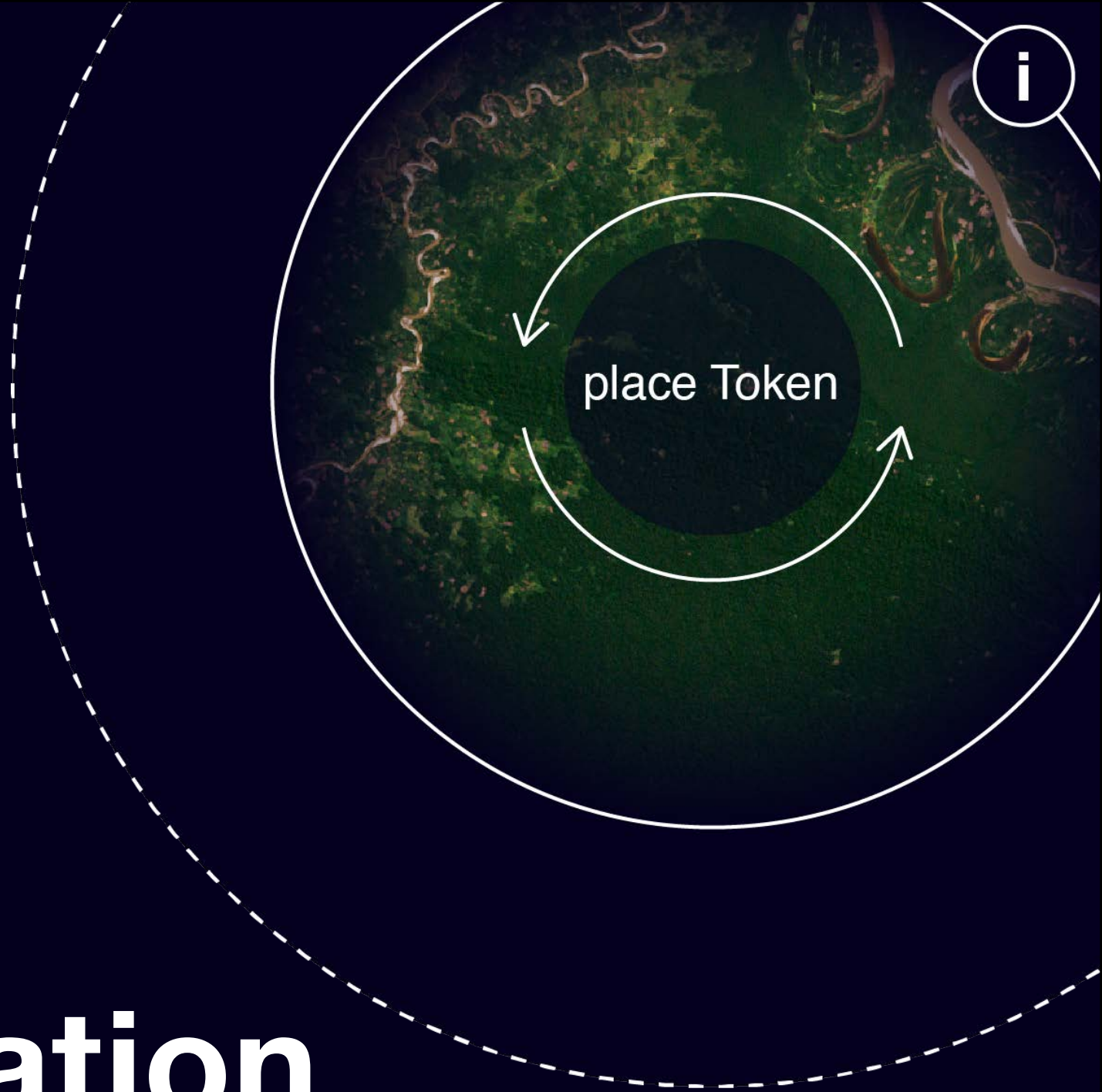Students:
Audrey Lohmann
Luis Praxmarer
Sonja Cowley

Mentors:
Jürgen Späth
Marcial Koch

Collaboration Partners:
ETH Crowther Lab
ETH *focus*Terra
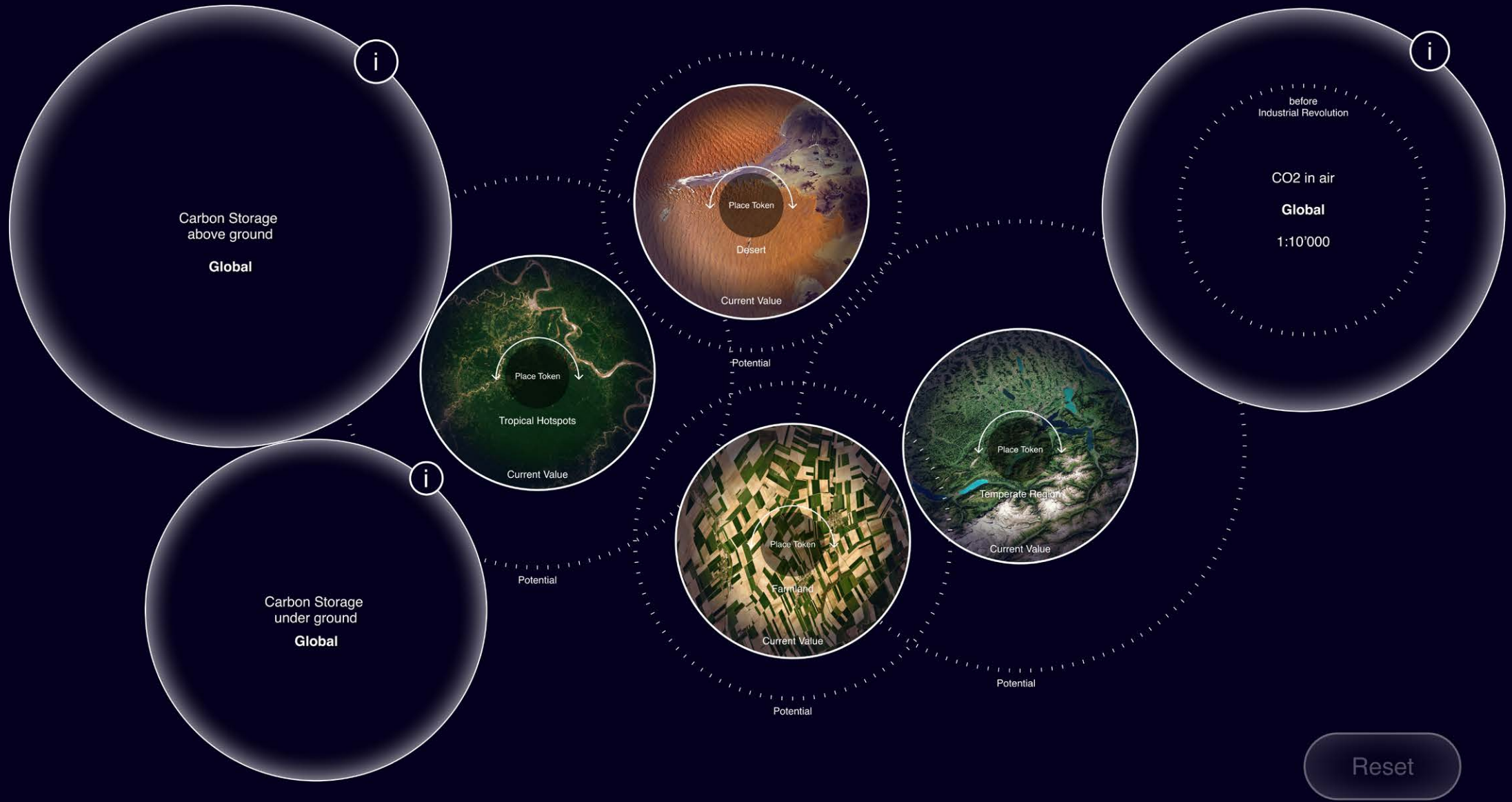
Fall Semester 2022
Data Visualisation

