*Gaia Spinoso*

*BSc Architecture & Environmental Design*

# PORTFOLIO

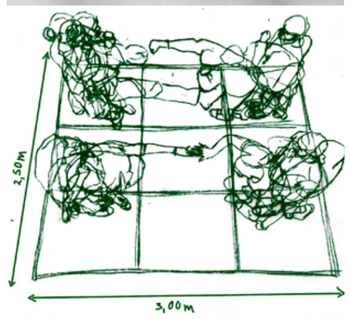
*DESIGN 1A*

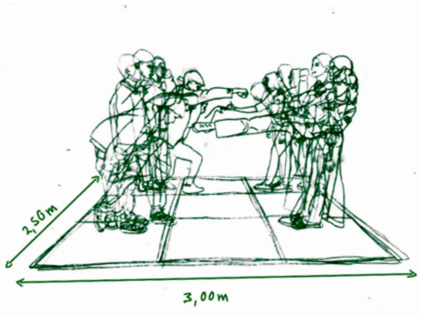
# TABLE OF CONTENTS

# THE ALTERNATIVE METRIC HANDBOOK

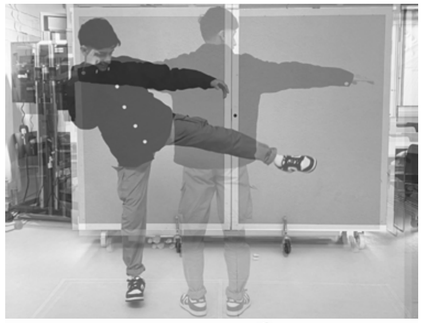
## *MINIMUM SPACE FOR FOUR PEOPLE TO HAVE A TAEKWONDO MATCH*

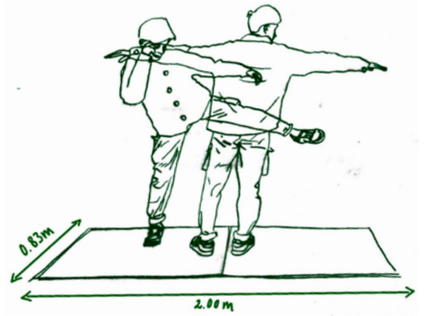


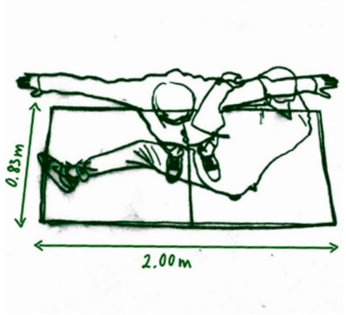





## MINIMUM SPACE FOR ONE PERSON TO PRACTICE TAEKWONDO





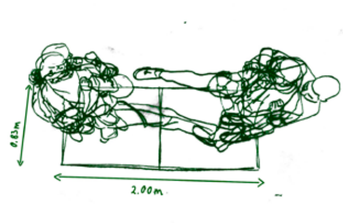


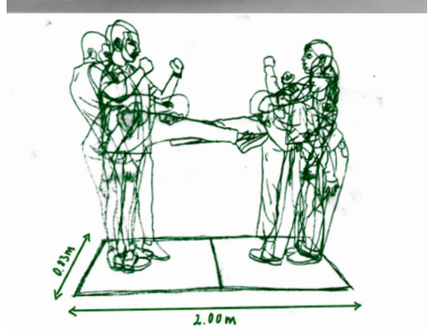

My colleagues and I studied the minimum space necessary to practice taekwondo. A space was considered suitable if all participants could freely perform a punch, a block, and a kick.

W\e tried three different combinations: a 2 vs 2 match, a 1 vs 1 match, and a single practice.

## *MINIMUM SPACE FOR TWO PEOPLE TO HAVE A TAEKWONDO MATCH*

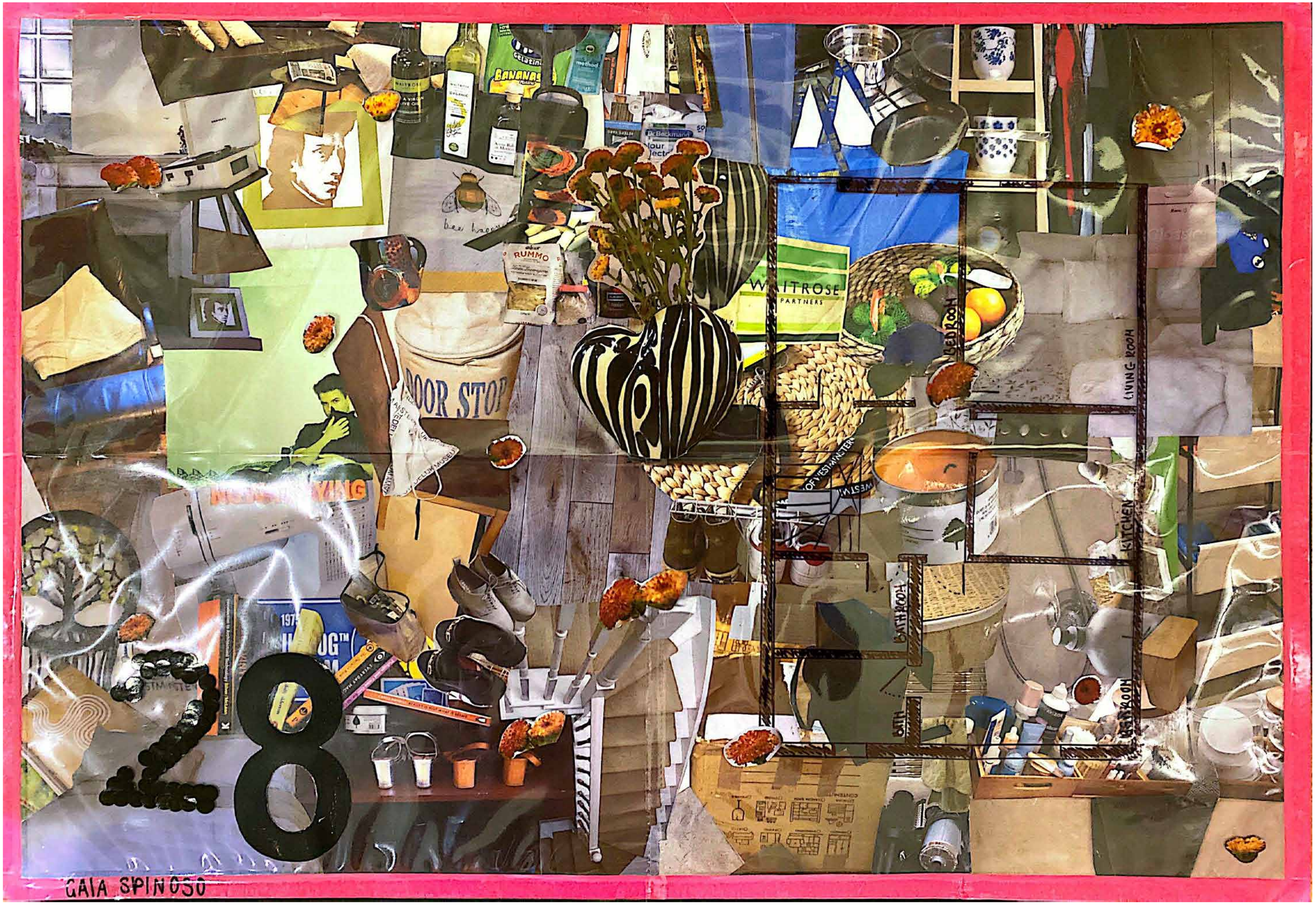


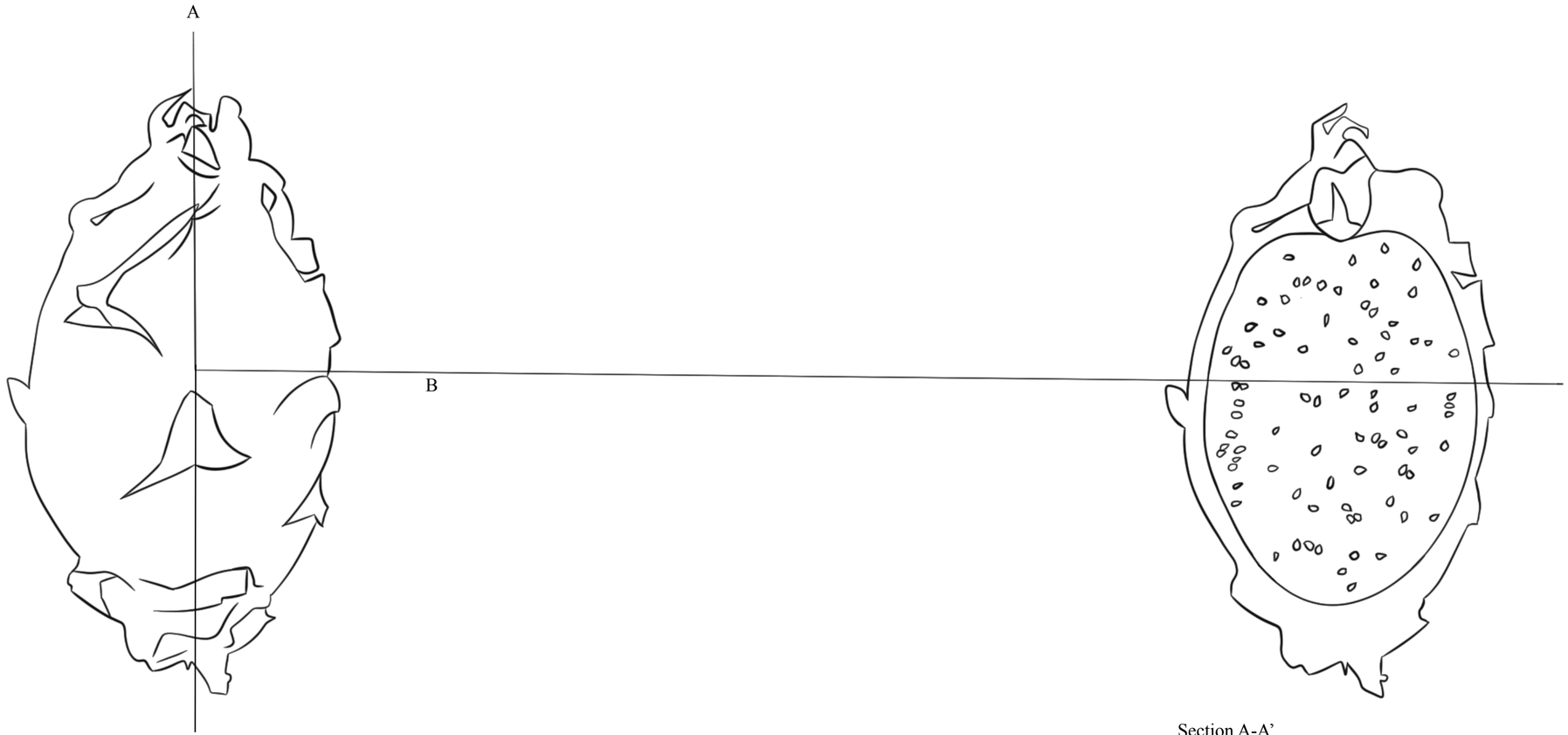




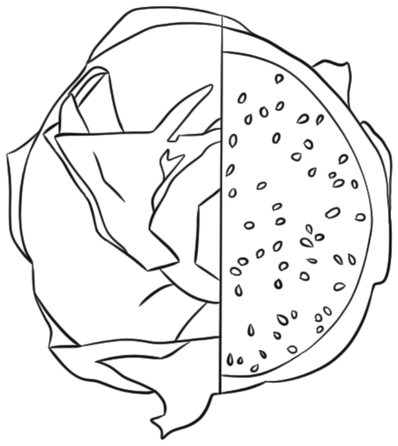

## *SPACES THAT DO NOT WORK FOR TAEKWONDO PRACTICES*





RUMMO
BEDROOM
LIVING ROOM
KITCHEN
BATHROOM
GAIA SPINOSO




Section A-A’



Plan A-B

# DRAGON FRUIT

*ORTHOGRAPHIC*

# CANNABIS SATIVA

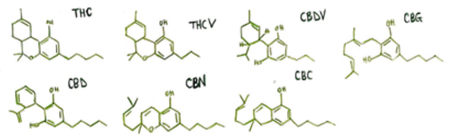
Genus: *Cannabacea* Species: *Cannabis Sativa* Subspiecies: *Cannabis Sativa ssp sativa/indica/ruderalis*

## METHODS OF DELIVERY

- Sublingual tinctures, sprays, and lozenges
- Oral ingestion: *gummies, oil, capsules, and edibles*
- Topicals: *from lip balm to acne face creams*
- Transdermal patches
- Vaginal and Rectal
- Herbal vaporizer

## PHYTOCANNABINOIDS

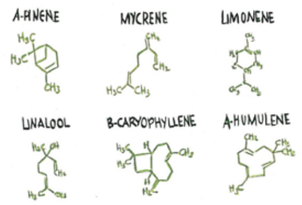
Produced in the trichomes mainly in female plants, phytocannabinoids are the most well-known chemicals on the cannabis plants. They are lipophilic and THC and CBD are the most common ones, but there is more than 120 types.




help restoring balance in our endocannabinoid system (ECS), We produce our own endocannabinoids (2-AG and Anandamide) and have our own receptors (CB1 and CB2).

## TERPENES

Produced in the trichomes alongside phytocannabinoids, they are responsible for the aromas that plants assume. They help protect from insects and attract pollinators.





