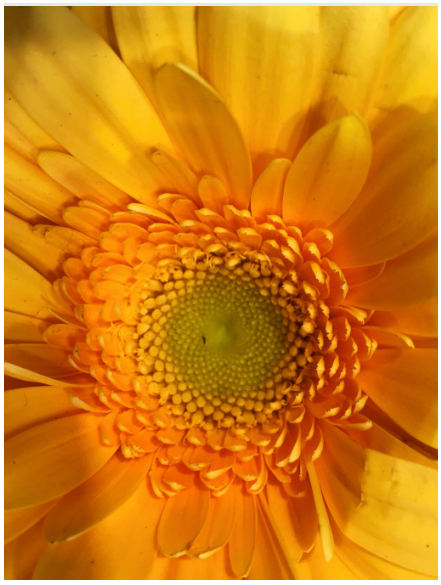

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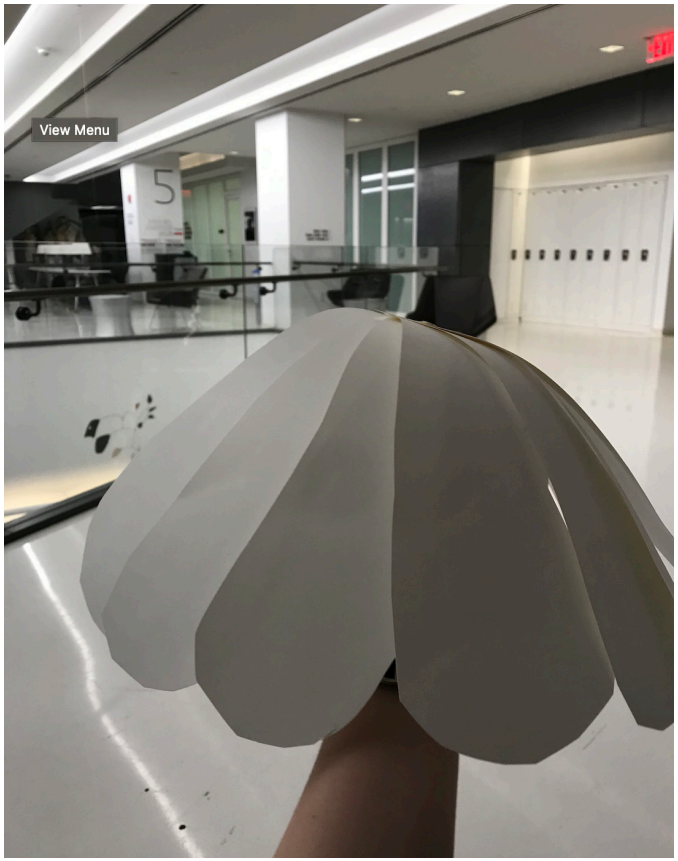
Collapsable Bristol Board Hat



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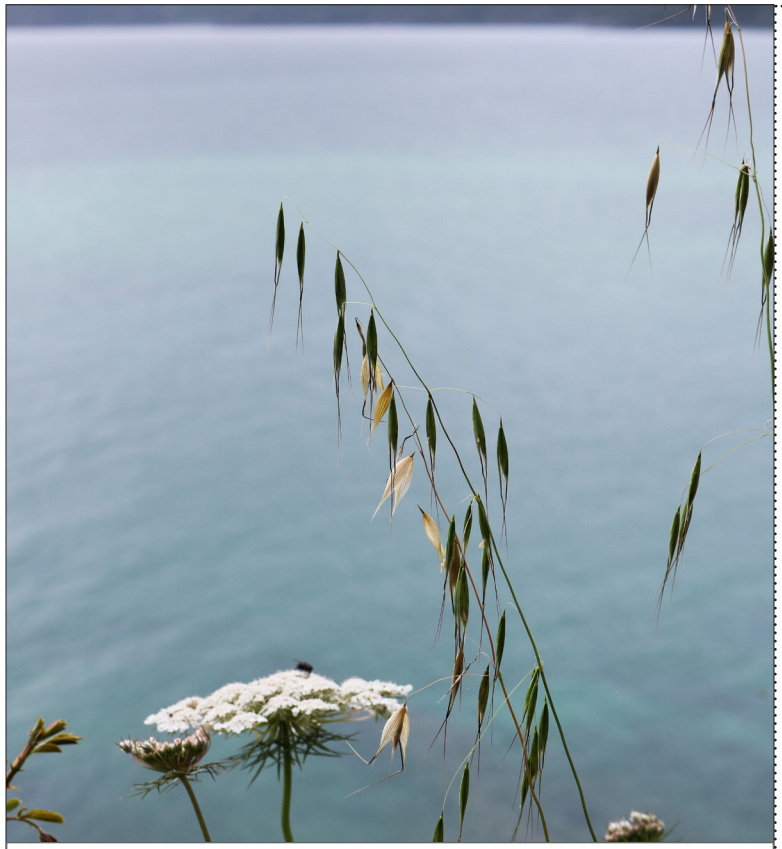