place Token

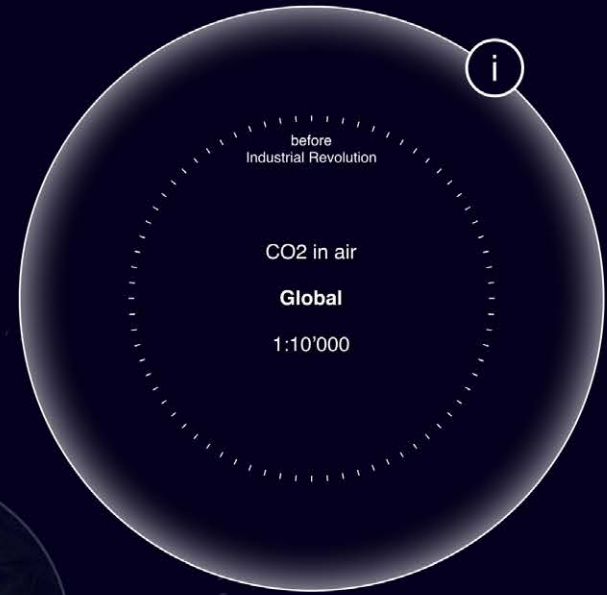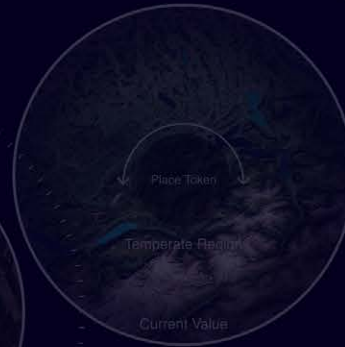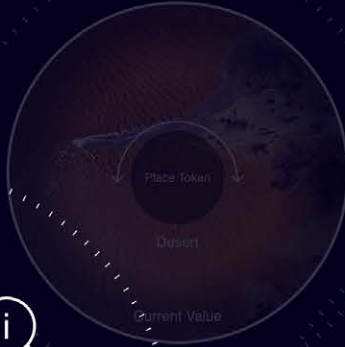# Data Visualisation

Abstract

We visualised data for the interactive touch table in collaboration with the ETH Crowther Lab and ETH *focus*Terra. With our project, we aim to give information about current CO_2 storage and the restoration potential in places so called Hotspot areas around the world. We have displayed the restoration potential in CO_2 storage in vegetation and soil, meaning the planets natural above and underground resources. We have tried to make this nature-based CO_2 storage potential understandable and explorable with an easy playful interactive data visualisation interface.