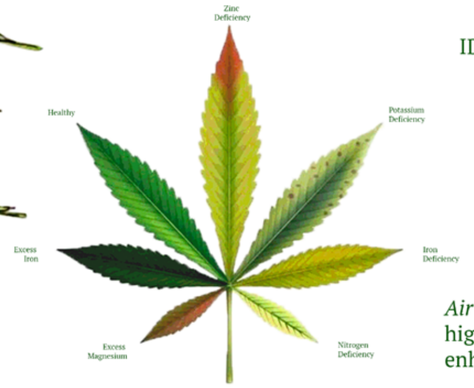
## MEDICAL BENEFITS

- Improving Brain Wellness and Brain Ageing
- Improving Neurological disorders
- Overcoming stress, Burnout, and Fatigue
- Addressing Anxiety and PTSD
- Dealing with low mood and depression
- Improving Sleep
- Managing Pain
- Optimizing Women's Health
- Enhancing Sec and Libido
- Better Gut Health
- Working on Autoimmune Conditions
- Improving Skin Conditions
- Help Epilepsy and Seizures


## CLIMATIC CONDITIONS

*Temperature:* ideally between 18 and 24 °C

*Relative Humidity:* ideally between 65 and 70%



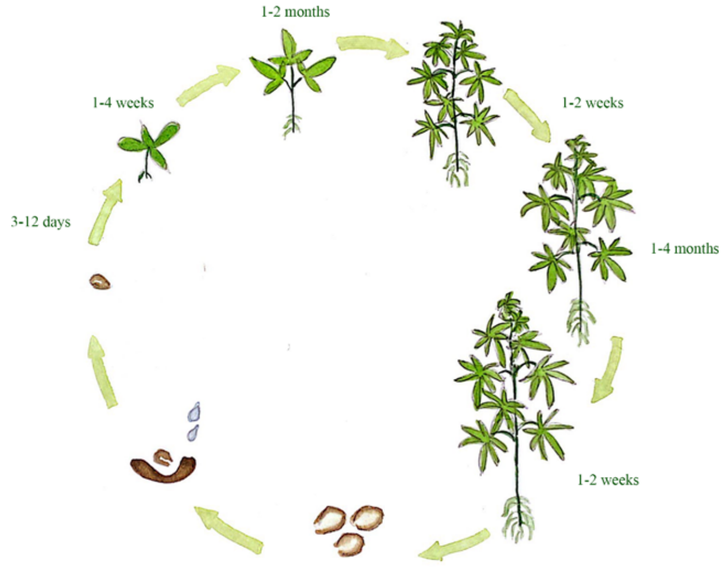


*Air Quality:* high quantities of $CO_2$ to enhance photosynthesis.

*Air Movement:* critical for pest management and plant growth.

## LIFE CYCLE

Annual dioecious flowering plant.
It germinates from a seed, reaches sexual maturity, reproduces and dies all within one year when growing wild




Originated in the Tibetan plateau 38 million years ago. Cultivated by humans over12,000 years ago.

Used in ancient civilizations for Medicine and Spiritual tradition and clothe making.

Introduced to the Americas in the 1600s

Used as universal medicine in the Victorian era.

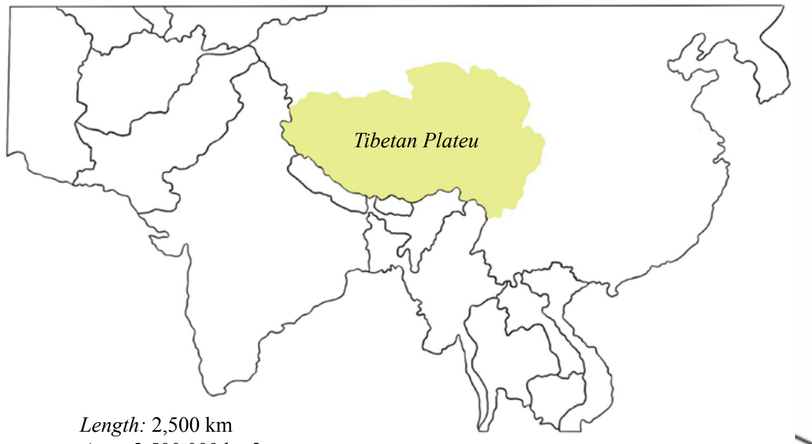
In the Prohibition era, hemp was banned due to political, economical,and racial reasons.


Today's Cannabis usage around the world.

# TIBETAN BLACK TENT

## *VERNACULAR ARCHITECTURE*

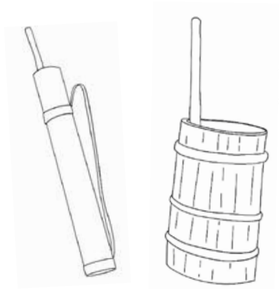
The black Tibetan tent is a winter tent used by pastoral nomads in the area of the Tibetan Plateu.
There are not many adornments or furniture to decorate, instead carpets and cushions are used, also for sleeping.



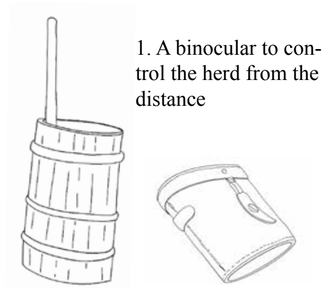

*Length:* 2,500 km
*Area:* 2,500,000 km2
*Width:* 1,000 km

The Tibetan Plateu is the world's highest and largest plateu above sea level situated in China, north of the Himalayan mountain range.
Its ice glaciers contain the third-largest reserve of fresh water in the world.

## *PARTICULAR FEATURES*

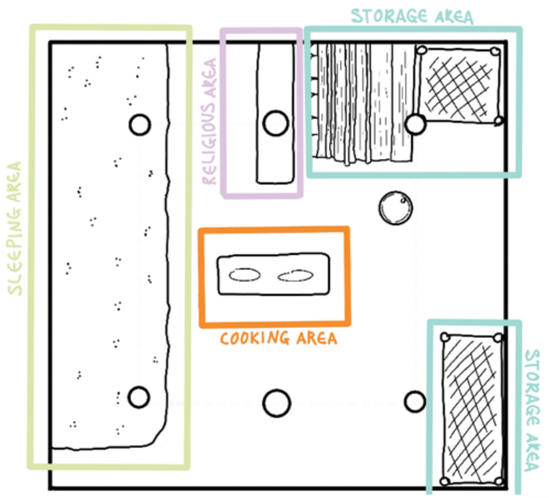


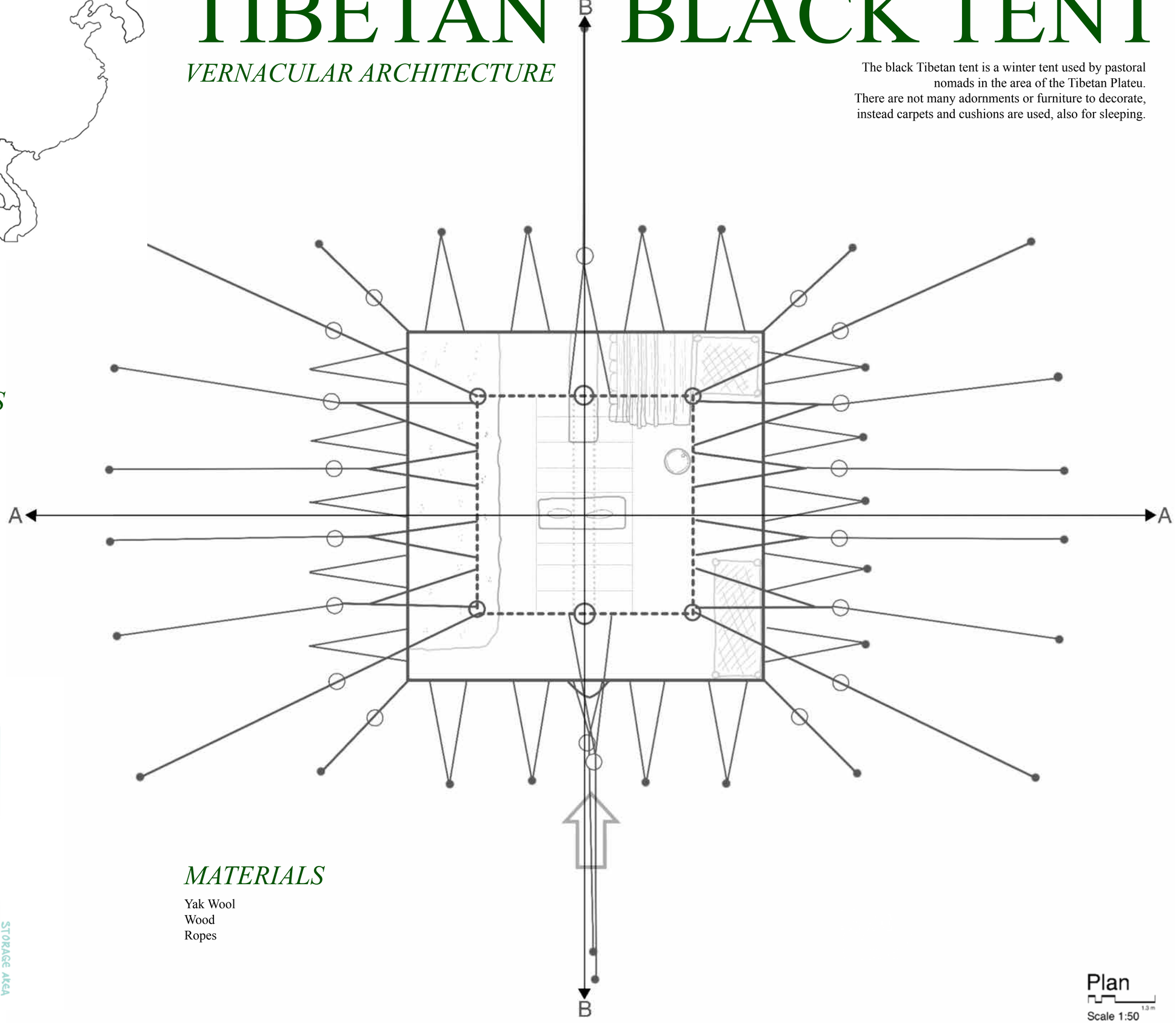
1. A binocular to control the herd from the distance