CLIMATE CHANGE & ENERGY

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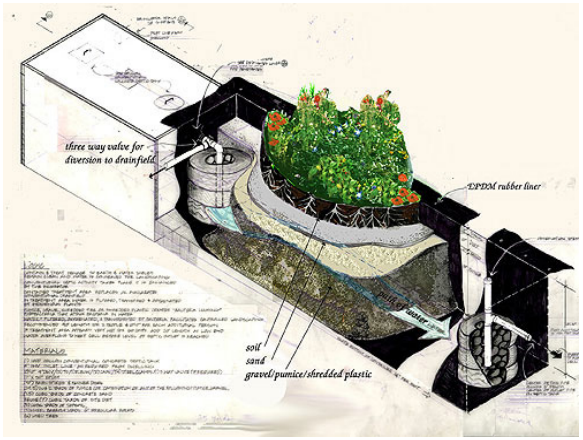

Harvesting rainwater has been prevalent in societies since the dawn of civilization. The need for water in off the gird areas is imperative and implementing the collection of it in both off the grid areas as well as developed communities is equally important. We are facing water crisis around the world and action must be taken. Many people have begun to collect rainwater with gutters that transfer the water into barrels which sift the various debris that can get trapped in the current from the water that falls from the sky. In a prototype created by the Simon Fraser's University, designers created a sort of transportable rainwater collector that rest on the back of the user, collects the water, filters it so that it is clean, and topped it off with a valve so that the user can drink the water shortly after it has been harvested.

image : http://rainwaterbuildings.blogspot.com/2010/06/earthships.html

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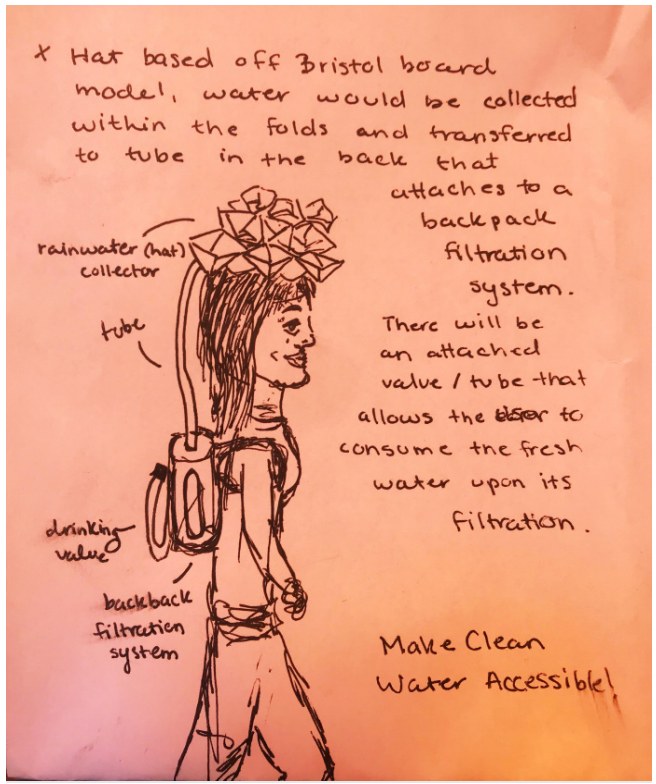

Harvesting rainwater proposal based off of bristol board model that was created in the climate change and energy portion of this journal.

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Natural dyes are able to be extracted from a variety of natural vegetation such as nuts, berries, foliage, and flowers. Natural dyes require the use of mordants and will not work without it. A mordant is a dye fixative, an example of a mordant is tannic acid. Mordants bond the dye molecule on one end to the fiber on the other end. The dyeing industry has been deemed one of the most polluting industries on Earth given its effluent – "liquid waste or sewage discarded into a body of water." The benefits of using natural dyes included – but are not limited to: promoting regenerative farming, sequester carbon, and produce no waste; whereas chemical dying can be linked to creating waste and polluting our environment on top of being toxic.

image: https://en.wikipedia.org/wiki/Dyeing

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I chose to use strawberries, blackberries, and carrots because they have lovely, vibrant colors that csn seeps off the fruits and vegtable, and into the plush wool.

GLUE STRIP

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The wearable rainwater collecter I created was a continutation of the hat project we had completed towards the beginning of the semester. I developed on this concept because I thought the collapasability of the hat was quite interesting and something to consider bringing into another design.

My bioleather came out quite well initally but five days after it had been out of the liquid, it completely dried up and started to break apart. I wanted to actually remake the paper hat with the bioleather, but since it dried up, every time I tried to work with it the leather crumbled apart and rendered it unworkable. So, I thought I would build up off of the model that I already had and pin pieces of the bioleather to various surfaces to somewhat indicate where it would have been placed. I would have to find a way to make the bioleather waterproof however, if I wanted the hat to successfully collect the rainwater and not decompose with it.