Carbon Storage
above ground

Global

Place Token

Desert

Current Value

before
Industrial Revolution

CO2 in air

Global

1:10'000

Place Token

Tropical Hotspots

Current Value

Potential

Place Token

Temperate Region

Current Value

Place Token

Farmland

Current Value

Potential

Carbon Storage
under ground

Global

Potential

Potential

Reset

Starter screen

Carbon Storage
above ground

Tropical

Carbon Storage
under ground
Tropical

Place Token

Desert

Current Value

Potential

Place Token

Tropical Hotspots

Current Value

Potential

Place Token

Farmland

Current Value

Potential

Place Token

Temperate Region

Current Value

Potential

before
Industrial Revolution

CO2 in air

Global

1:10'000

Reset

Token on hotspot

Carbon Storage
above ground

Tropical

Carbon Storage
under ground

Tropical

Place Token

Tropical Hotspots

Current Value

Potential

Desert

Current Value

Potential

CO2 in air

Global

1:10'000

before
Industrial Revolution

Place Token

Temperate Region

Current Value

Place Token

Farmland

Current Value

Potential

Reset

Increased potential of one hotspot

Carbon Storage
above ground
Global

Carbon Storage
under ground
Global

Place Token
Desert
Current Value
Potential

Place Token
Temperate Region
Current Value
Potential

Place Token
Tropical Hotspots
Current Value
Potential

Place Token
Farmland
Current Value
Potential

before
Industrial Revolution
CO2 in air
Global
1:10'000
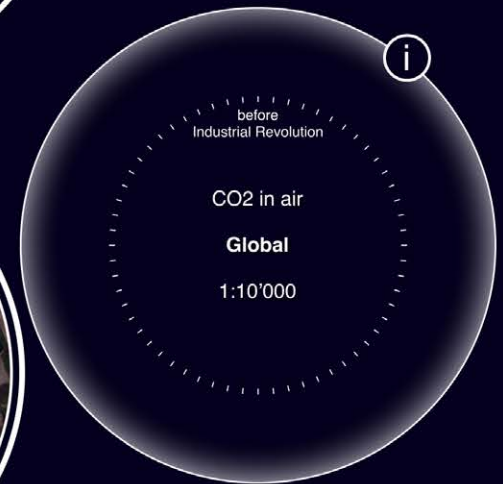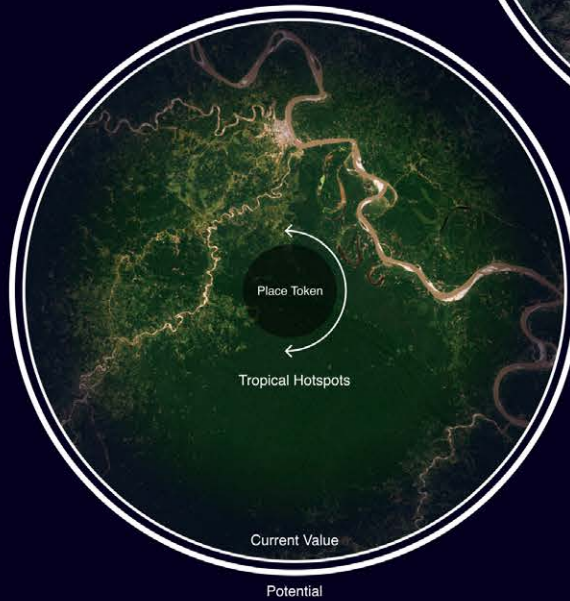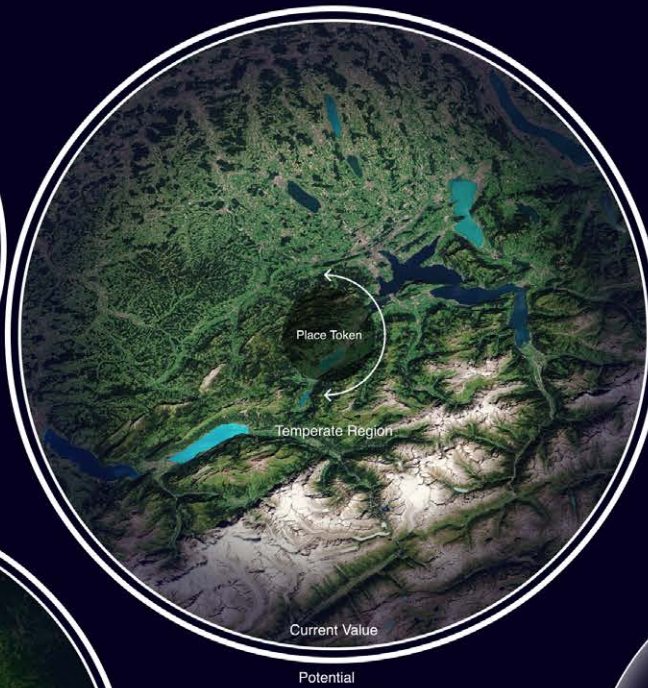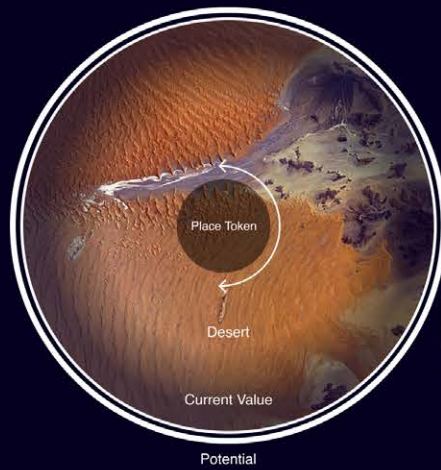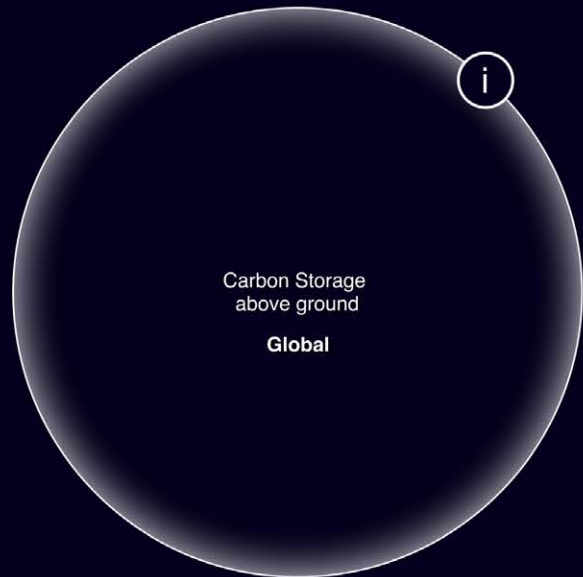
Reset

Global full potential
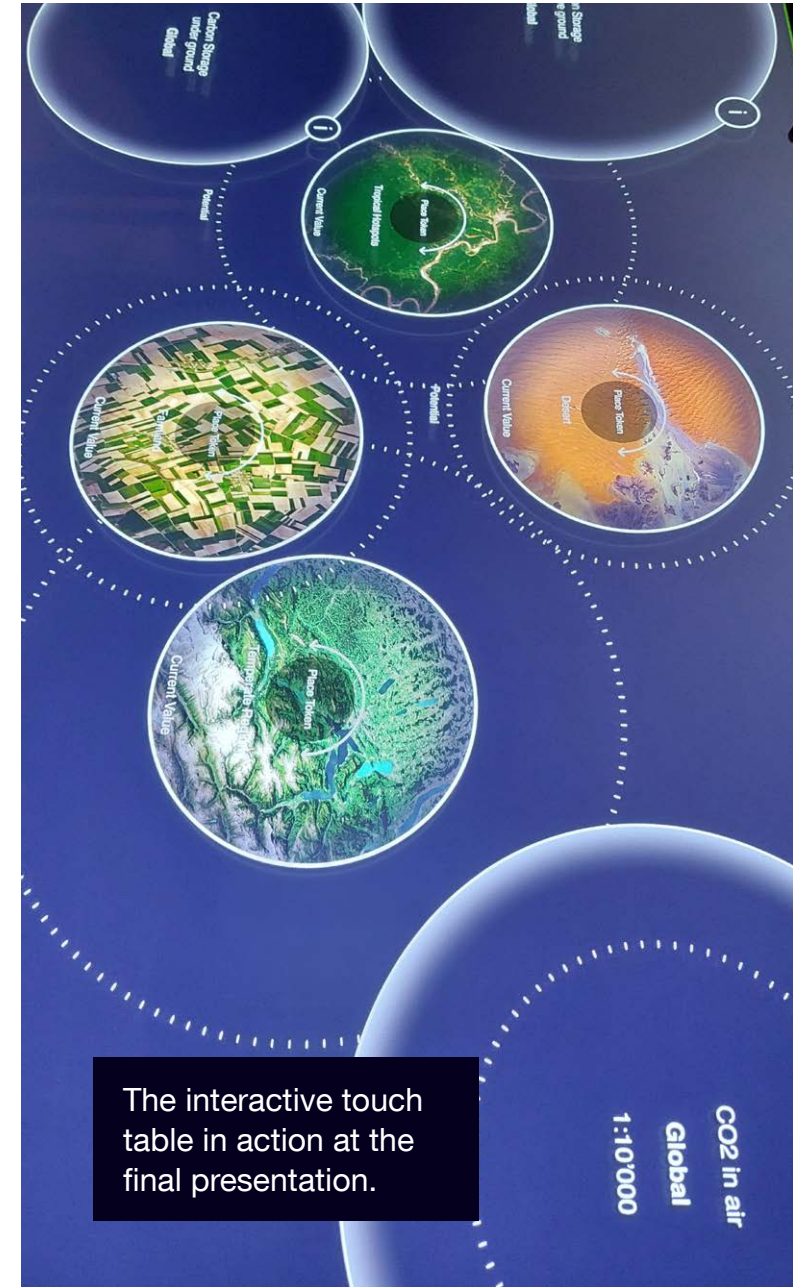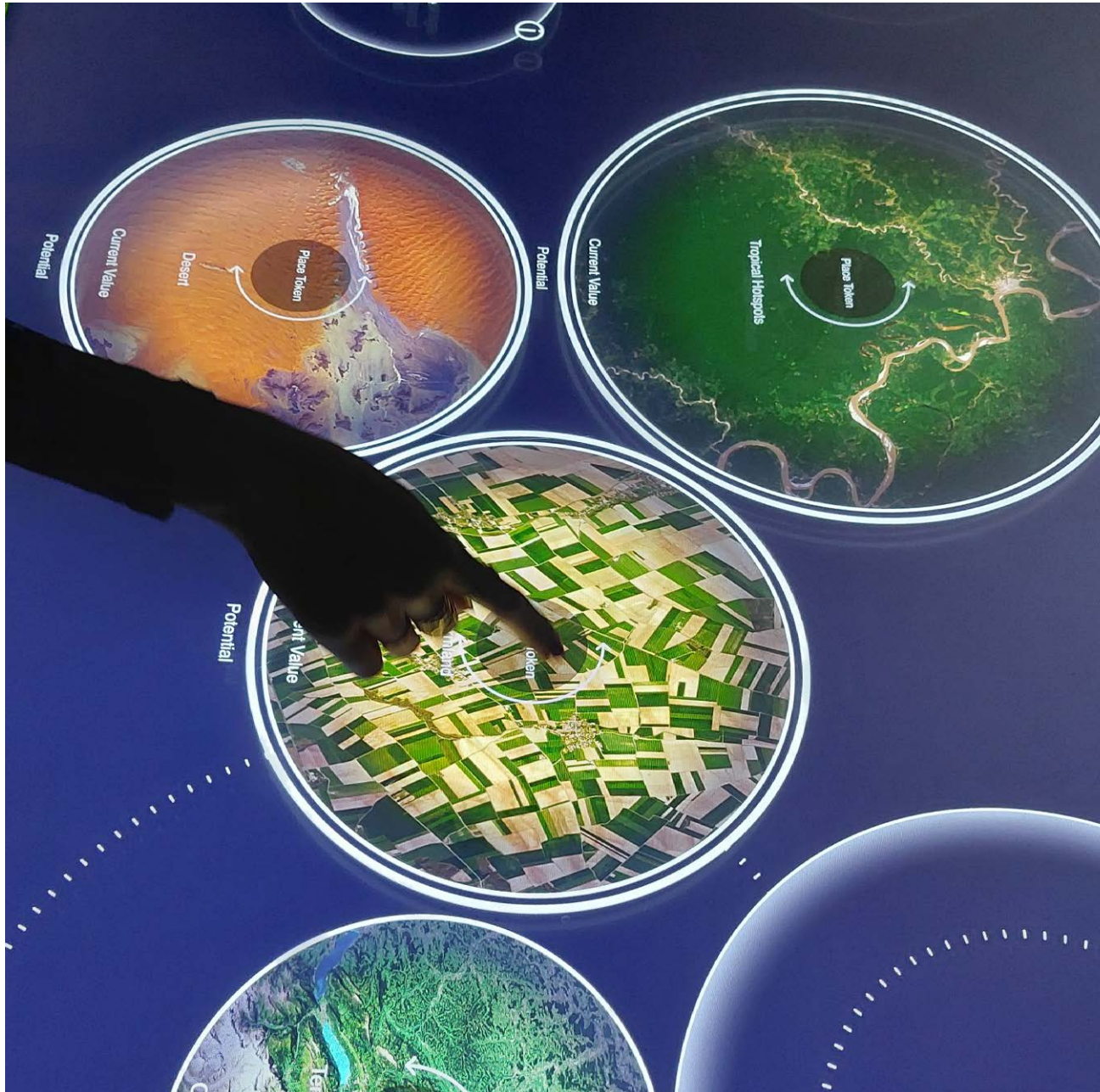
The interactive touch table in action at the final presentation.