2. Wooden instruments used to make butter, cheese, yogurt, and butter tea.

## *SPACE ORGANIZATION*



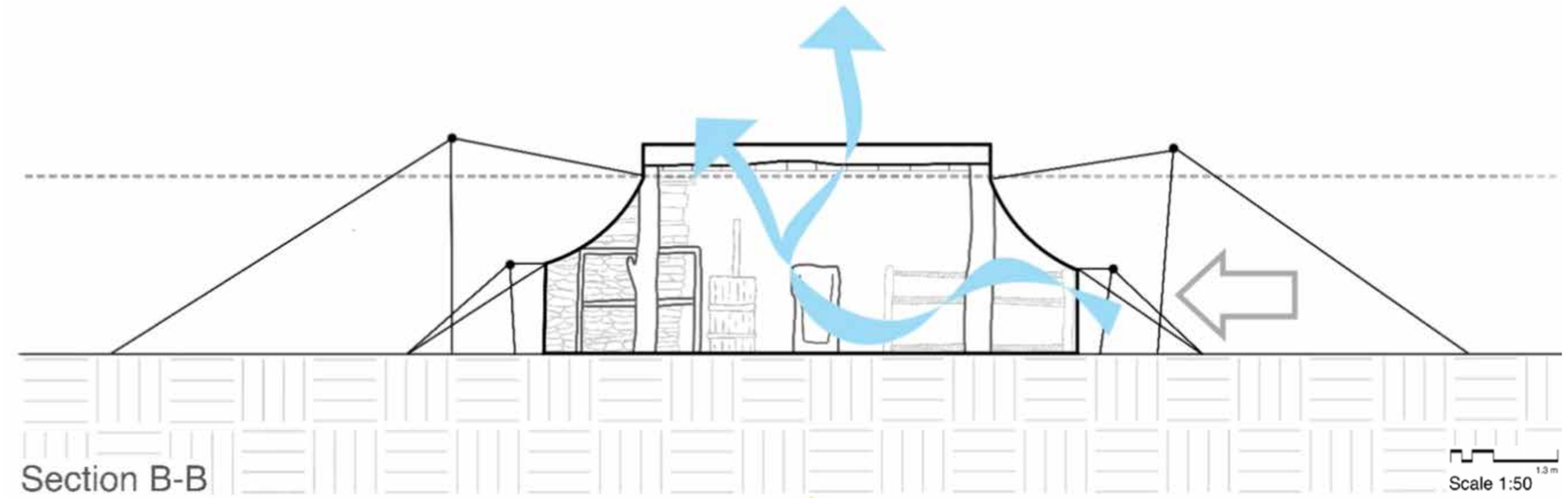

Plan
Scale 1:50

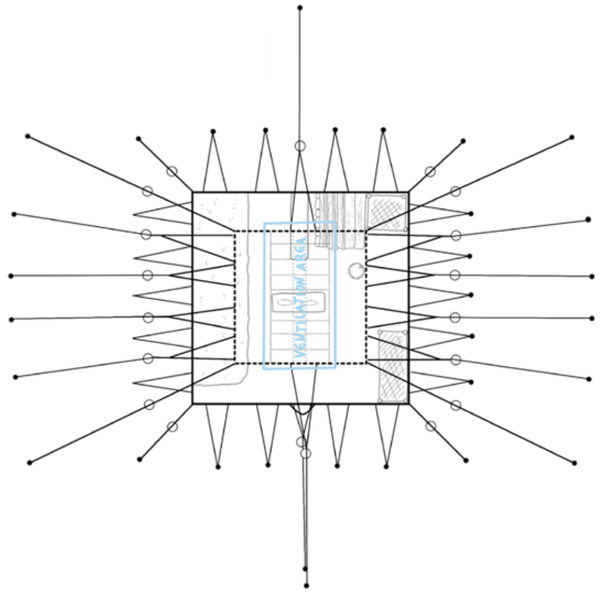
## *MATERIALS*

Yak Wool
Wood
Ropes

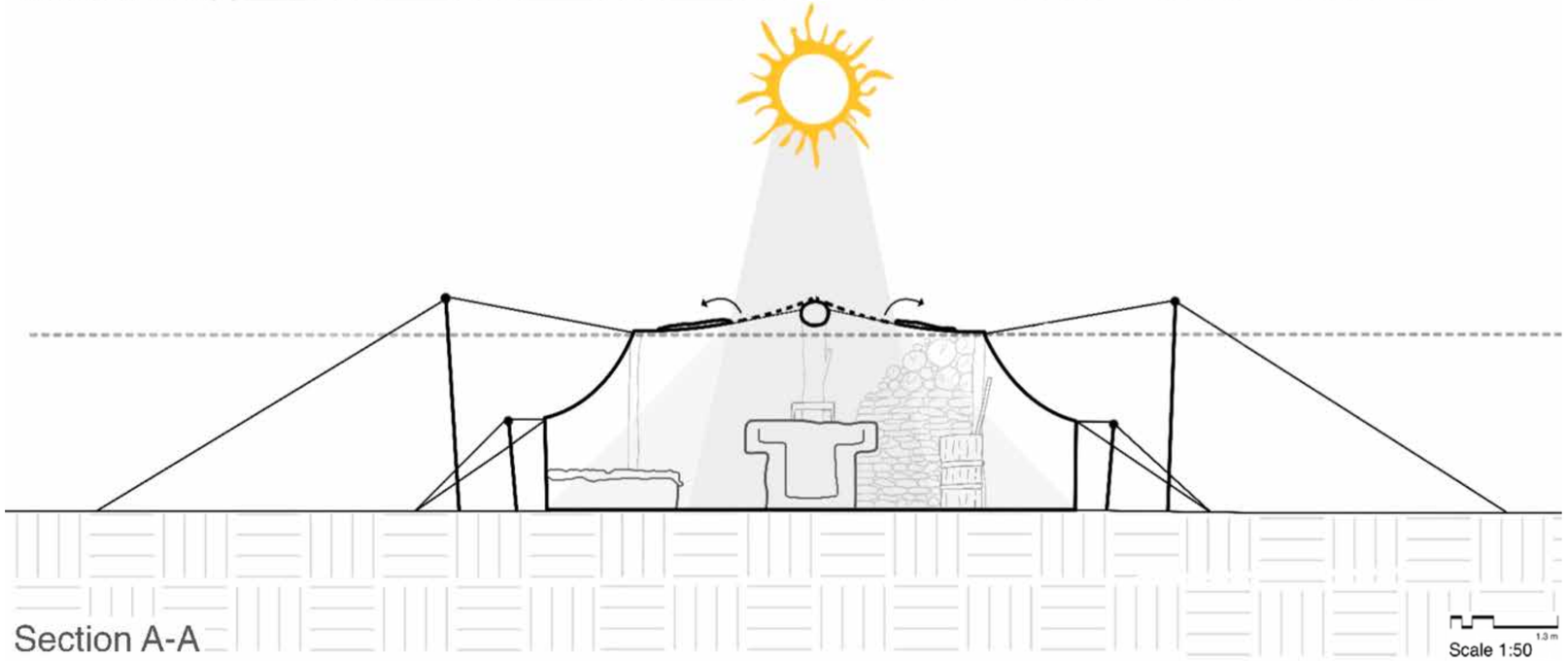
# ENVIRONMENTAL FEATURES

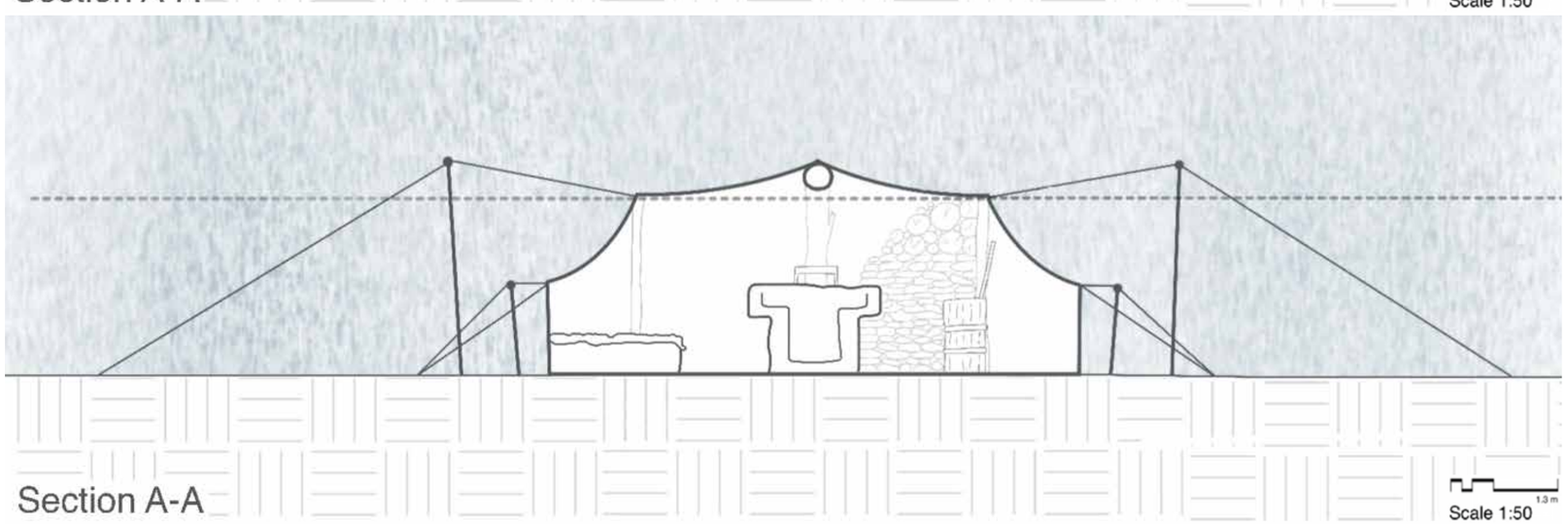
*VERNACULAR ARCHITECTURE*

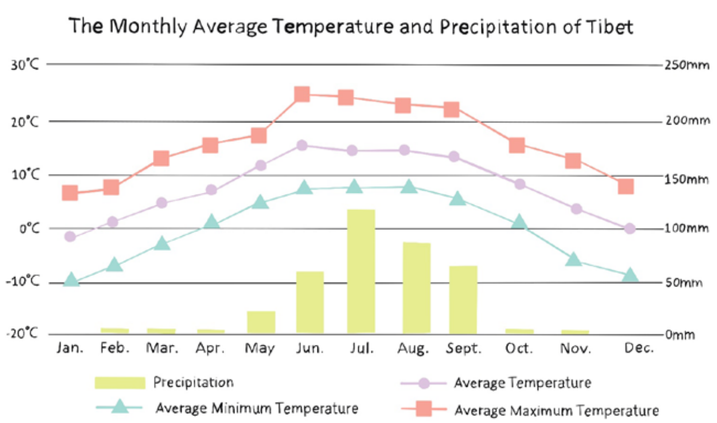



Tibetan black tents are openable at the top, letting the air flow throughout the space and the sun illuminate naturally, erasing the need for electricity. The opening lets the smoke escape while the central clay stove is on, as yak excrement (the most common fuel used by nomads) produces a lot of smoke when burned.
When closed, the tent shields from the rain and other atmospheric conditions as it is also waterproof, thanks to the msterial used: yak wool.
The tent is slightly see through by itself, but still prevents the water from infiltrating inside.

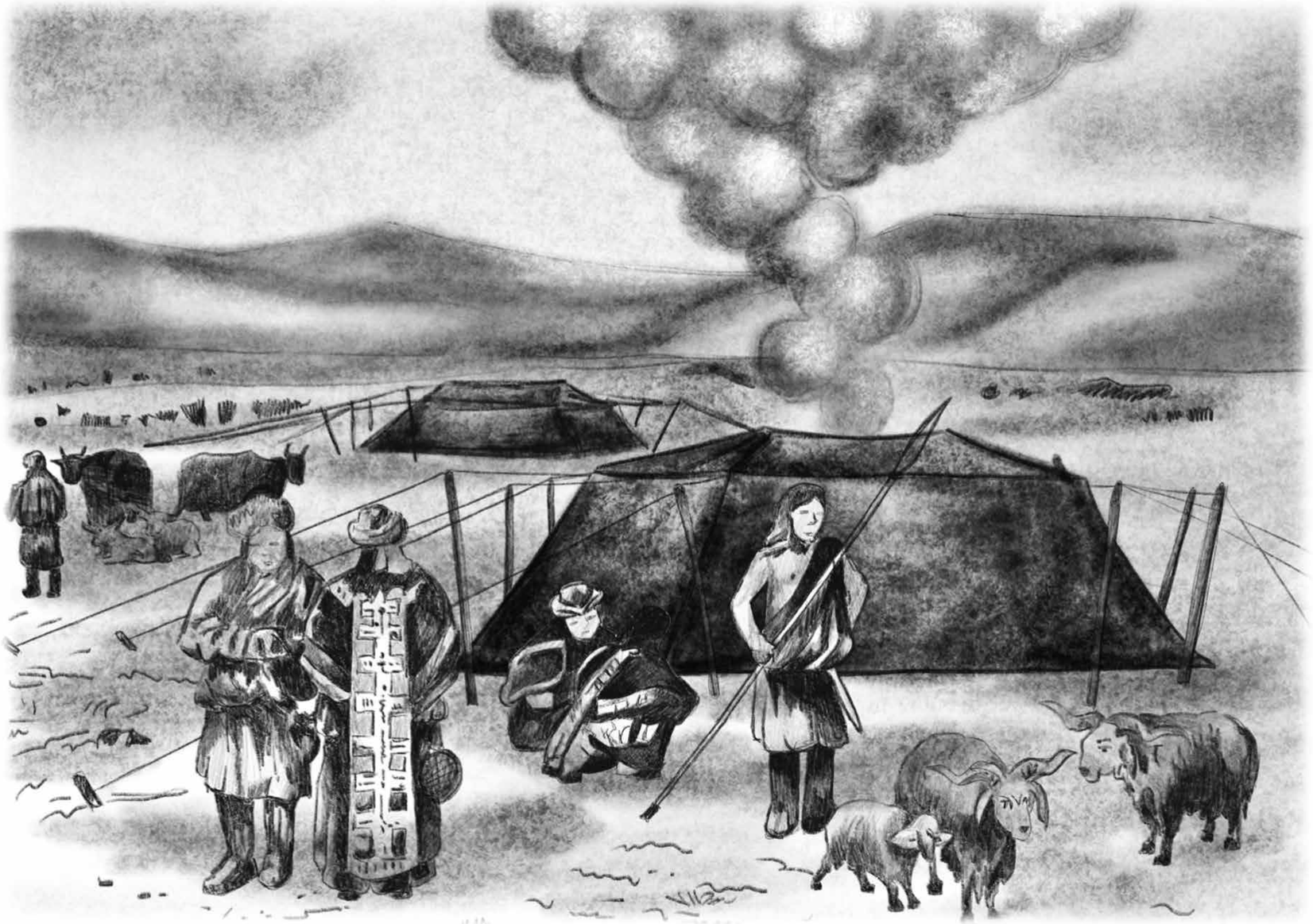


# NOMADIC LIFE

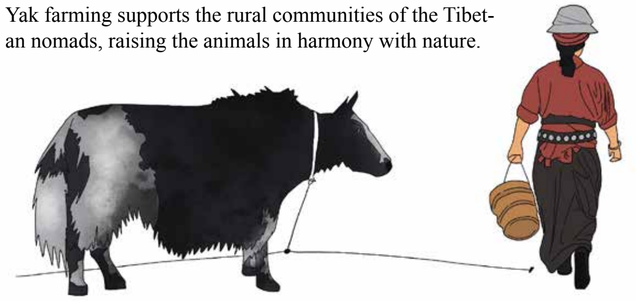
## *VERNACULAR ARCHITECTURE*



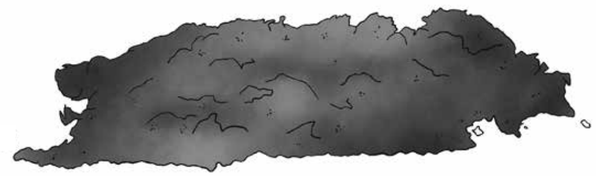
Tibetan nomads live a very simple lifestyle, with no electricity or external distractions. They act as the caretakers of the grassland, moving around to ensure sustainable farming, exterting little to no environmental pressure. They produce their own dairy products such as butter, cheese, and milk by farming mainly yaks, which are also used for creating the fabric of the nomad tents.

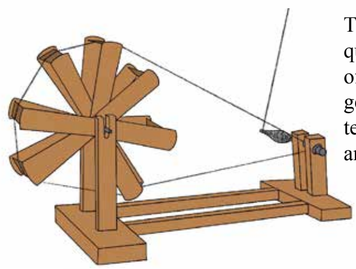
## *YAK WOOL MAKING PROCESS*

Yak farming supports the rural communities of the Tibetan nomads, raising the animals in harmony with nature.



Yak wool is harvested once a year during spring, producing roughly 500 grams per yak. It is collected through combing with a special tool, a sustainable and unharming method for the yaks.



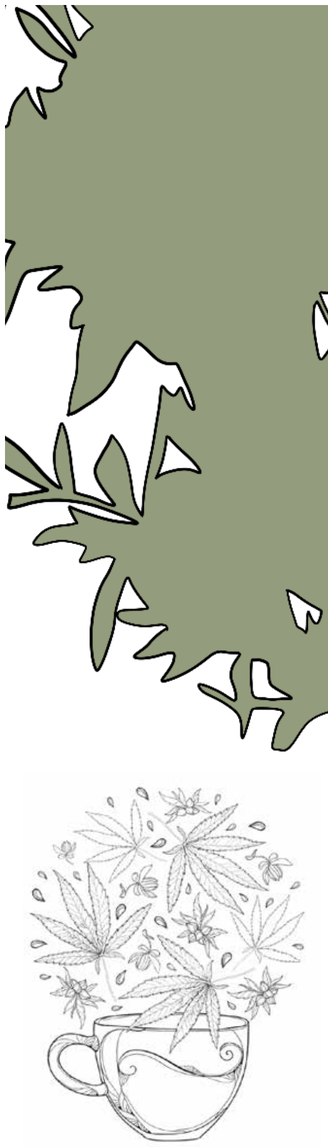


The hair is sorted by color and quality, then it is washed to get rid of all the grass and dirt. The longer hair is used to make ropes and tents. It is spun on a wooden lathe and collected.

Finally, the yak wool is intertwined with a loom and yak wool fabric is obtained to be later sold or used.