Within the geometric shapes, I wanted to make the actual water collector with the wool. My idea was for the wool to be made much denser and in geometric form inserts that could be placed into the somewhat complex folds of the hat and fit in there snug. The wool would contain the water until the user is able to take the inserts out and squeeze the clean water from the sodden wool. There would then be a purification process to ensure that the water is clean, but I believe that would be developed in another project that would conicide with this one.

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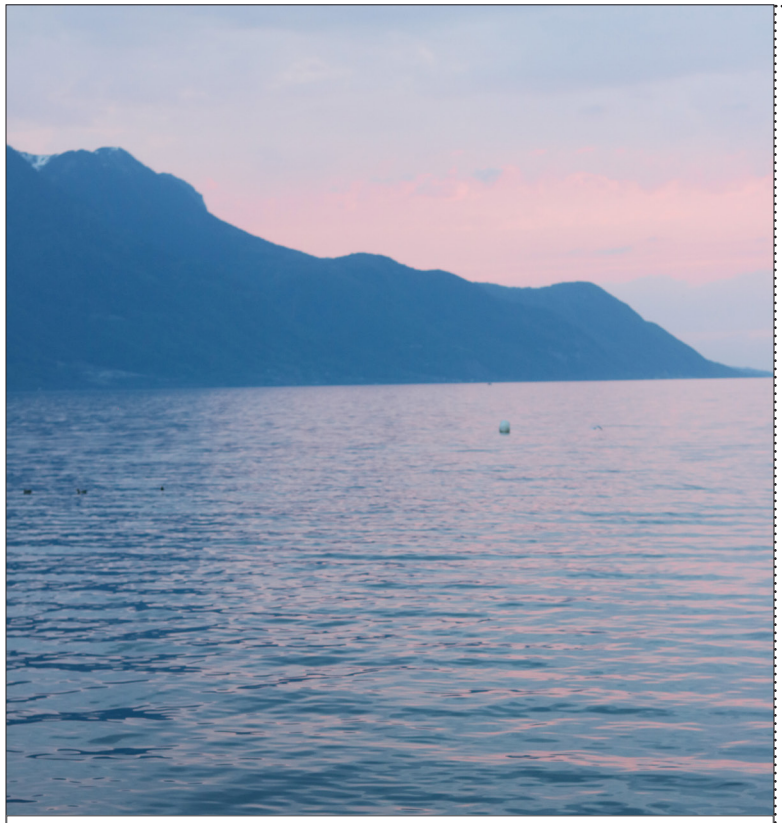

WATER & MATERIALS

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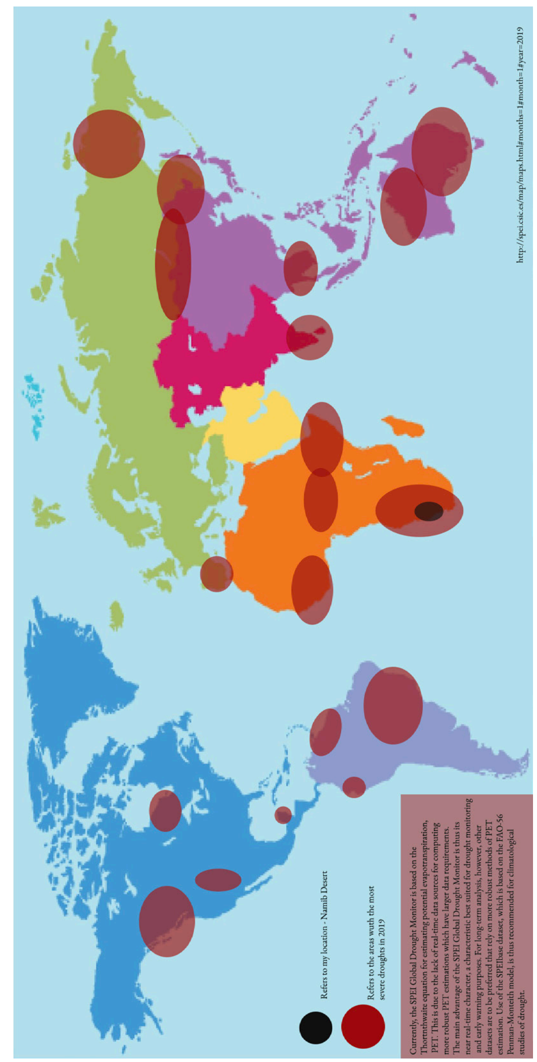
DROUGHT MAP



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https://geekologie.com/2018/02/trippy-flood-completely-submerges-nature.php

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Each morning, a fog drifts through Africa‘s Namib desert. The Namib beetle takes advantage of this brief opportunity and faces the wind at just the right angle. Bumps on the wing covers are composed of a hydrophilic substance that attracts moisture. The moisture builds up, forming ever larger droplets. Gravity then takes over, and aided by water-repellent troughs between the bumps, the droplets run down the wing covers and into the beetle‘s mouth. From research however, the fog-basking behavior itself is a more important factor than structural adaptations which I found to be quite interesting.