Research
Creation
Outcome
Evaluation

Main focus: Explore!

Create awareness of the possibilities

gaining knowledge through exploring

what carbon storage means

Explore the potential of carbon storage
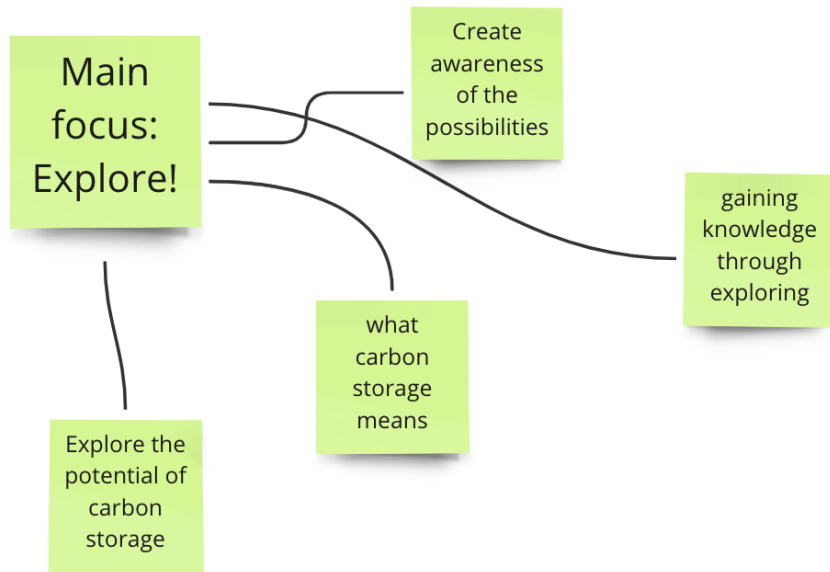
First desk research

We started off by researching the materials from the Crowther Lab and after that we went on with brainstorming our ideas and assumptions. We had a lot of interesting ideas, which many were a little out of the assigned topic. Being interested in the topic was definitively an advantage.

Brainstorming Ideas:

What	How	Interaction
Idea 1		
Technological carbon footprint	Guiding through co2 emissions from different actions in web	one could slide through a story of different actions: seeing results
	E-waste, production of electronic devices	one could choose a video / just call : see results
Idea 2		
Co2 emissions of different foods / meals	Calculator to see the co2 from different choices	One could choose from a list of different foods or meals and drag them on a plate
Idea 3	"to visualize the climate futures"	
Temperature rise in the northern areas of the globe	what kind of things this affects = for example no snow = no sledding / downhill skeeing	timeline & illustrations of symptoms form temperature rising
Idea 4		
Fungi & their ecosystems	to grow knowledge what species make up an ecosystem together	One could connect a fungi with a surface (according to climate) and trees that grow together in harmony & collect co2
Idea 5		
Fish that mate in certain streams	how recreating fish paths could help a population grow : how this affects positively	One could rebuild streams by digging and carrying
Idea 6		
Wetlands and their ecosystems		
Idea 7		
Sounds of different forests	comparing recorded sounds from poly- and monocultures	One can choose a forest / plantation and hear the difference in the sound

https://www.capgemini.com/gb-en/insights/expert-perspectives/are-you-aware-of-your-digital-carbon-footprint/

https://paul.zhdk.ch/mod/page/view.php?id=61705

Example of "slides"
http://senseable.mit.edu/proximate/

https://hooge104.shinyapps.io/future_cities_app/

https://paul.zhdk.ch/pluginfile.php/208367/mod_resource/content/2/journal.pone_.0217592%20%283%29.pdf
"our analysis highlights the value of using cities to visualize the tangible effects of climate change across the globe."

https://www.kesko.fi/en/media/themes/fishpaths/

https://www.audubon.org/climate/survivalbydegrees

Client Brief

Keep it COOL

Goal:
«Visualize nature-based solutions for CO2-storage»

So that the user understands different possibilities and solutions how to store CO2 on the planet.