# TIBETAN BLACK TENT

*VERNACULAR ARCHITECTURE MODEL*

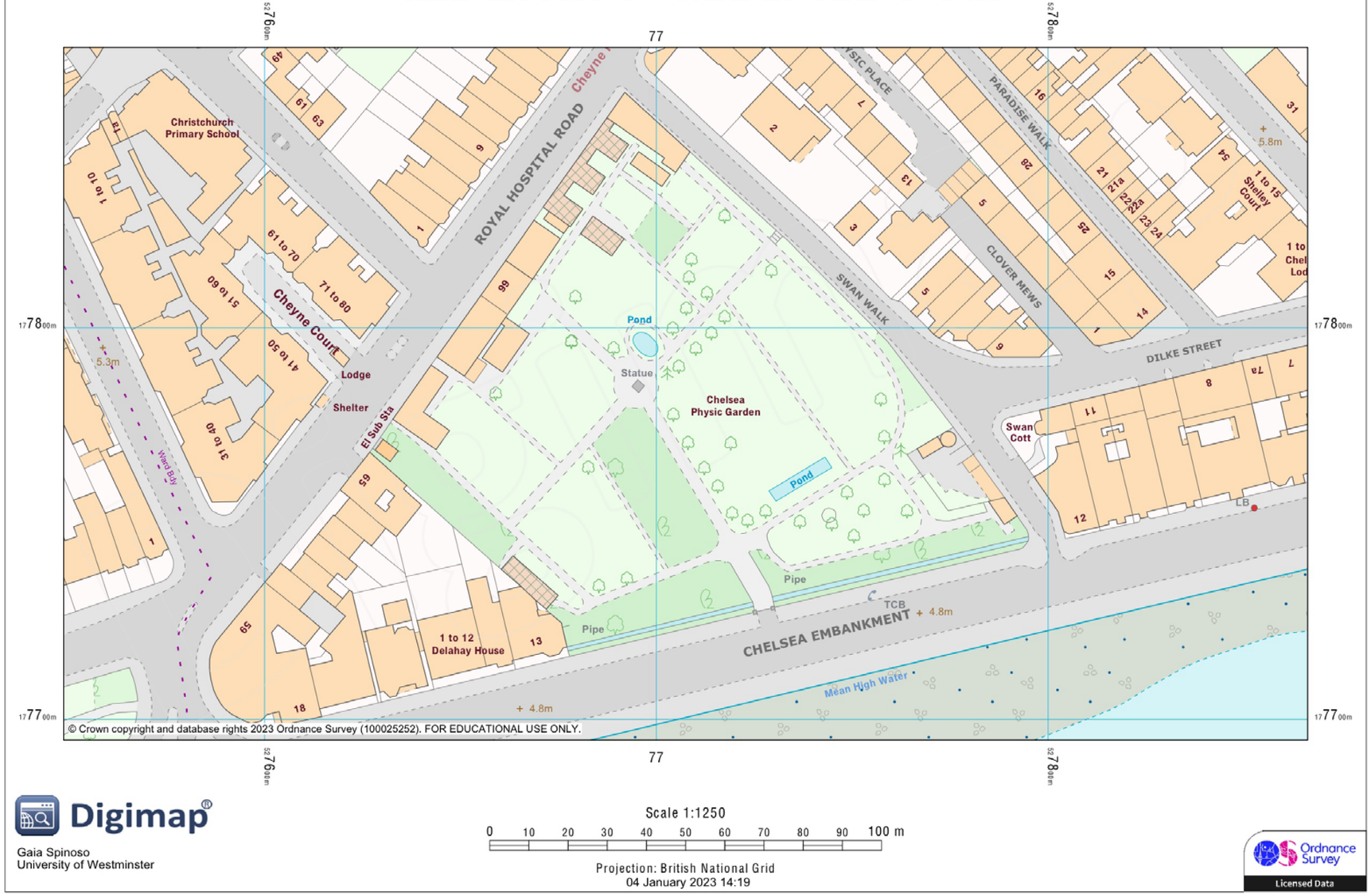


In my pavillion design I wanted to highlight the multipurpose of Cannabis Sativa. It is a plant with a very tortuos life, as in the last century it has been demonized and misjudged, but it turned out that it is a precious resource that could solve a lot of our problems.
From the textile industry to the building industry, from beauty products to medical oils to sustailable foods... hemp really is a plant that has it all. It is estimated that there are more than 50 000 different uses for this plant.

# HEMPAVILLION

Inside the Pavillion there will be weekly workshops to learn how to embroid with hemp-derived threads or intertwine them to make bracelets.
When the workshops are not held, the Pavillion is still open to visitors to work independently on their embroidery projects, or simply to enjoy a cup of CBD tea with a friend.
The space is round and small, hosting about 14 people maximum, contributing to the cozy and open atmosphere.
In the future, maybe even lectures and talks with experts could be held while enjoying the tea.

## CHELSEA PHYSIC GARDEN MAP TODAY




# CHELSEA PHYSIC GARDEN

## SITE ANALISYS

The Chelsea Physic Garden was founded in 1673 by the Apothecaries to grow medicinal plants and today is London's oldest Botanic Garden.

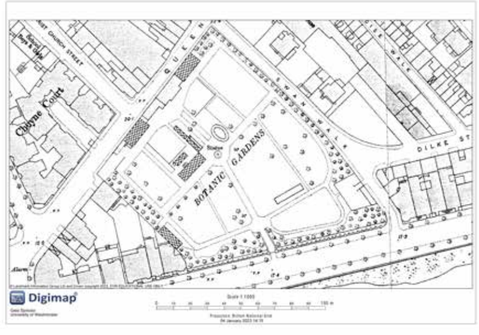
It is situated near the river Thames in Chelsea. Its unique location takes advantage of the warm air currents and rich, light soil from the river shores.
Thanks to the extraordinary microclimate it contains over 5,000 different plants with various purposes from medicinal to structural to edible.

The Garden has seen many outstanding characters taking care of its beauty, but its primary benefactor was Sir Hans Sloane: a notable collector and founder of the British Museum. Some other notable figures were Philip Miller, Robert Fortune, and Thomas Moore.

## CHELSEA PHYSIC GARDEN THROUGH THE CENTURIES

### 1870

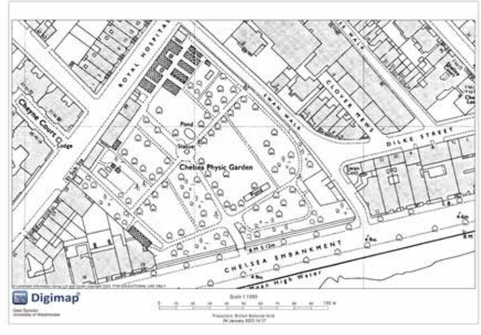

### 1890




### 1920


### 1950

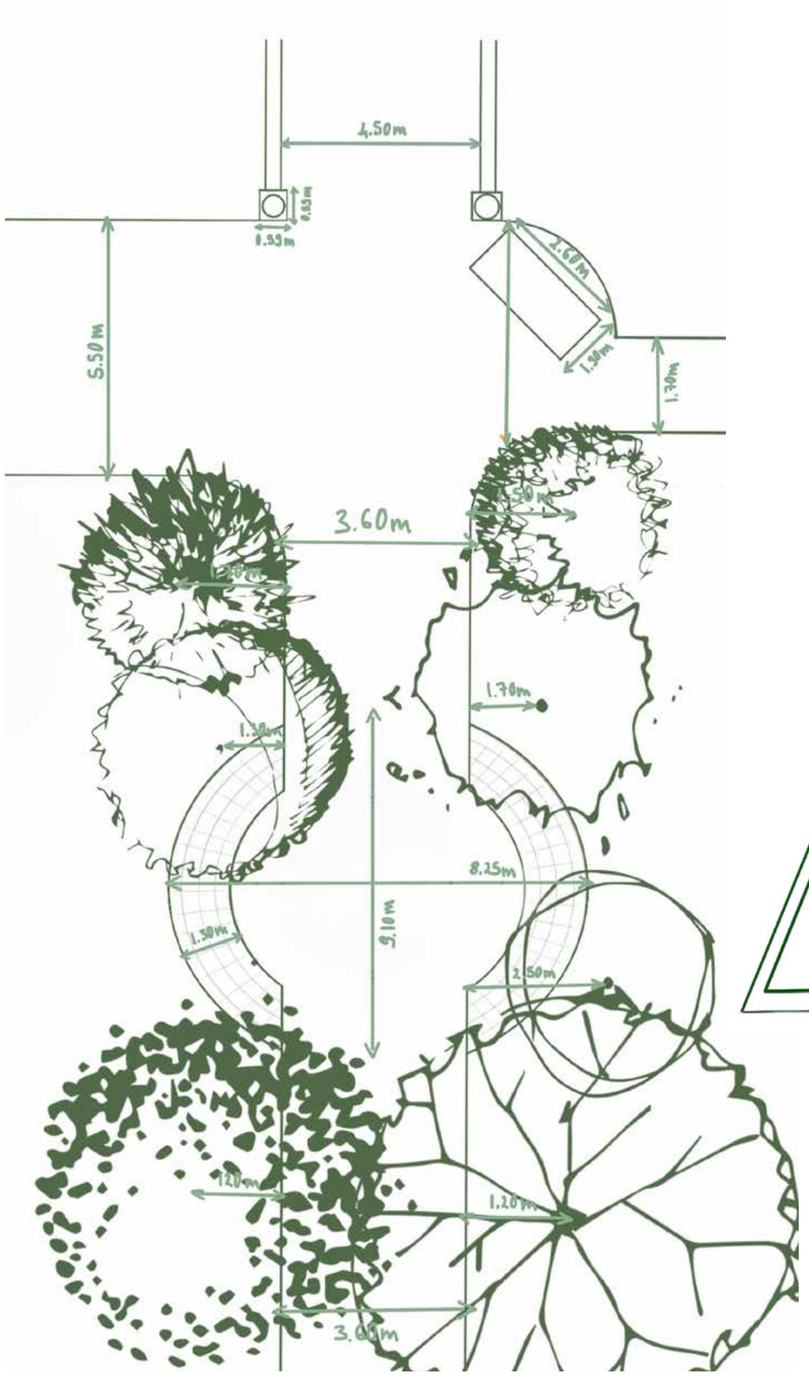

### 1970

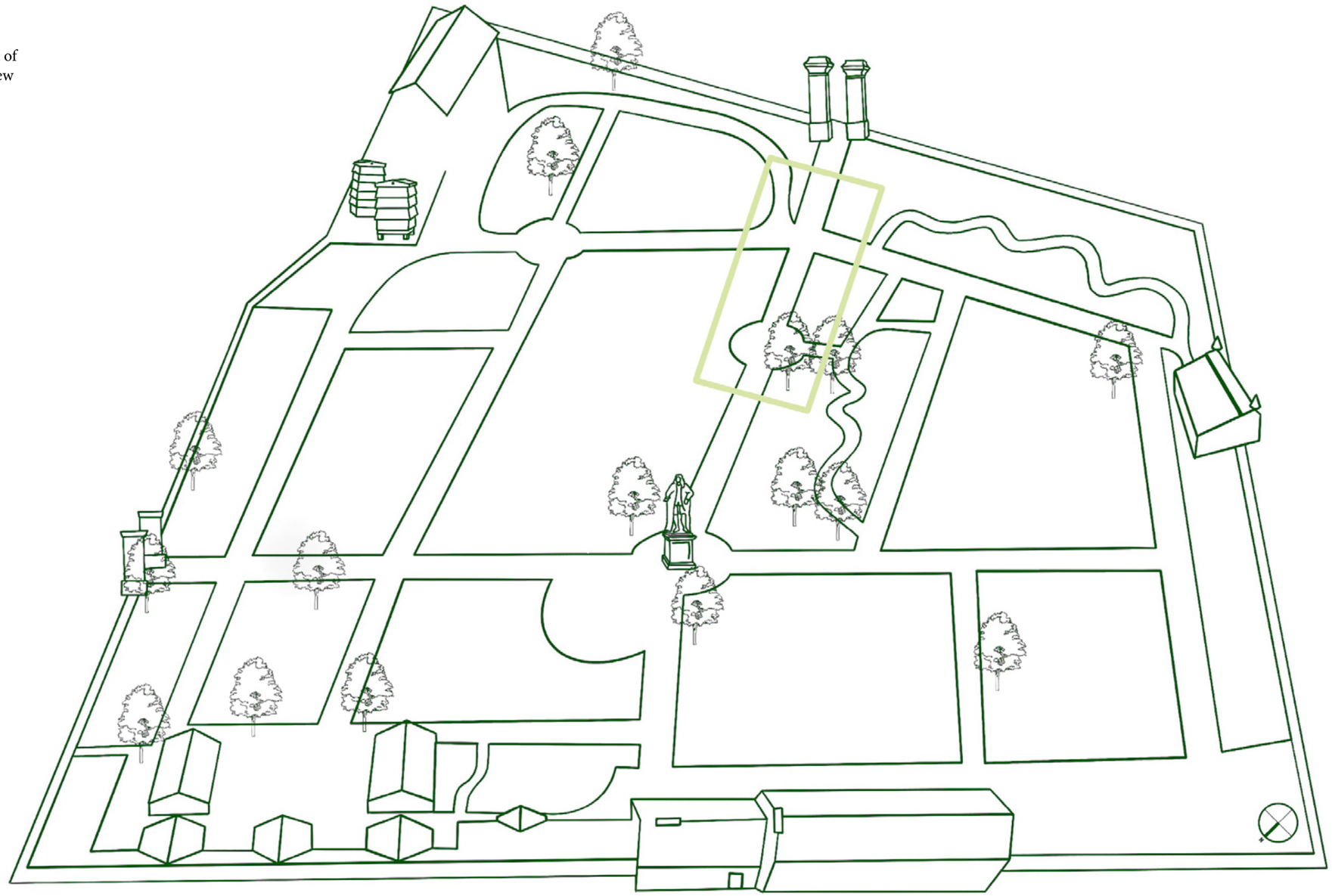


# SITE ANALYSIS

## CHELSEA PHYSIC GARDEN
## CLOSE UP OF THE SITE

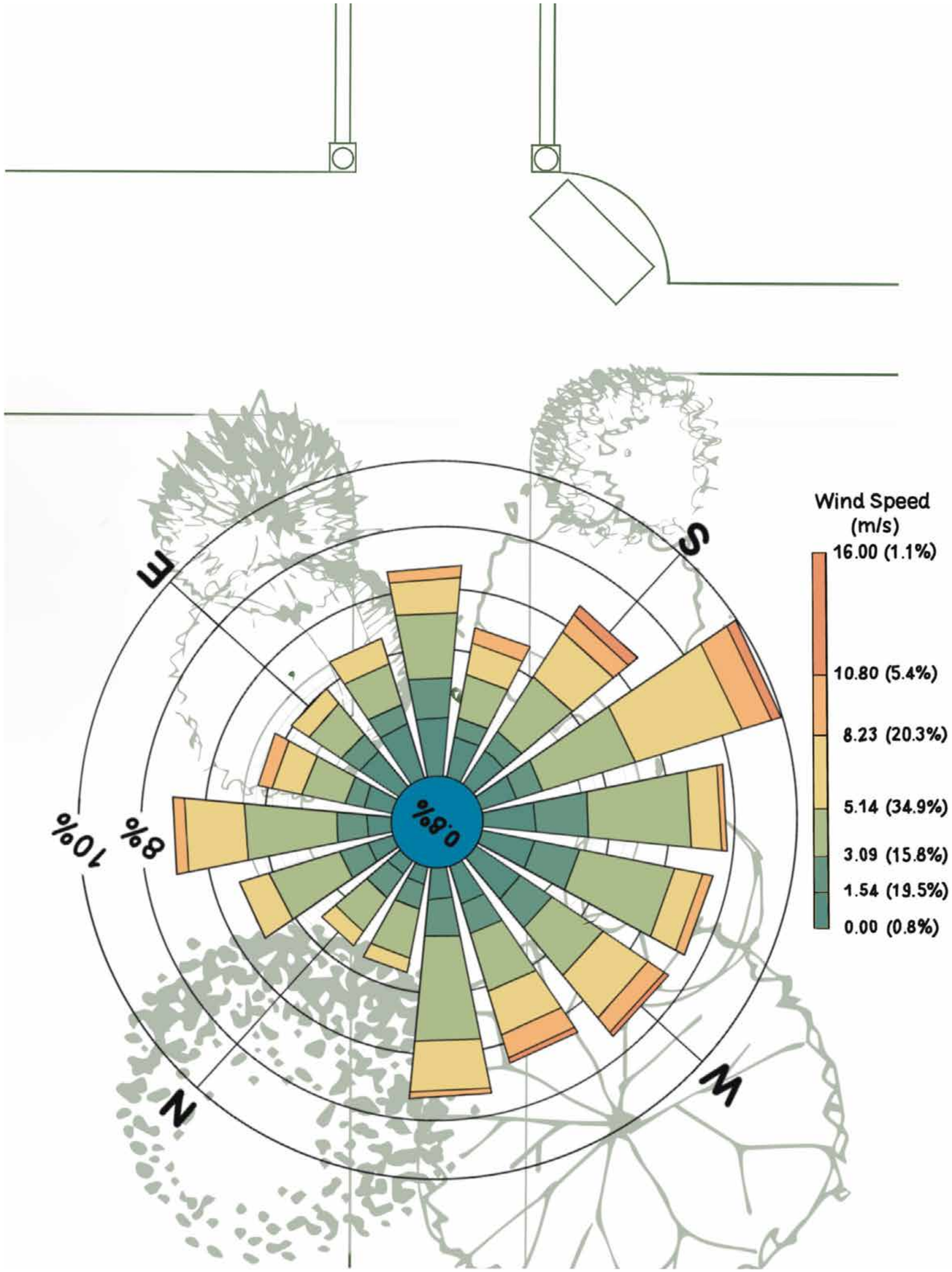
During my site analysis I investigated the measurments of the surrounding area of where I wanted to position my pavillion and then layed it out to have an top view idea of the space.