https://asknature.org/strategy/water-vapor-harvesting/#.XKdM5i2ZNQI

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Preliminary Research Notes

Vernacular Architecture - “Liviable Heritage“

- Intrisically Connected to Communities
- Safe guarding and expanding cultural features
- Territorial Connection
- Construction Techniques
- Lifestyle
- Materials: mud straw, clay, reeds

Fog Harvesting Nets MIT by Shreerang Chhantre

- Mesh vs. Solid - more porous = more water
- Balance between hydrophilic and hydropobic materials that attract and then send the water to collection
- In some tests, fog harvesting captures upwards of one liter of water per sqaure meter per day

Produce in Namibia

- maize, wheat, nuts, sunflowers

Produce in Arid, Desert Conditions

- green onions, corn, squash, bell peppers, hot peppers, tomatoes, spinach

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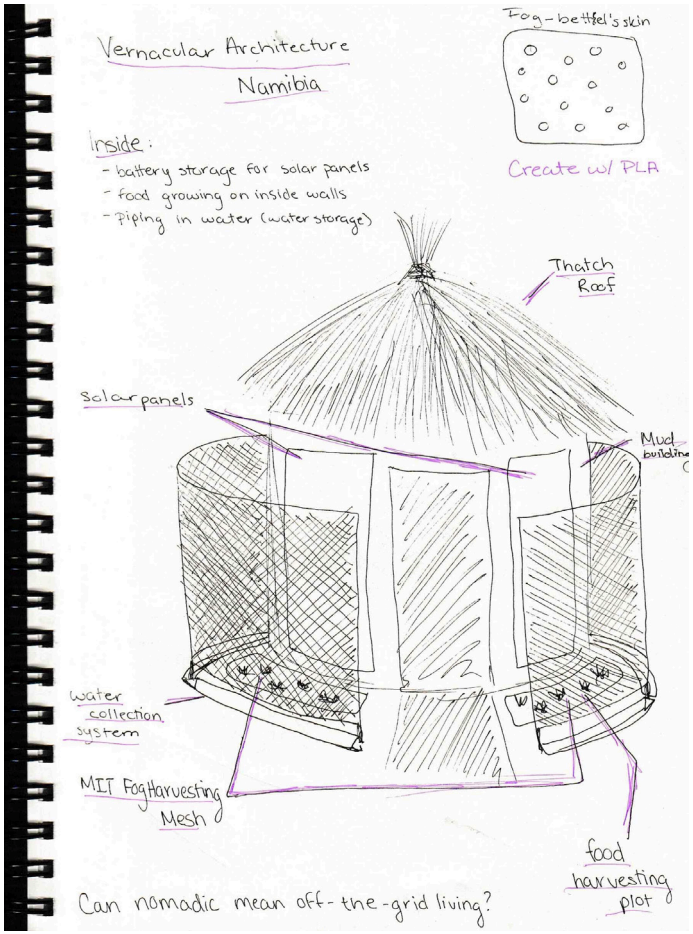
Biomimicary Drought Structure Drawings



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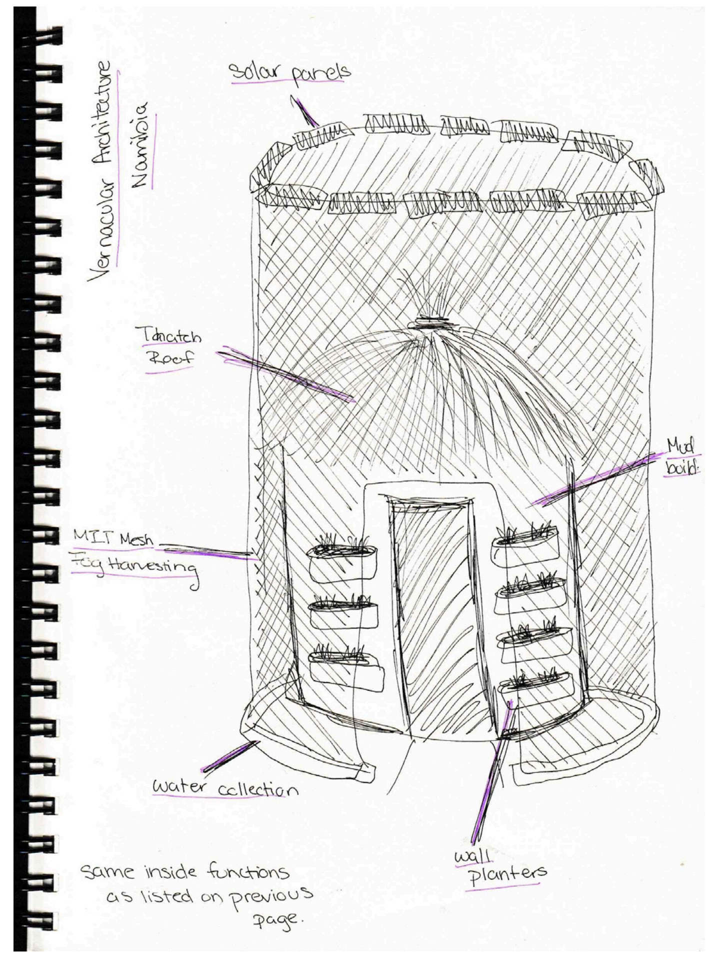
Vernacular Architecture
Namibia
Solar panels
Thatch Roof
MIT Mesh
Fog Harvesting
Mud bld.
water collection
wall
Planters
same inside functions
as listed on previous
page.