Giving a simple Insight in to the topic

3 Pillar System:
1. **Understand** (Starting point, Where are we from? etc.)
   An understanding of the amount of CO2 that can be stored in natural systems

2. **Explore** (Where and what is storage potential? Explore Aboveground (vegetation and belowground (soil), Show the potential
   Potential for CO2 storage in natural ecosystems, aboveground and belowground (Hotspots)

3. **Act** What can people do, what is possible, get information about companies and people that already doing something. What would happen if at the spots with storage potential would emerge ecosystems/biodiversity again.
   Conservation and restoration projects as examples
   possible actions
   get away from misconceptions

Target Group
Sekundarschüler / Gymnasium / ältere Personen / generell breite Zielgruppe / Laien

Design / Look
Scientific, neutral design; neutral wording

Our Process

After the extensive brainstorming, we selected a couple of themes that made the most sense at this stage of the process.

We wanted to know what were the pain points of the user group, and what we can do better to improve the user experience while using the touch table in the exhibition.

We started focusing on Fungus that grows everywhere in the world above and under the ground and we were thinking of visualising the CO_2 storage of the fungus itself. After mentoring, we realized that maybe that was beyond our scope and that we should focus purely on the general above and underground CO_2 storage in the different hotspots.

Research
Creation
Outcome
Evaluation

CO2 Air   restoration of nature   Carbon storage
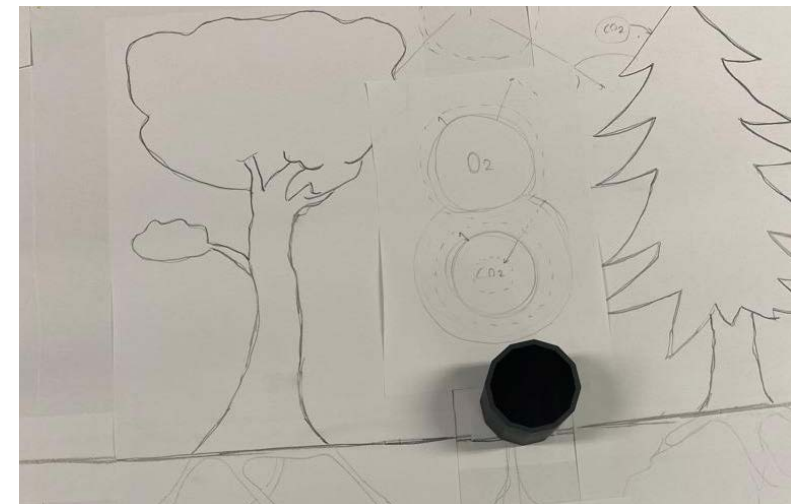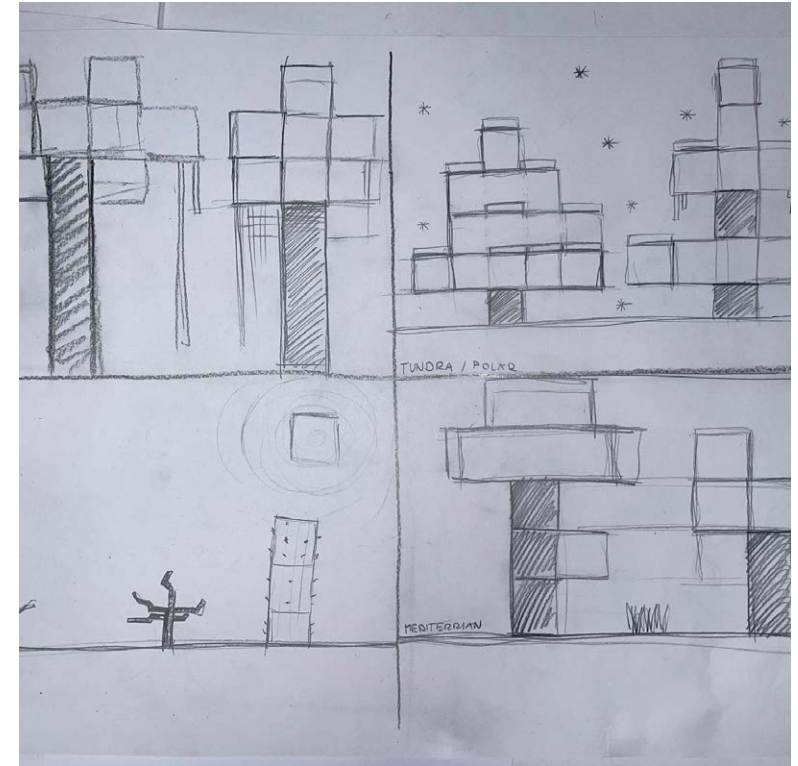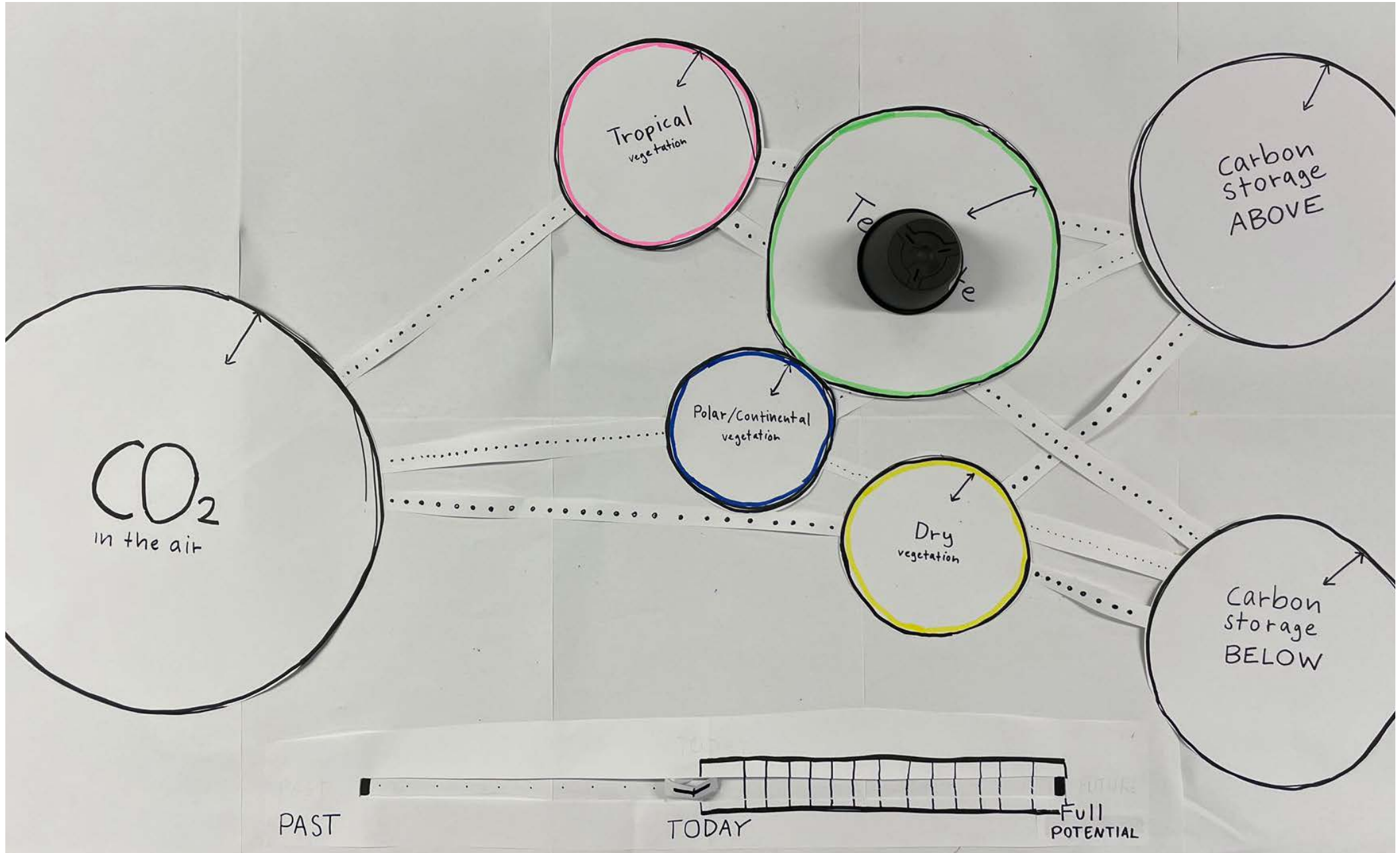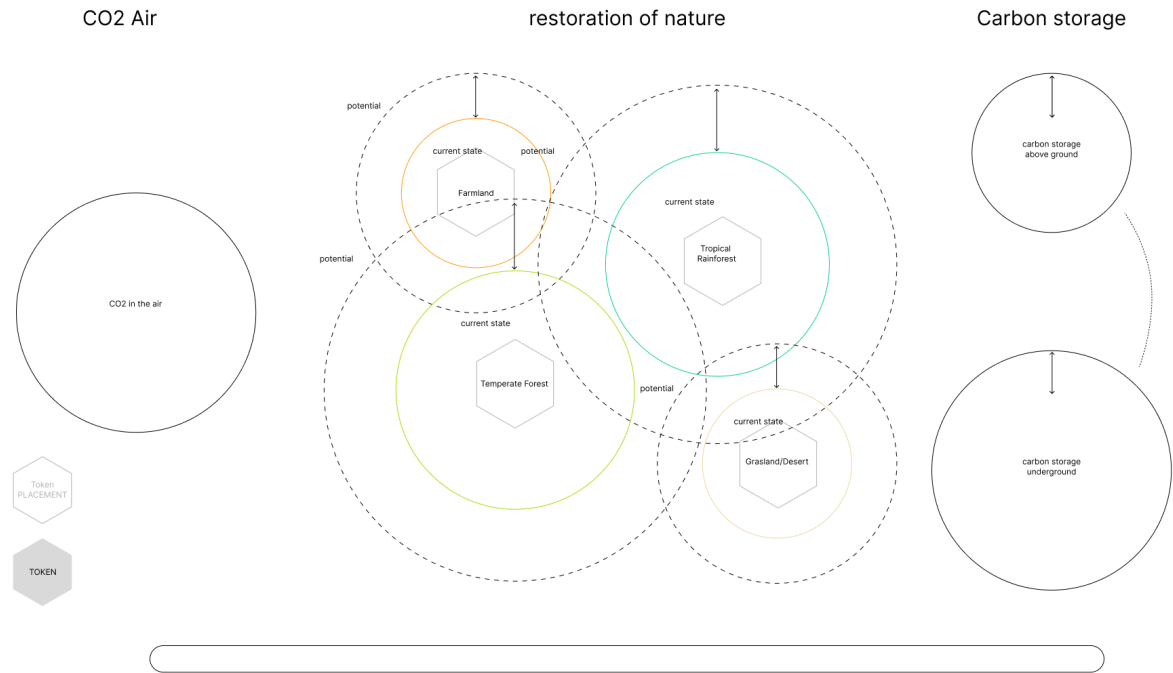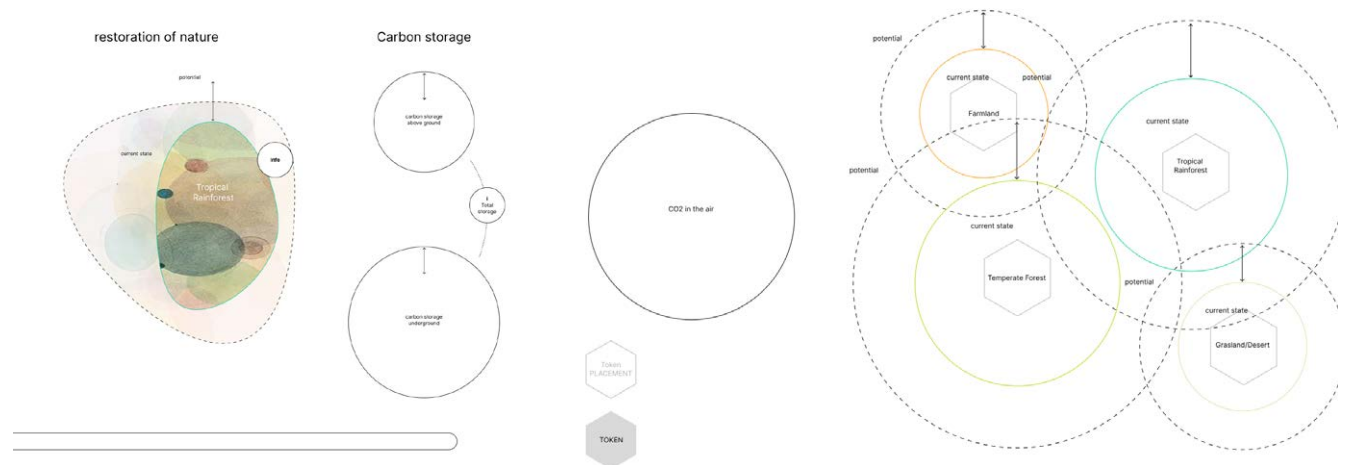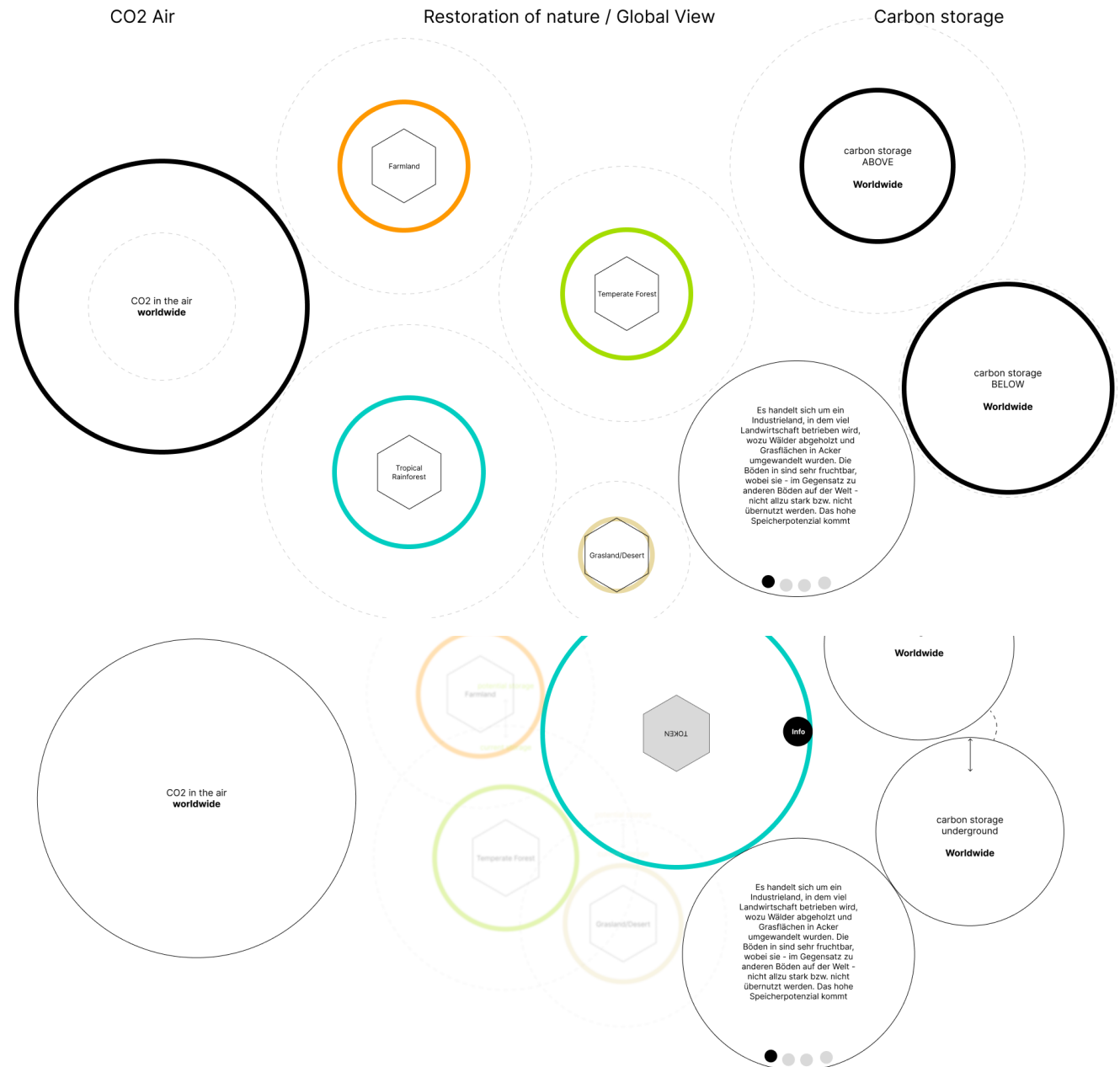