## CHELSEA PHYSIC GARDEN MAP

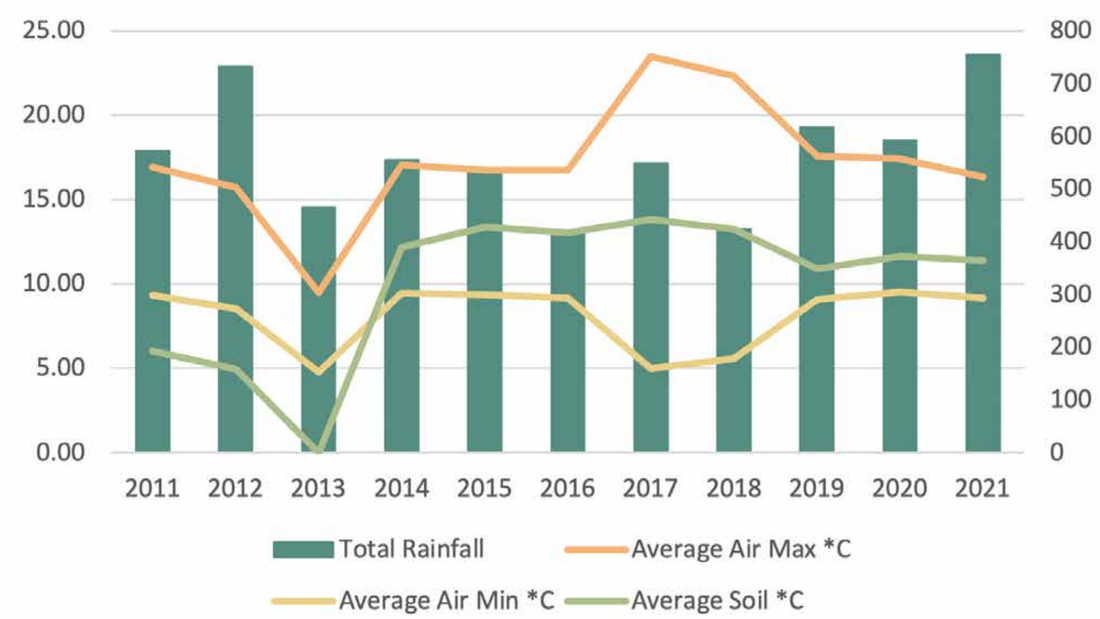
After visiting the site, I decided to develop my pavillion in the second circular square near the South Gate of the Garden. The space is surrounded by tall trees that generate a pleasant shade throughout the whole day. It is far enough from the gate to minimize the ouside noise, which is instead replaced by a gentle rustling of the leaves.




# SITE ANALYSIS

## WEATHER

### TEMPERATURE AND RAINFALL RECORD




In the Chelsea Physic Garden the main wind comes from South-West.
The Garden benefits from a particular microclimate, which is the main reason that so many exotic plants can grow, even if far away from their natural habitats.

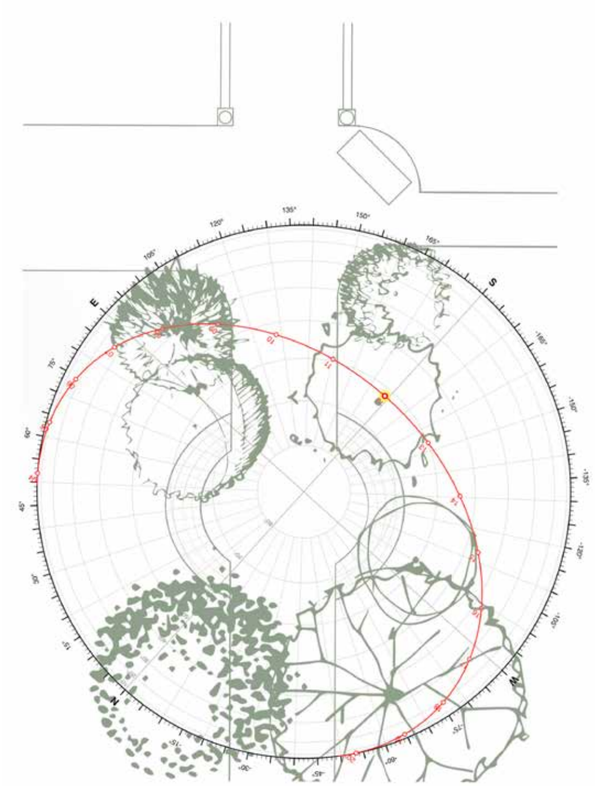
In the past decades due to climate change, the microclimate of the Chelsea Physisc Garden and many others have been changing. In the future, the Garden plans to adapt many micro-interventions to protect the environment inside their walls, as well as calling out other gardens to help the join the fight against this huge issue.

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average Air Max *C** | 16.92 | 15.73 | 9.48 | 17.06 | 16.76 | 16.76 | 23.48 | 22.36 | 17.60 | 17.43 | 16.36 |
| | | | | | | | | | | | |
| **Average Air Min *C** | 9.35 | 8.55 | 4.78 | 9.44 | 9.38 | 9.17 | 5.01 | 5.57 | 9.09 | 9.53 | 9.16 |
| | | | | | | | | | | | |
| **Average Soil *C** | 6.03 | 4.97 | 0.00 | 12.17 | 13.38 | 13.04 | 13.82 | 13.28 | 10.89 | 11.63 | 11.42 |
| | | | | | | | | | | | |
| **Total Rainfall** | 572.8 | 733.5 | 465.95 | 556.45 | 541.2 | 416.55 | 549.45 | 424.8 | 617.7 | 593.3 | 755.4 |

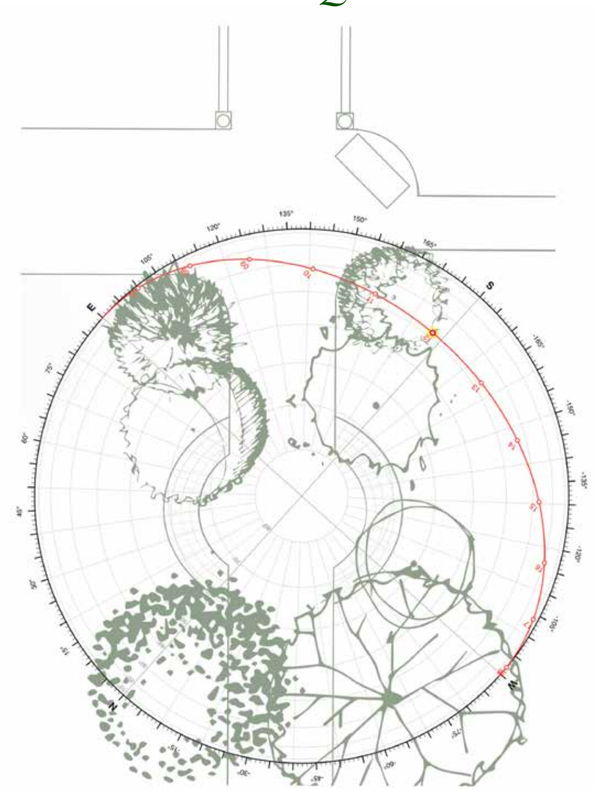
# SITE ANALYSIS

## SUN PATHS

### SUMMER SOLSTICE

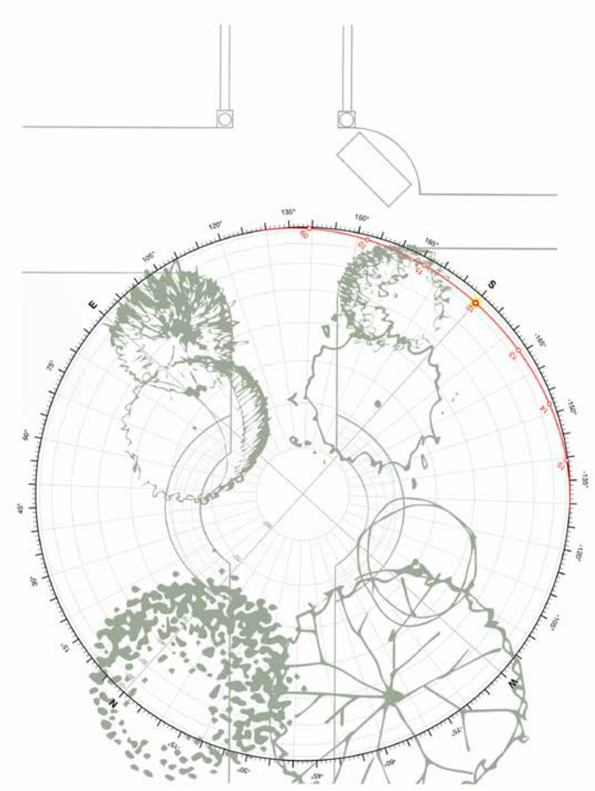


### AUTUMN EQUINOX

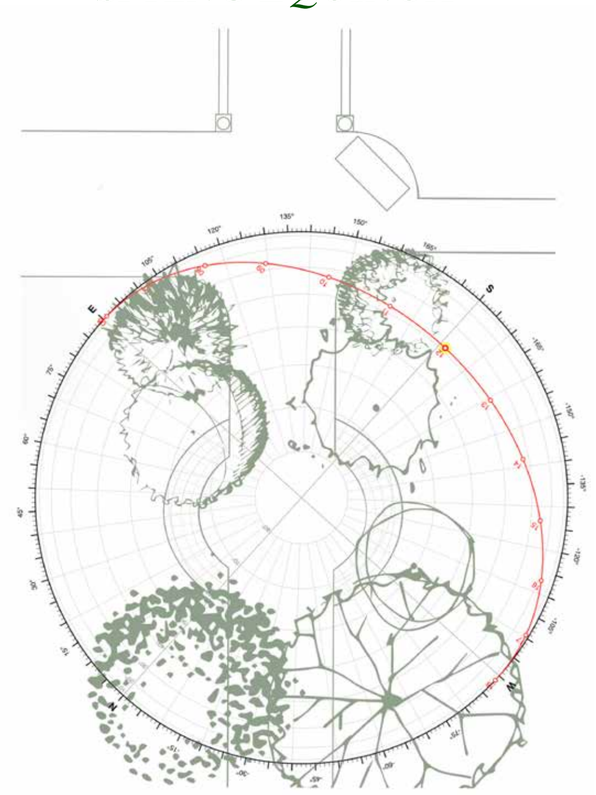


### CHELSEA PHYSIC GARDEN SATELLITE VIEW


### WINTER SOLSTICE



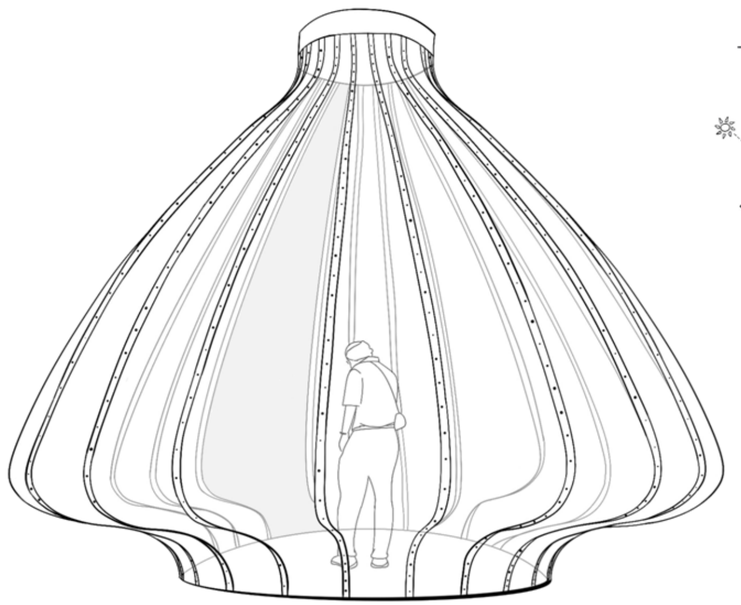
### SPRING EQUINOX

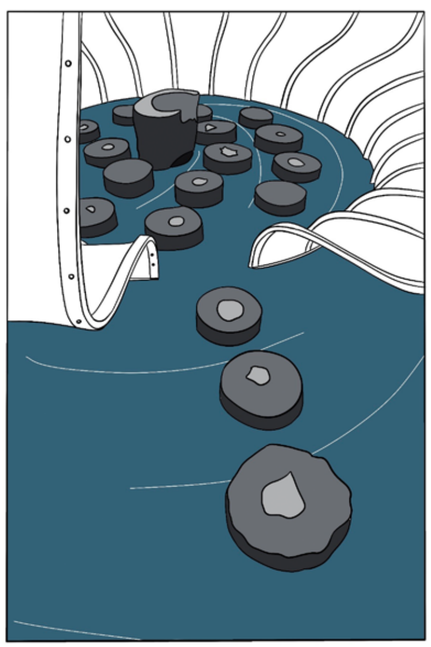


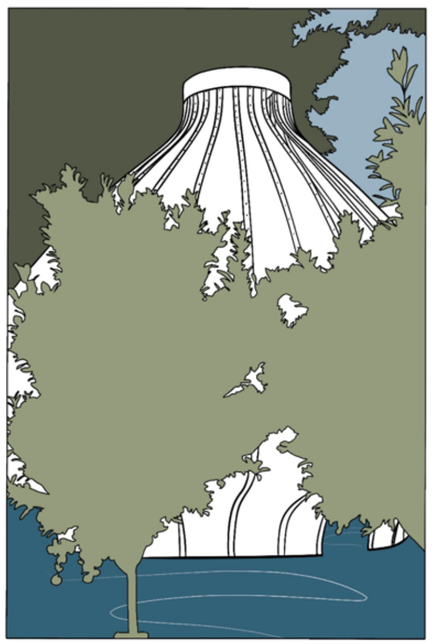
# PRECEDENTS

## *JARDIN DES HESPERIDES*

*Metis Garden Festival, Metis-sur-Mer (Quebec), 2006*
*by Andy Cao and Xavier Perrot*