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Biomimicary Drought Structure Rough 3D Iteration

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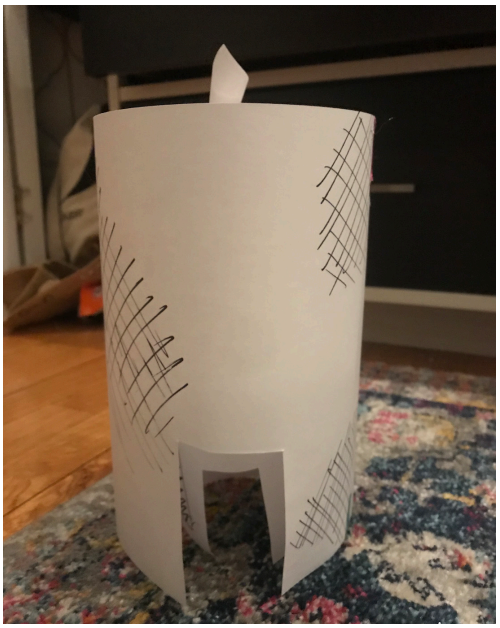

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Biomimicary Drought Structure Model Drawing

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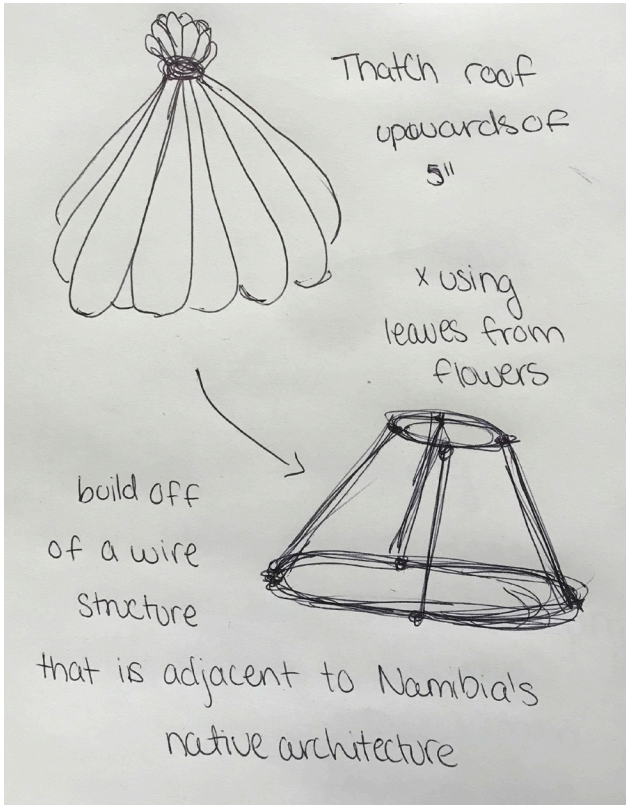
Biomimicary Drought Structure Model : Roof



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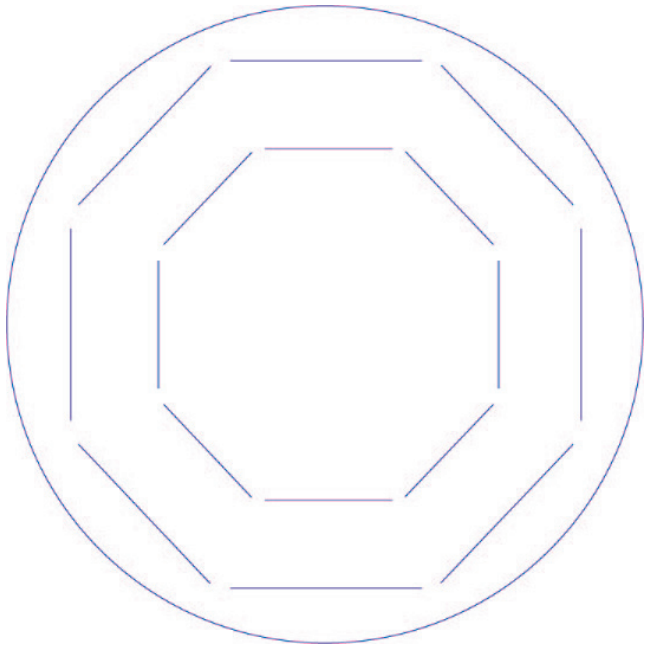
Biomimicary Drought Structure 10“ Base Rendering

with Insterts for Modular Structure



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Biomimicry
Drought Structure