Wireframes

In this phase of the design
process, we created wireframes to
ideate the features of the interface
and we started thinking about the
possible interactions.

CO2 Air   Restoration of nature / Global View   Carbon storage

Farmland

carbon storage
ABOVE
Worldwide

Temperate Forest

CO2 in the air
worldwide

carbon storage
BELOW
Worldwide

Tropical
Rainforest

Es handelt sich um ein
Industrieland, in dem viel
Landwirtschaft betrieben wird,
wozu Wälder abgeholzt und
Grasflächen in Acker
umgewandelt wurden. Die
Böden in sind sehr fruchtbar,
wobei sie - im Gegensatz zu
anderen Böden auf der Welt -
nicht allzu stark bzw. nicht
übernutzt werden. Das hohe
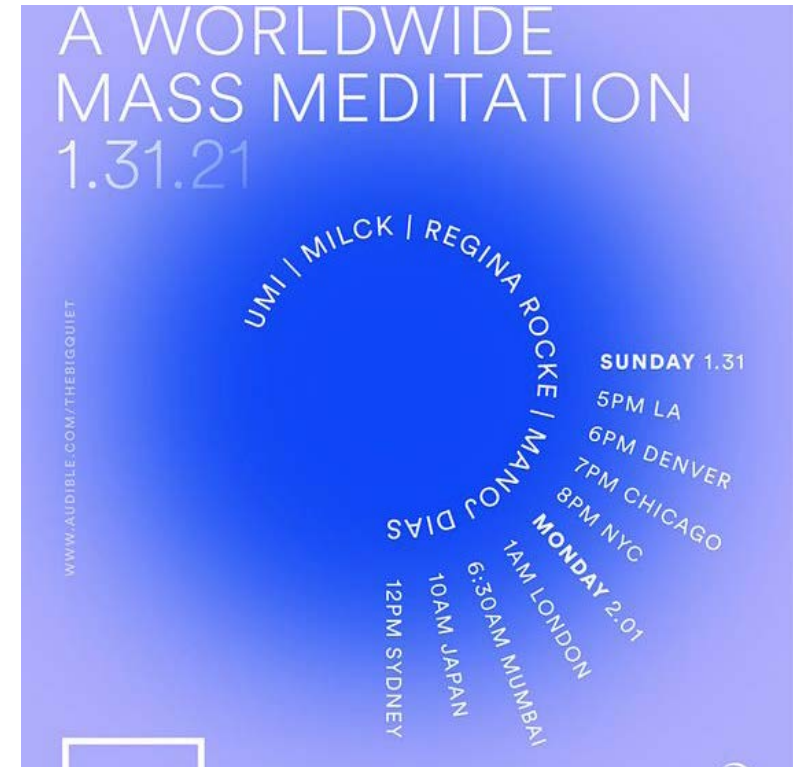Speicherpotenzial kommt

Grasland/Desert

Information Architecture

After a lot of wireframing and
having long discussions, we
came up with an information and
interaction structure for the touch
table that made sense.

We decided to divide the
functions into three main
categories: overview, detailed
view of a hotspot, and an external
information bubble when a certain
hotspot or a CO_2 bubble is
selected.