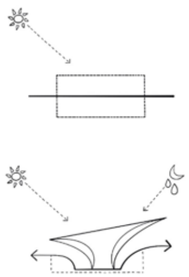


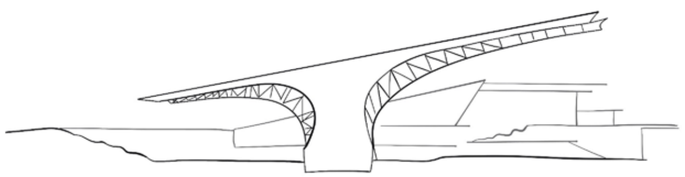


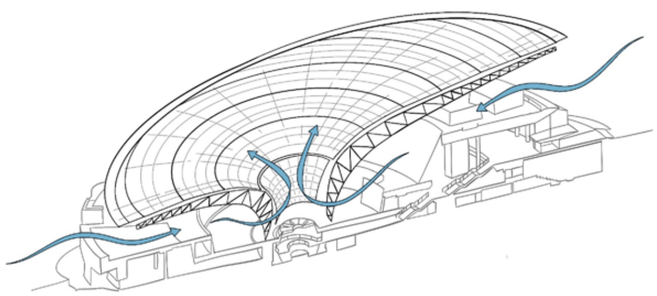


## *TERRA*

*The Sustainability Pavillion Expo 2020 Dubai*
*by Grimshaw Architects*

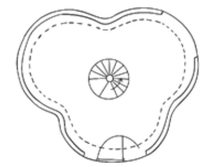


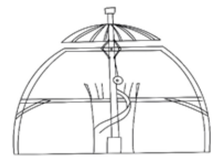


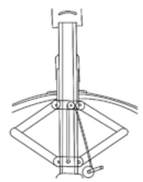


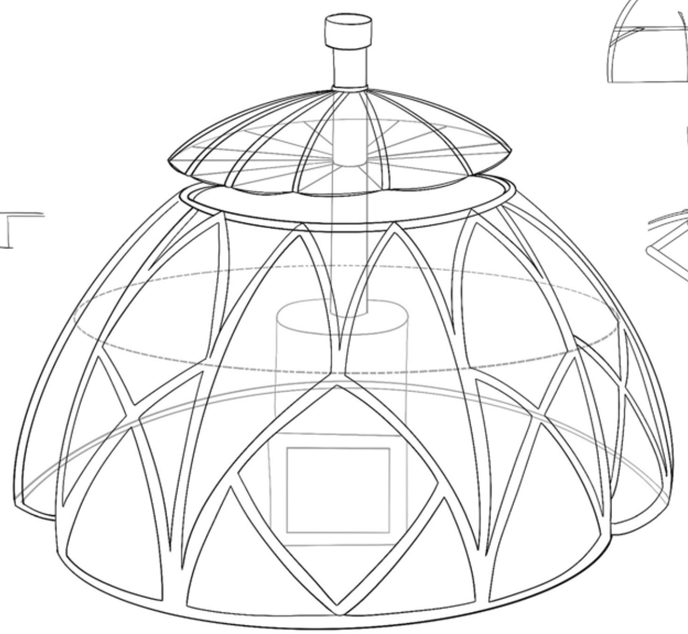
## *TRIDOME*

*Ipotherical project of the Vegetal City by Luc Schuiten*





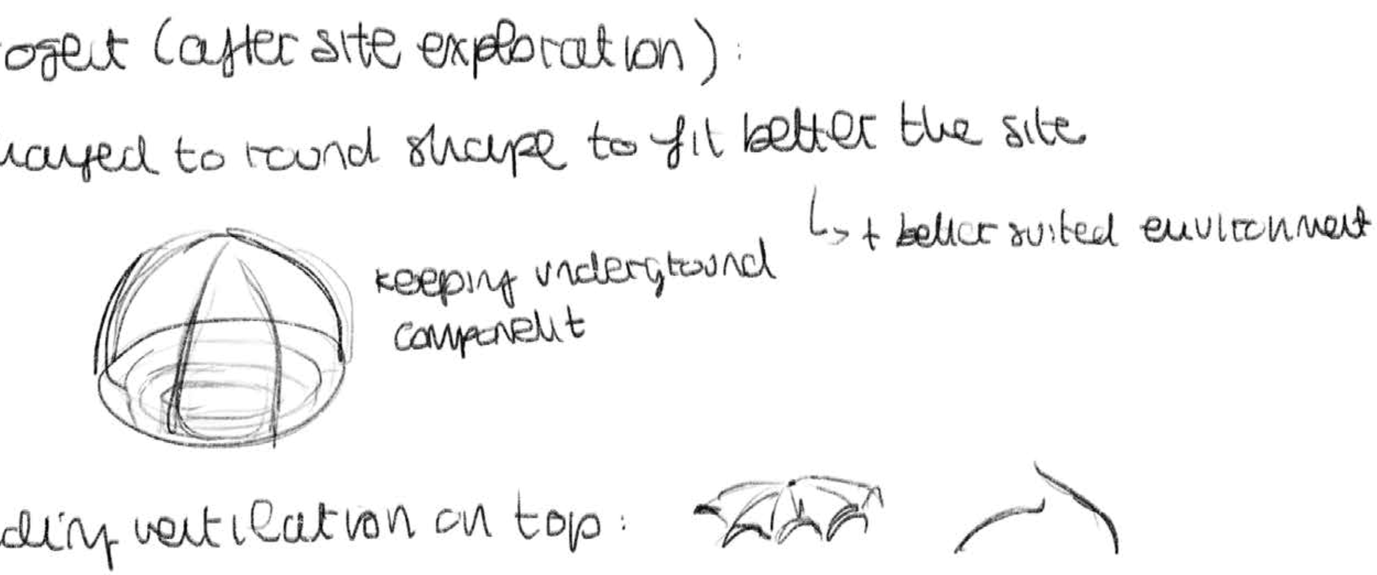




*I explored thee main precedents:*
*Jardin des Hesperides and Tridome for their shapes,*
*and Terra for its isolation and ventilation properties.*

# DESIGN DEVELOPMENT

*PAVILLION*




I started from a shape similar to the one of my Vernacukar, but after the site visit I decided to change the shape to the one of a circle.
I really liked the idea of developing a part of the pavillion underground, but first I decided to work on the outside. I liked the idea of the pavillion resembling a closed flower, but I wanted to incorporate the environmental characteristics of my Vernacular, so I studied different dome shapes and how they interacted with the wind. In the end I settled for Option 2.

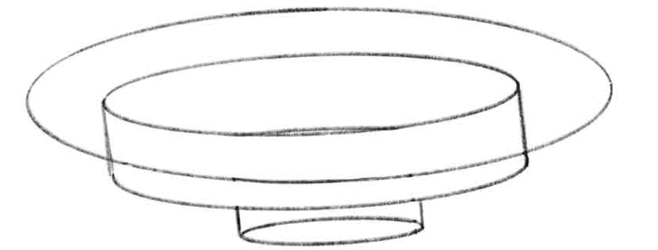
Option 1

Option 2

# DESIGN DEVELOPMENT

*PAVILLION*

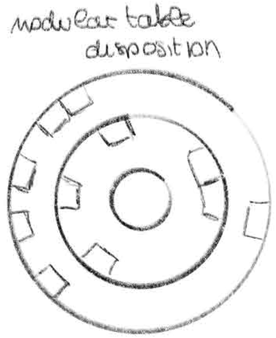
## underground part exploration :



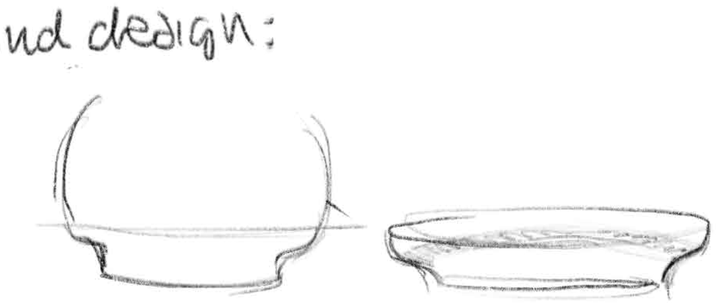
6m

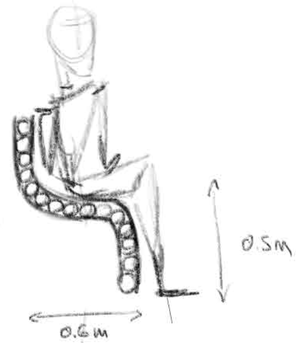
space not really suitable → not enough to be comfortable

tea furnace → fire hazard




## 2nd design :

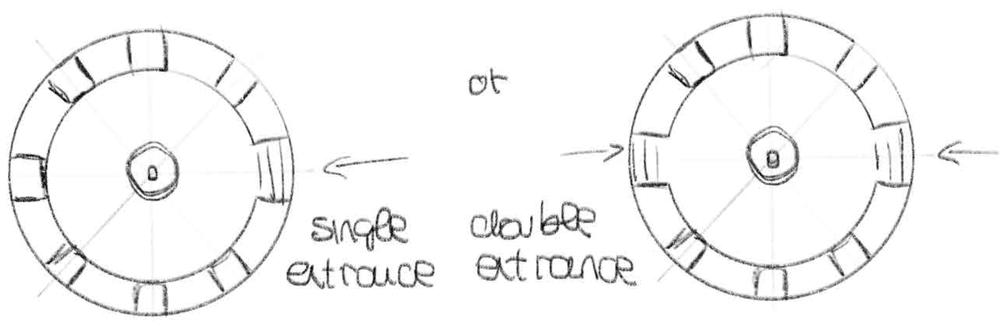





→ change of activity → embroidery + CBD tea served

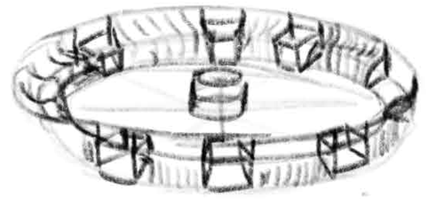
only one "step" → bench for people to sit

## 3rd design :



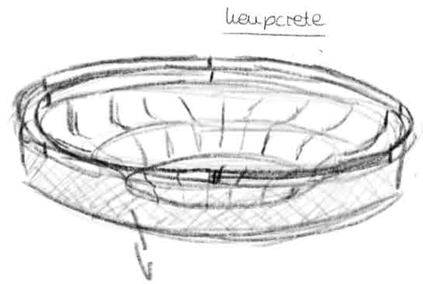

addition of tables for storage and surface space to put tea servings + central round table and pole for structure

UNDERGROUND DEVELOPMENT 2



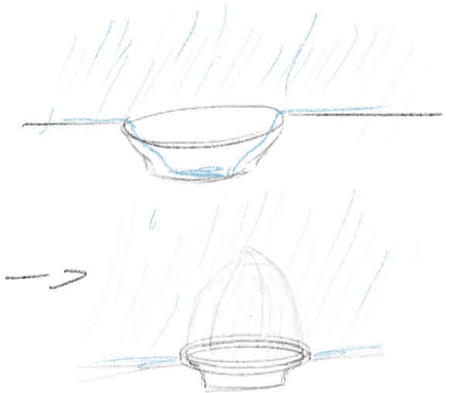
central table + side tables

ISOLATION




isolation layer with beucrete

## flooding prevention.



→ higher than the groun

the addition of a step to prevent water from getting inside

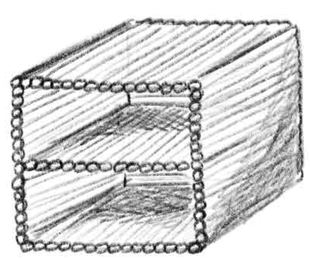
also isolates bamboo from getting wet

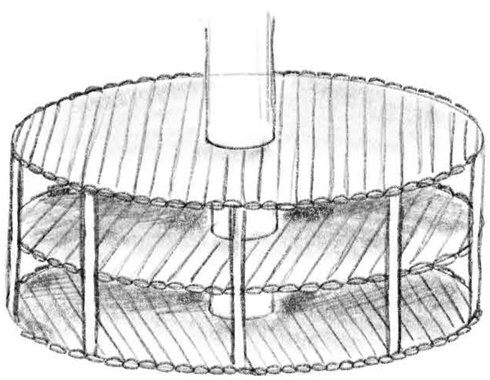
material : compacted beucrete (?)