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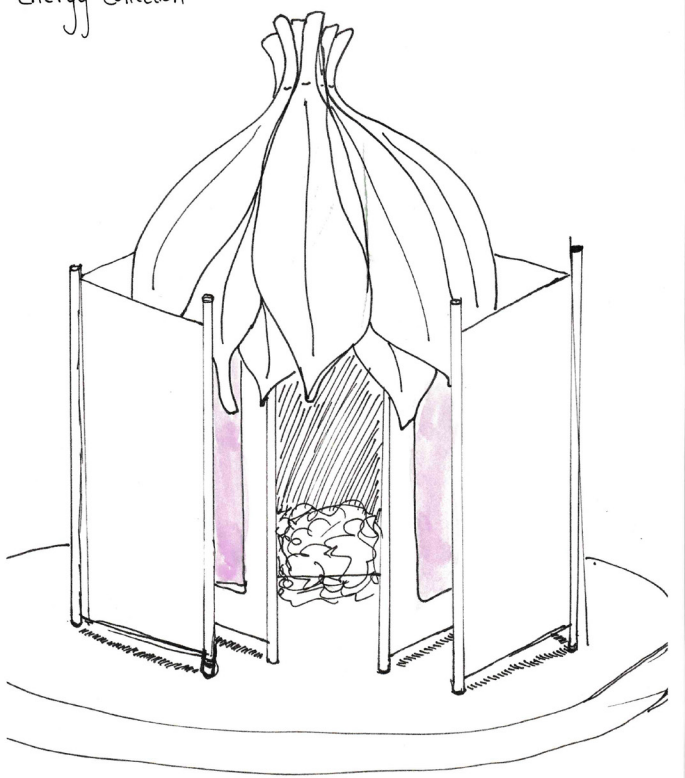
Solar
Energy Collection



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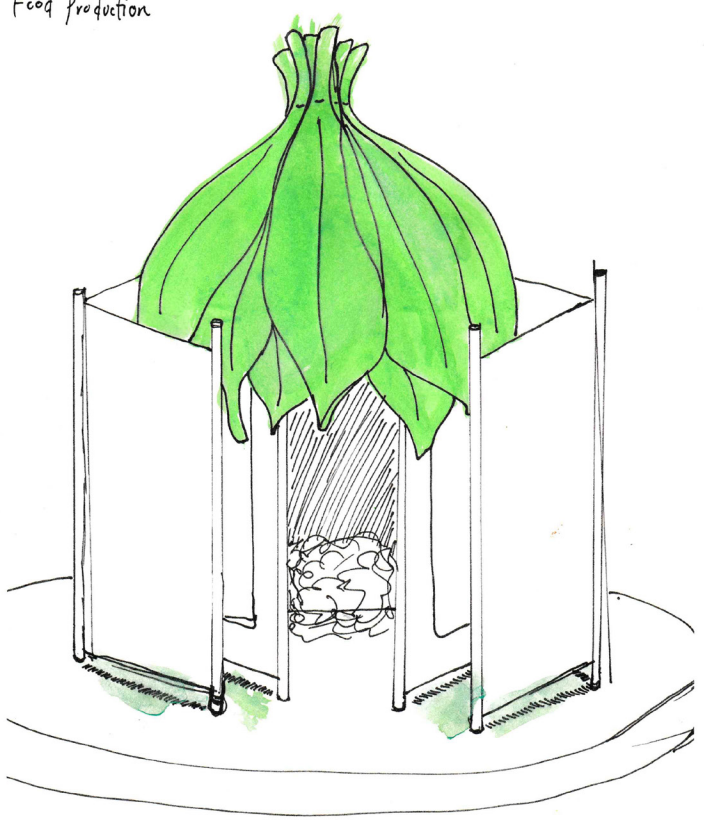
Food Production



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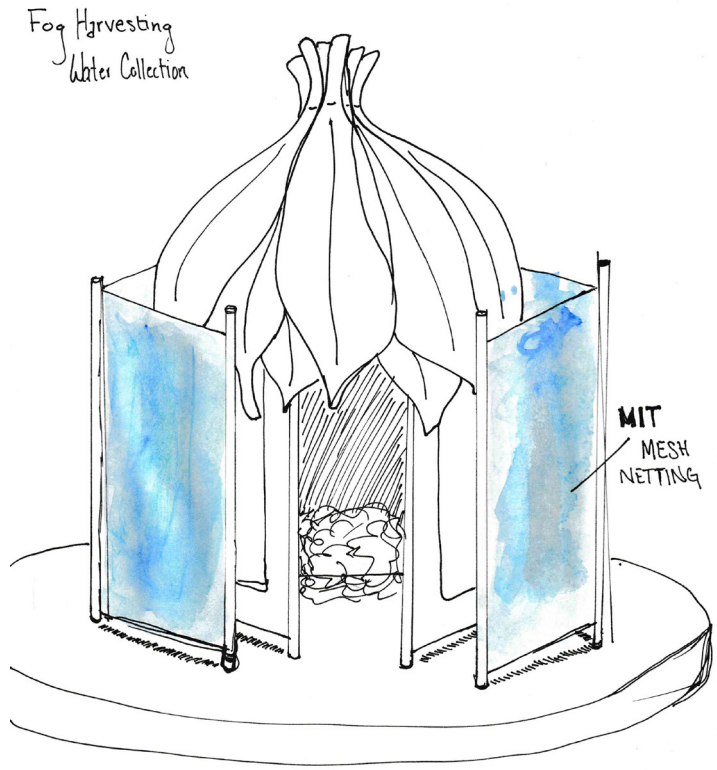

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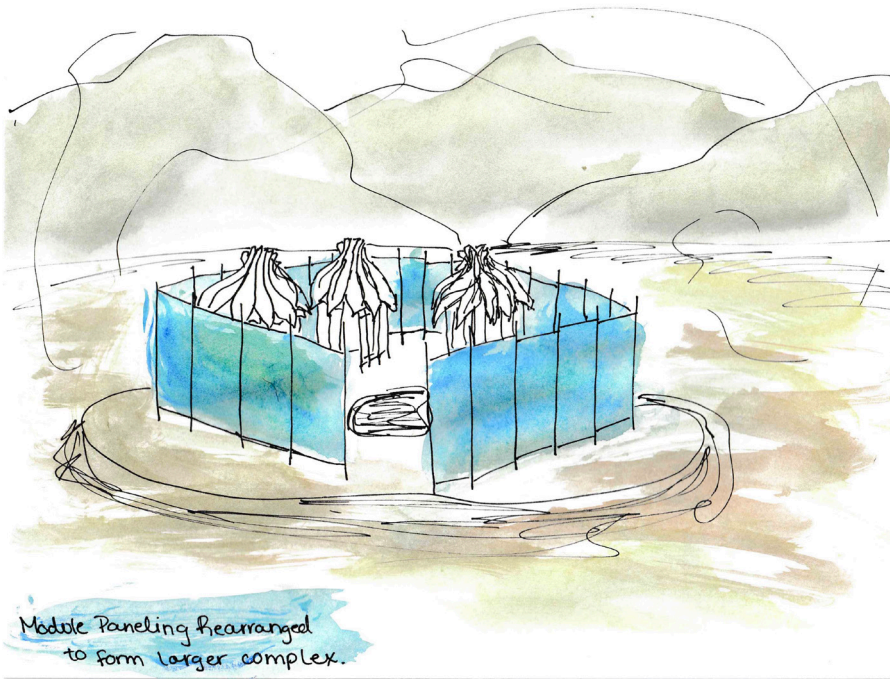

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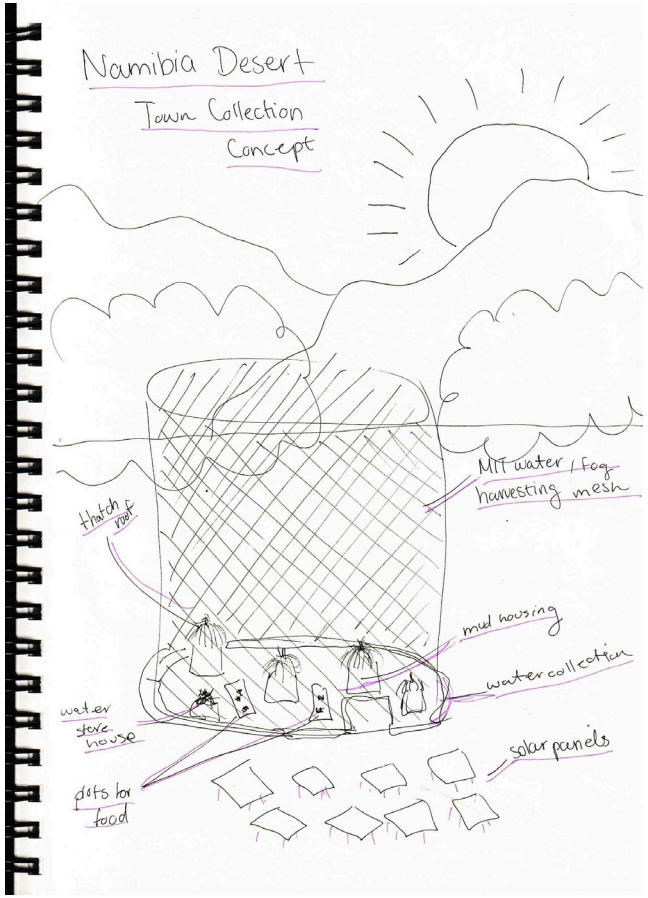
Attach Panel Fencing Together to Encompass Larger Community Cimplex



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biomimicry

drought

structure

***

final iteration

and

description

With a focus on the arid regions of Namibia, I designed a deployable nomadic structure that aids in the adaptation to warming global temperatures and desertification. Using biomimicry, I chose to draw inspiration for my design from the Nambid beetle living in the Namibia desert. As the fog rolls in, these beetles are able to harvest the water that clings to the air. This harvesting method is known as a fog-harvesting behavior. As I began looking into existing biomimicry developments of the Nambid beetle, I came across a fog harvesting mesh that MIT graduate student, Shreerang Chhatre, has developed "A fog-harvesting device consists of a fence-like mesh panel, which attracts droplets, connected to receptacles into which water drips." His aim behind this fog-harvesting mesh is to help poor villagers collect water in a more efficient way.