## Furniture design :

ROUND CENTRAL TABLE

TABLES



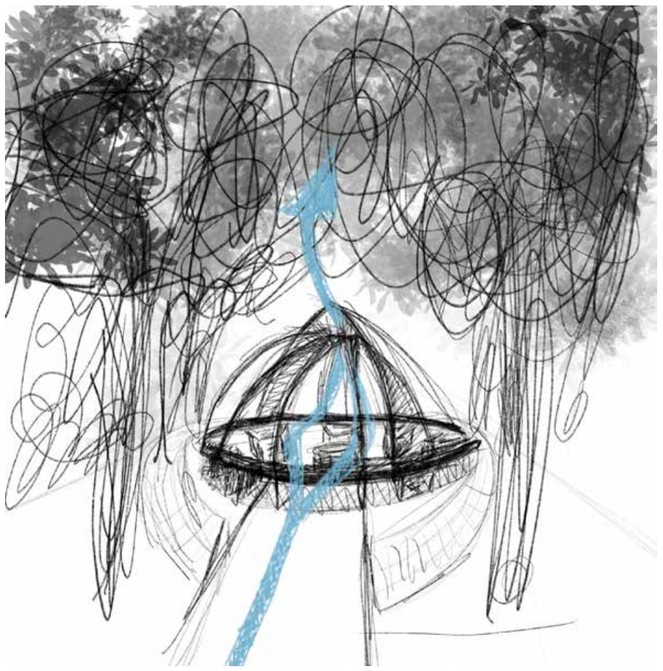


# DESIGN DEVELOPMENT

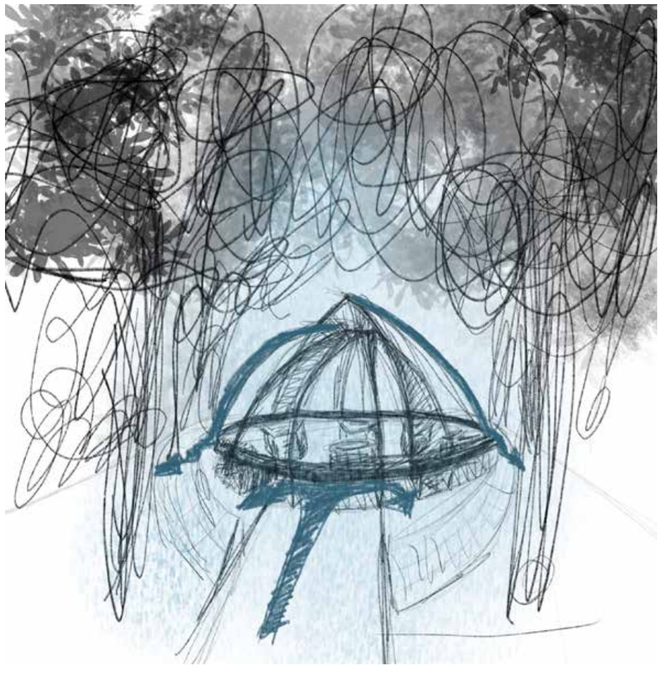
## *PAVILLION*

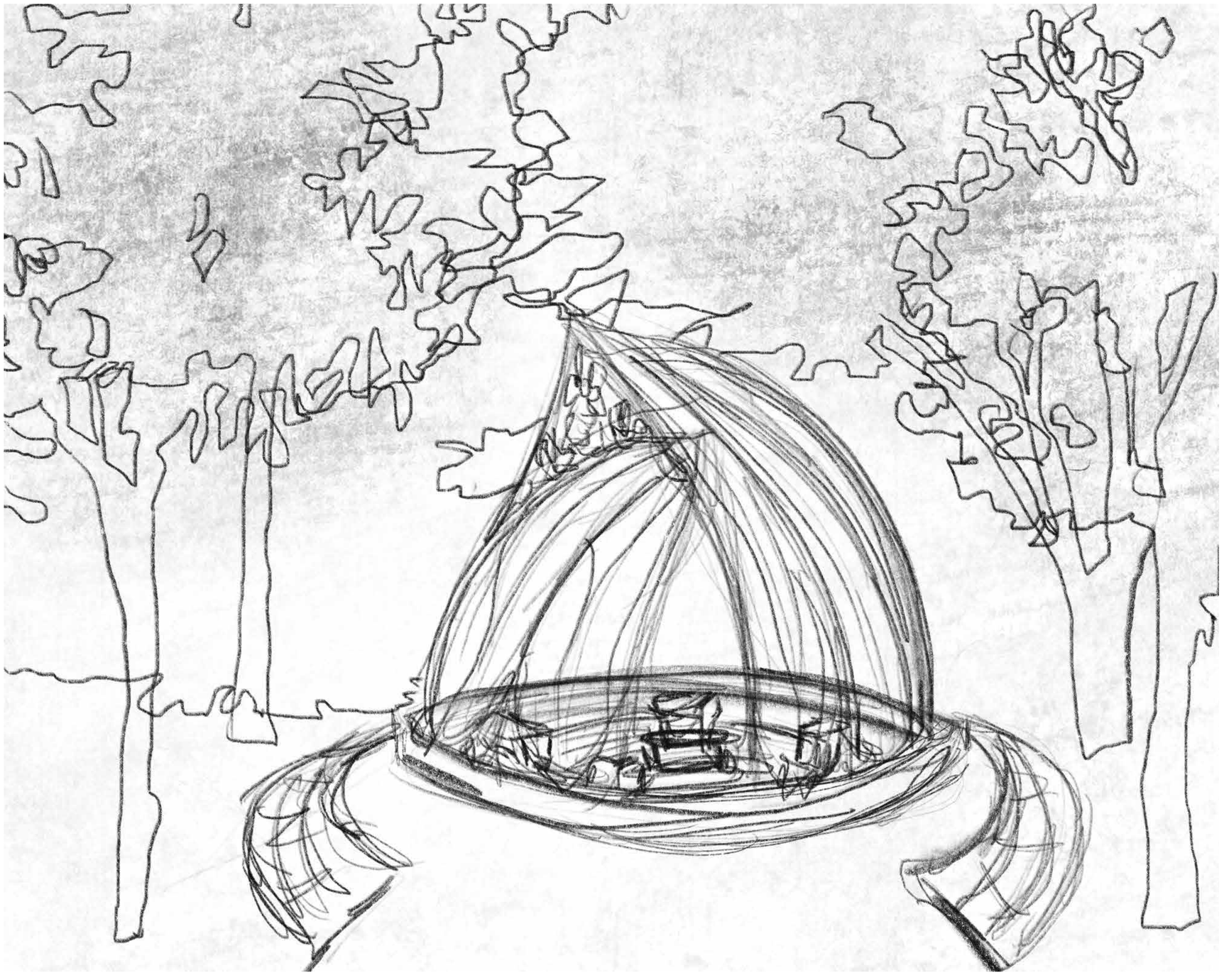
I created some sketches of the pavillion in site to have a general idea of how it would interact with the environment.
I also sketched the air cycle and how it would repel water as the structure is slightly raised froom ground level.

### *AIR FLOW*



### *PRECIPITATIONS PROTECTION*





# MATERIALITY

*PAVILLION*

## ETFE

→ structural integrity achieved by placing the materials in tension

- lightweight
- flexibility / elasticity
- free form
- cost efficient

→ how ways of printing it
→ single skin
↳ design

## PRE-STRESSED SINGLE LAYER STRUCTURE

- can span large areas
- does not carry a heavy load on its own
- need to be supported by cables → 2-3 feet spacing for each
- no insulation performances
- mostly designed as a flat element

## BENEFITS OF TENSILE ARCHITECTURE

thermal performance, flexible design aesthetics, outstanding translucency, excellent durability, light weight nature, reduce solar heat gain, low maintenance, cost effective, code compliance, variety of performance, sustainable

## HEMP FABRIC

↳ sustainable textile made of fibers from the cannabis sativa

one of the most versatile and durable fibers:
- tents
- rugs
- ropes

(+ many other uses)

## BEESWAX

↳ natural wax produced by honey bees (Apis)

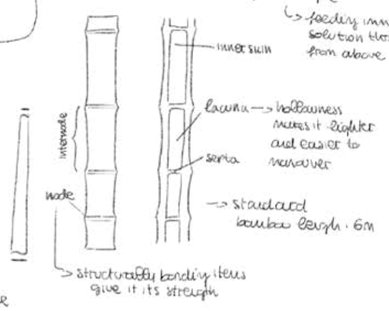
used to make materials stiff and water proof

→ beeswax will cover the hemp fabric on the outside of the pavillion

## STRUCTURE

→ treated with floating technique
↳ feeding immunization solution through internodes from above

bamboo
- is a grass, not a tree
- ↳ part used is the base (has a regular diameter)
- high compression strength
- high tensile strength




→ stronger on the outside

| | layers | | |
|---|---|---|---|
| | inner | middle | outer |
| fiber | 10% | 30% | 60% |
| basic tissue and water tubes | 90% | 70% | 40% |
| ratio | 1 | 3 | 6 |

more use of flexible thin poles
↳ longer and curved length

Species of bamboo:

GUADUA

- very good structurally
- light, strong, durable
- consistent in width and visually pleasing

TECHNICAL INFORMATION

name: Guadua angustifolia

height: 15 - 30 m

diameter: 7 - 18 cm → average diameter at base: 12 cm

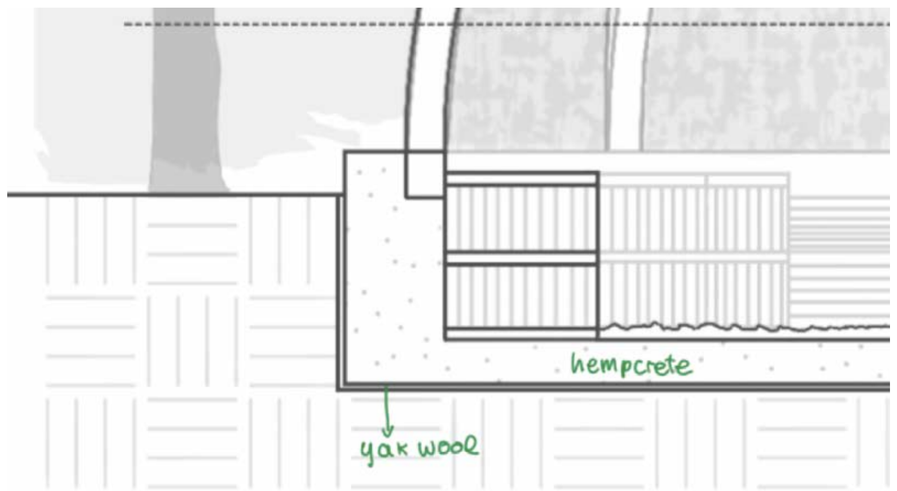
main characteristics
↳ thick white bands around the nodes

PRING WULUNG

↳ color: black / green

diameter: 9 cm

more suited for furniture use

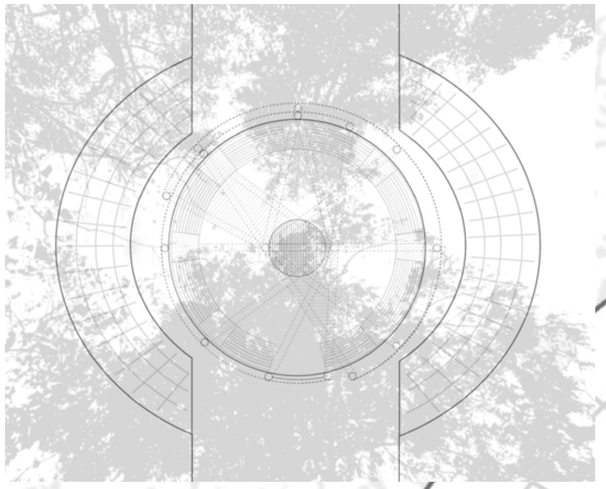



Section A-A

I spent a lot of time carefully studying which materials I would use for my pavillion. I wanted to highlight the enourmous variety of hemp in both the building and textile industries.
I opted for hemp fabric covered with a layer of beeswax to make it waterproof as the fabric for the biggest half-dome of my pavillion. For the smaller half-dome I decided to use ETFE for its lightweight and transparency, so that the pavillion would not need artificial light. To support the material I implemented copper cables to hold the curve of the structure.
The undergound part is made out of hempcrete, an amazing isolating material made from hemp fibers and a lime based binder. Although it is not waterproof, therefore I added a layer of yak wool, a waterproof material, taking inspiration from the Vernacular Tibetan Black Tent. The area below the ground also shields from water the bamboo structure that holds up the superficial area, preventing it from rotting.
I chose the Guadua species of bamboo, thick and resistant, for the main architecture and Pring Wulung, a bamboo characterized by its dark green/black color, for the furniture inside. The external poles of Guadua hold a hemp-derived rope, intertwined in a floral motive, recalling to the embroidery activity of the pavillion.
The inside floor is covered by a hemp-derived carpet, visitors should remove their shoes upon arrival.

# PAVILLION

*PLAN*



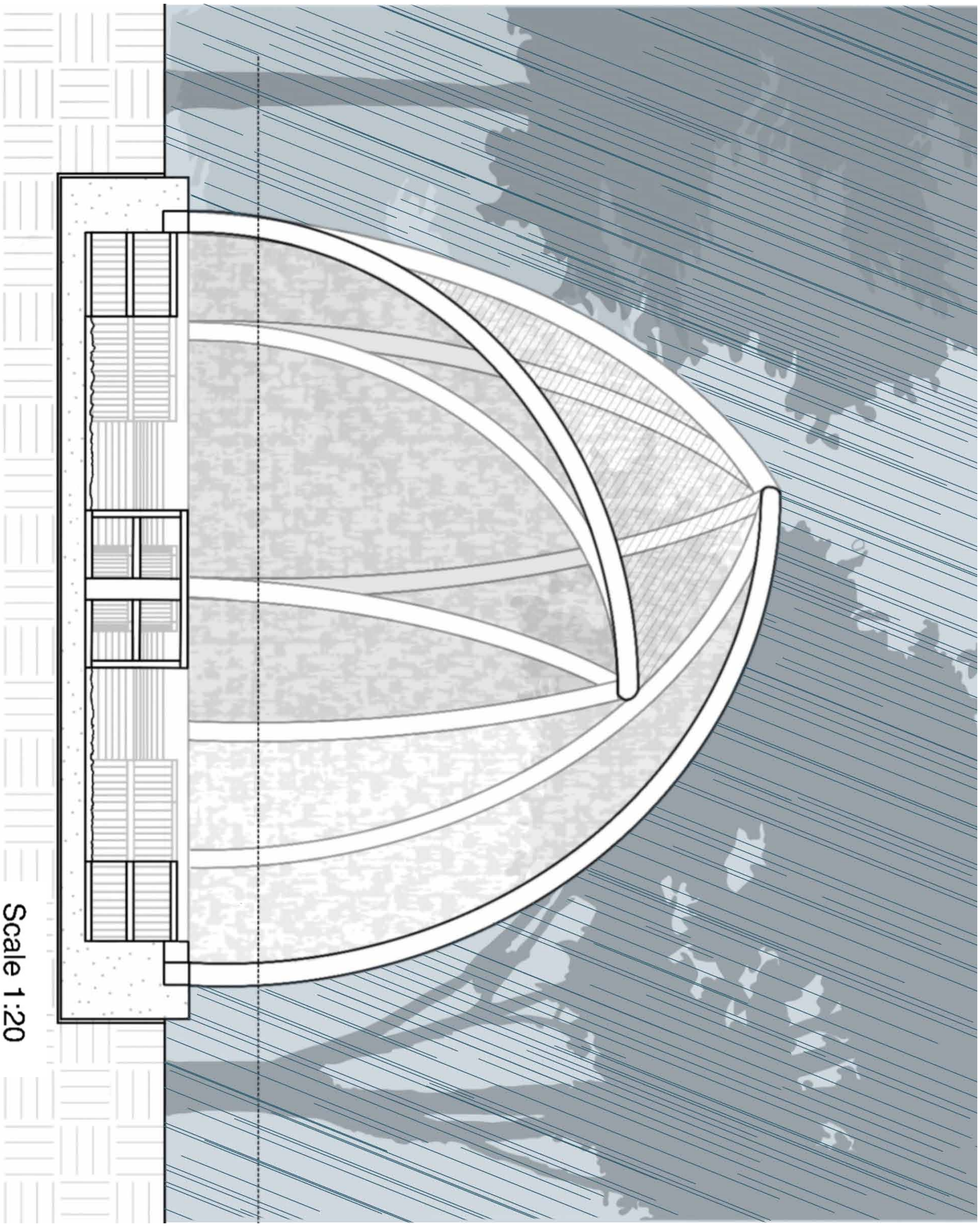
Top view and tree shade areas

Scale 1:20

1.2 m

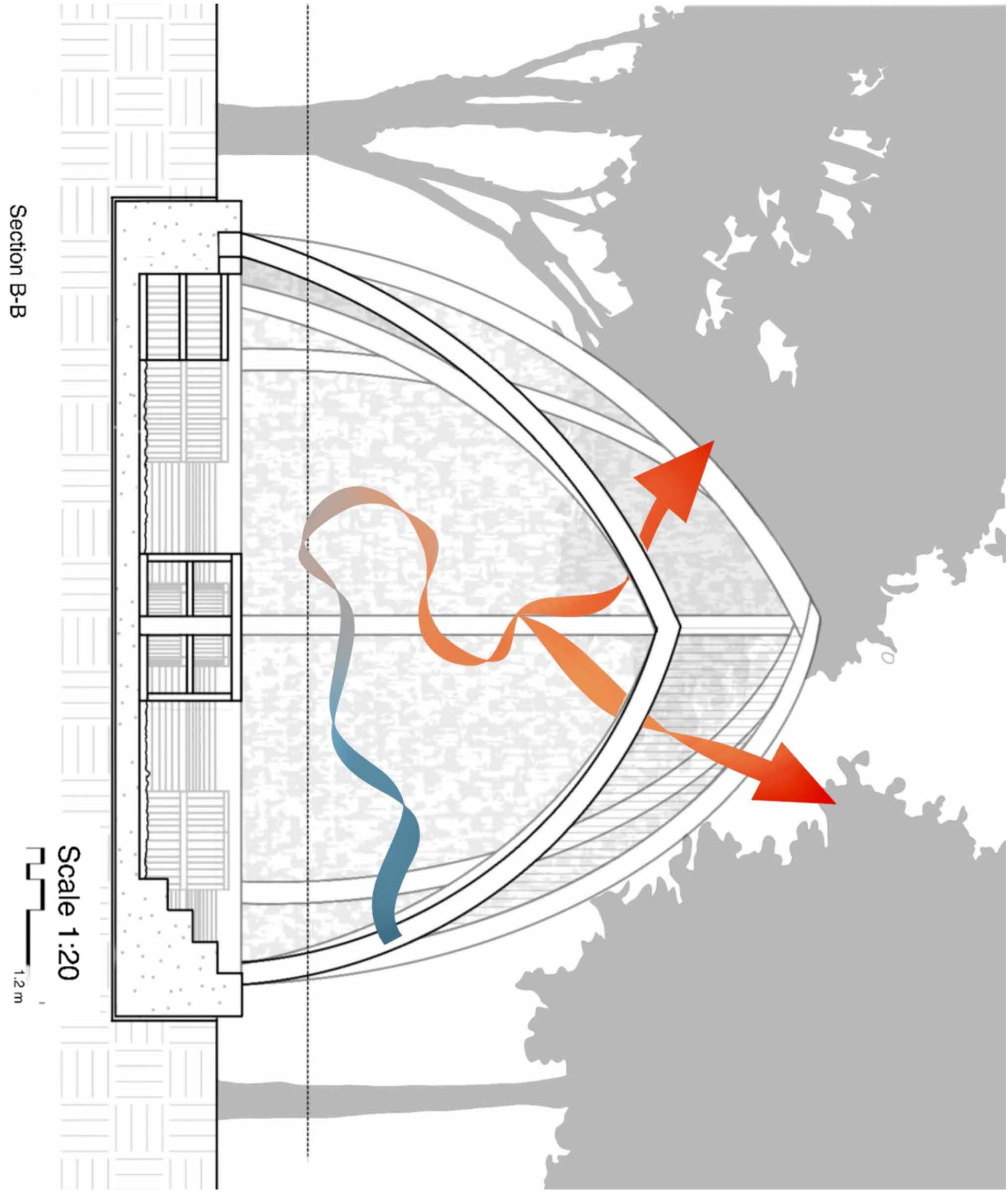
# ENVIRONMENTAL SECTION

*PAVILLION*



# ENVIRONMENTAL SECTION

*PAVILLION*

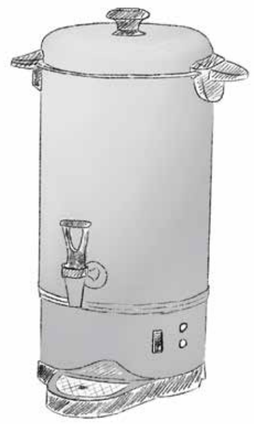


# ACTIVITIES

*PAVILLION*

## *TEA MAKING*

I wanted my pavillion to feel cozy and safe. Serving tea, especially CBD infused tea helps the body relax and melt into the orgnic space, making us reconnect with nature and our loved ones. Together with Cannabis tea, Tibetan butter tea is served, a typical beverage from the Tibetan Nomads. Just grab a pottery set at the centre table and bring it to one in the round bench and enjoy it with your guest.

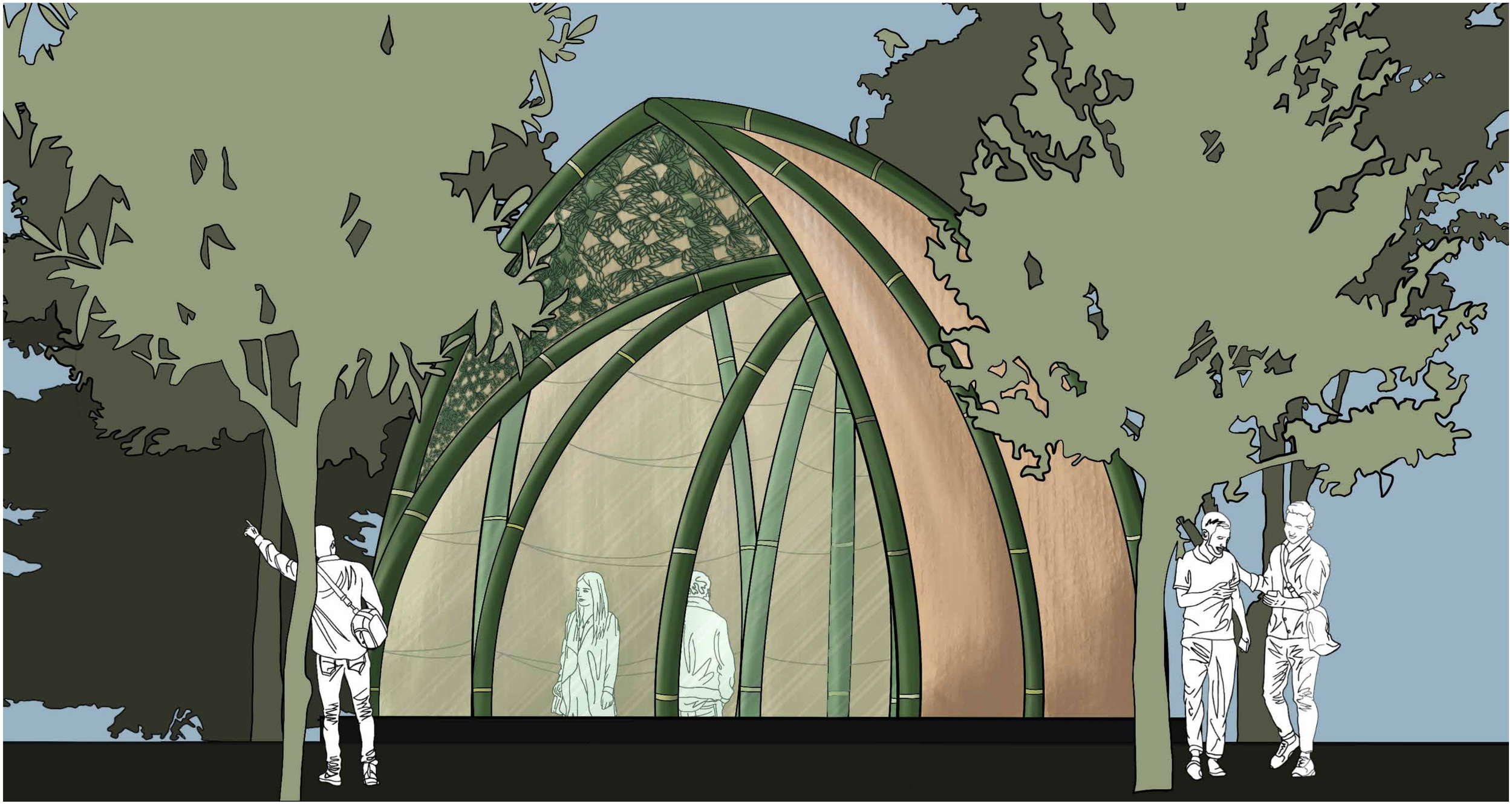



## *EMBROIDERY*

If just chatting is not enough, to keep the hands busy there's embroidery workshops held weekly, or one can work on their own project. In this case as well, the bottom shelves of the round centre table host a variety of materials for embroidery and bracelet making. The string used is all derived from Cannabis Sativa fibers to demonstrate one of the many uses of hemp in the textile industry.

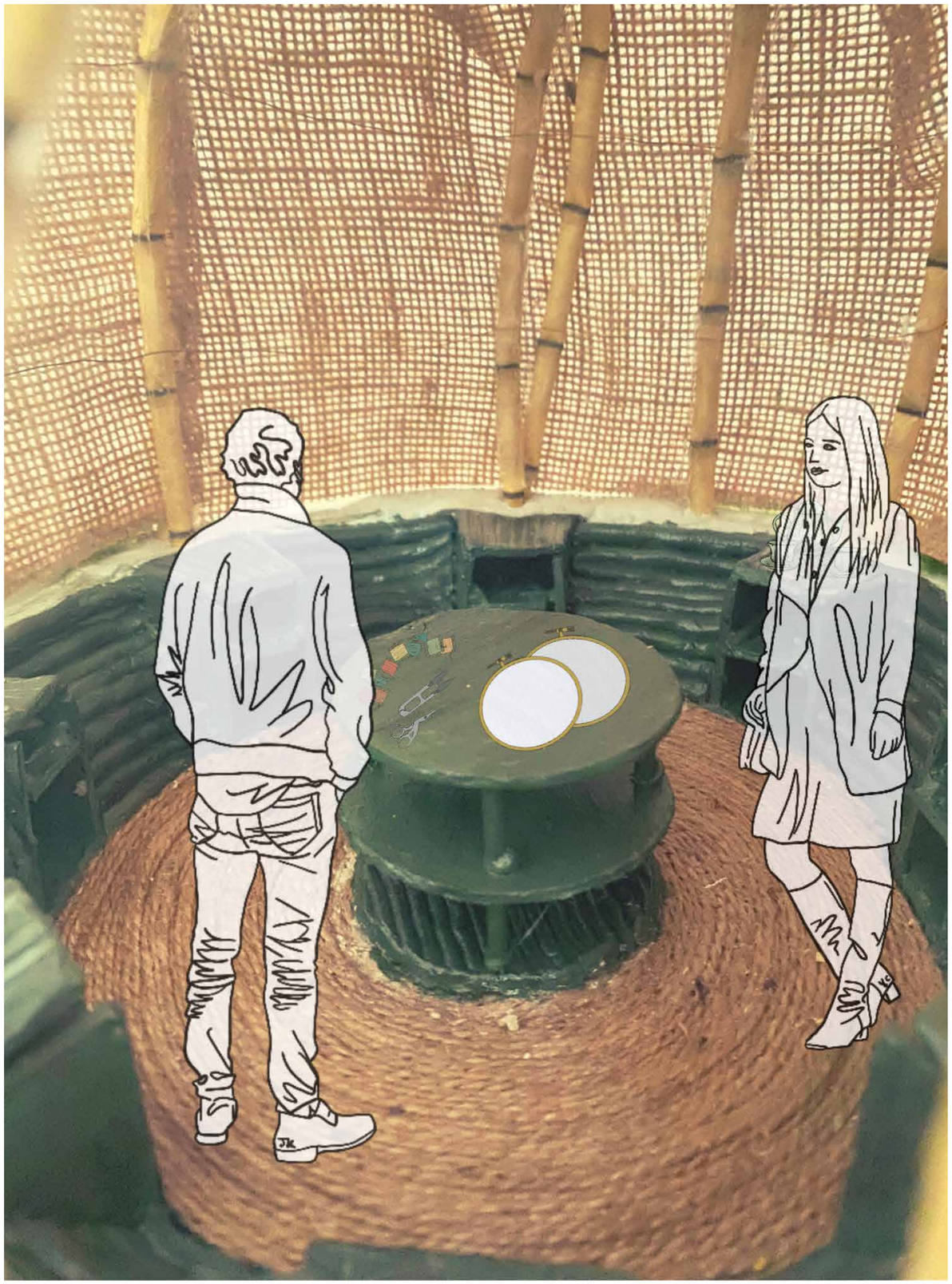
# ELEVATION IN CONTEXT

*PAVILLION*



# PAVILLION MODEL

# COLLAGE



# EXPLORATION SKETCHES

*I explored many shapes that looked interesting to me for the base of my Pavillion. Later on I chose the final proposal and started sketching the orthogonal projection and explore different types of rope embroidery.*