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As temperatures are warming, water is becoming harder to obtain. In arid conditions, many of the people living at the poverty level have to lug water home from wells and streams which could be hours away from their home. I chose to incorporate this mesh netting as a fence that would surround the hut. The fence would be divided into modules that would be able to me moved with ease. Having modular fencing would also allow the individuals to connect fencing creating a larger complex. Focusing in on the hut, I wanted to honor the vernacular architecture found in Namibia. Architecture is intrinsically connected to communities. By integrating their traditional architecture into my design, I am able to expand on the existing cultural features to adapt to the warming world while safeguarding the history. Traditional housing in Namibia is constructed of mud with a thatch roof. I was hoping to make paneling for the hut that was light weight and transportable.

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I found a material called Made of Air on MaterialConnextion that is “A carbon-negative building material made of 90% atmospheric CO2. The material is made from waste biomass that has absorbed CO2 during its lifetime, such as plants that naturally absorb CO2 by photosynthesis.” The end material is fire retardant, useable outside, lightweight, recyclable, and can be reformed to fit the needs of the consumer. Though this material’s intended use is to replace MDF boards or thermoplastic, and act as sheathing boards and cladding panels, I believe that a version of this could be created to act as a stand-alone building material to create the paneling for the deployable hut. The roofing of the hut would honor Namibia’s traditional architecture with the use of a thatch roof that is made of local materials. On two of the wall panelings, solar panels would be attached to collect energy for the hut to use, while also growing succulent plants to nourish the inhabitants.

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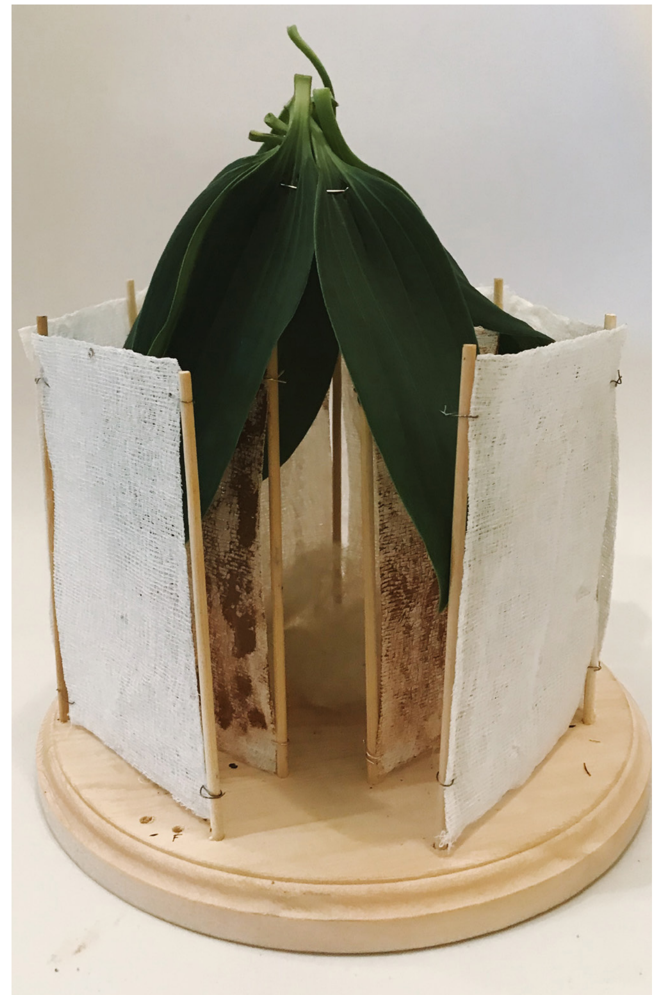

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Biomimicry Drought Structure

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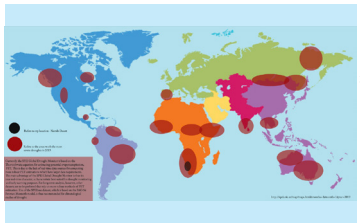
View 1 of Final Iteration

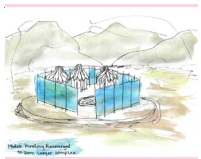
View 2 of Final Iteration

View 3 of Final Iteration + Human Scale



Drought Map

Area of Focus: The Arid Regions of Namibia



Deployable Fencing can be attached to one another to form a larger complex.

MIT Fog Harvesting Mesh

Made of Air

Thatch Roofing

Natural Died Wool

Vernacular Drought Architecture Naimibia

Water Collection by Fog Harvesting
Using MIT Biomimicry Fog Harvesting Mesh

Energy Collection
with Solar Panels

Food Production
With Succulent Planters

Biomimicry Drought Structure **Luna Van Arsdale**

SUSTAINABLE SYSTEMS, PARSONS SCHOOL OF DESIGN / THE NEW SCHOOL, SPRING 2019, INSTRUCTOR: CAROLIN MEES

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