Worldwide

Farmland

CO2 in the air
worldwide

TOKEN

Info

Temperate Forest

carbon storage
underground
Worldwide

Grasland/Desert

Es handelt sich um ein
Industrieland, in dem viel
Landwirtschaft betrieben wird,
wozu Wälder abgeholzt und
Grasflächen in Acker
umgewandelt wurden. Die
Böden in sind sehr fruchtbar,
wobei sie - im Gegensatz zu
anderen Böden auf der Welt -
nicht allzu stark bzw. nicht
übernutzt werden. Das hohe
Speicherpotenzial kommt

Design Inspiration

We started with a Pinterest design inspiration board and ended up with three major themes: a landscape picture theme, a more minimal abstract design, and a cell-like inspiration.
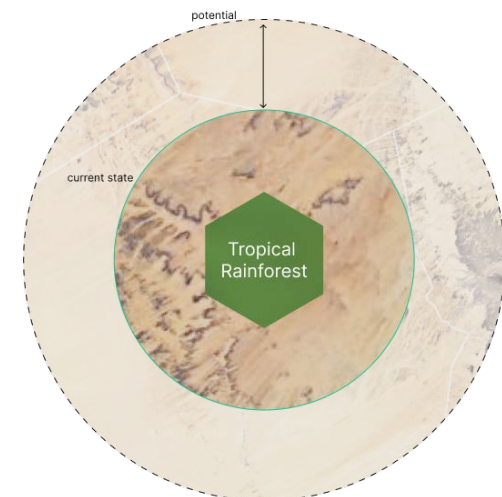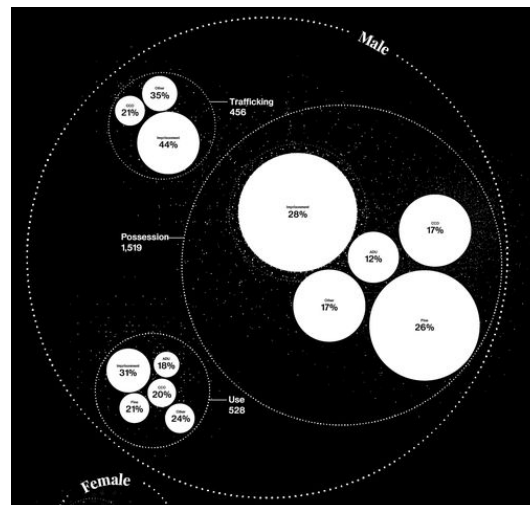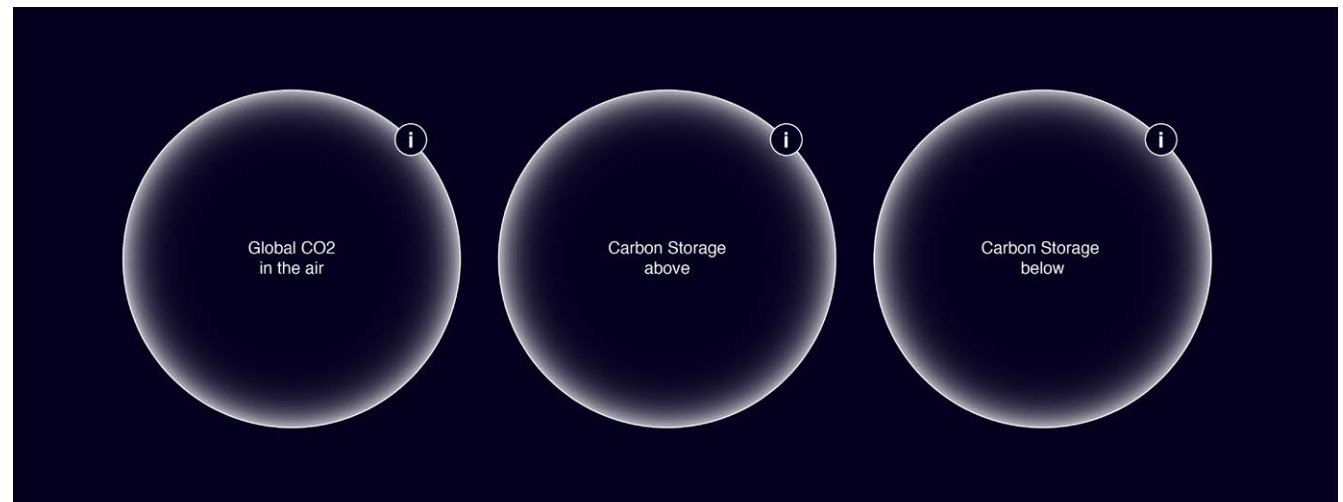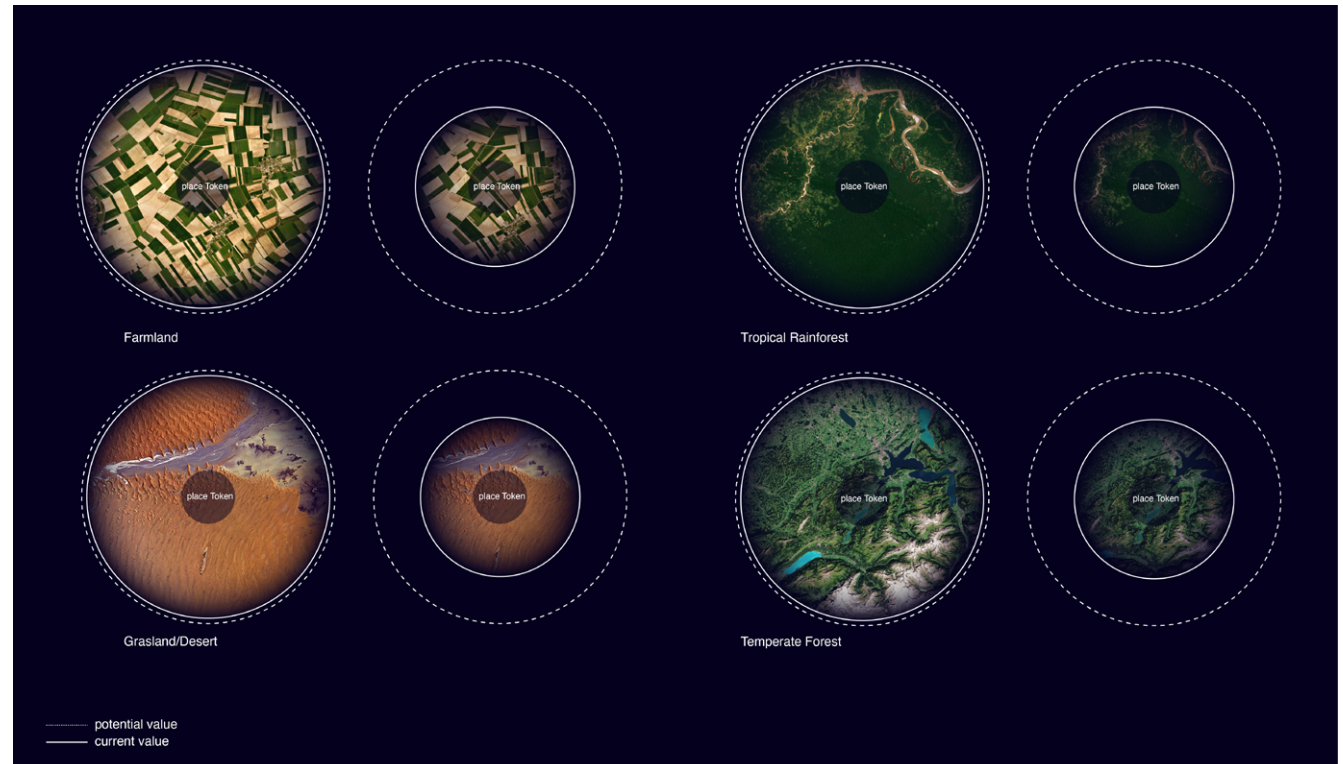
Research
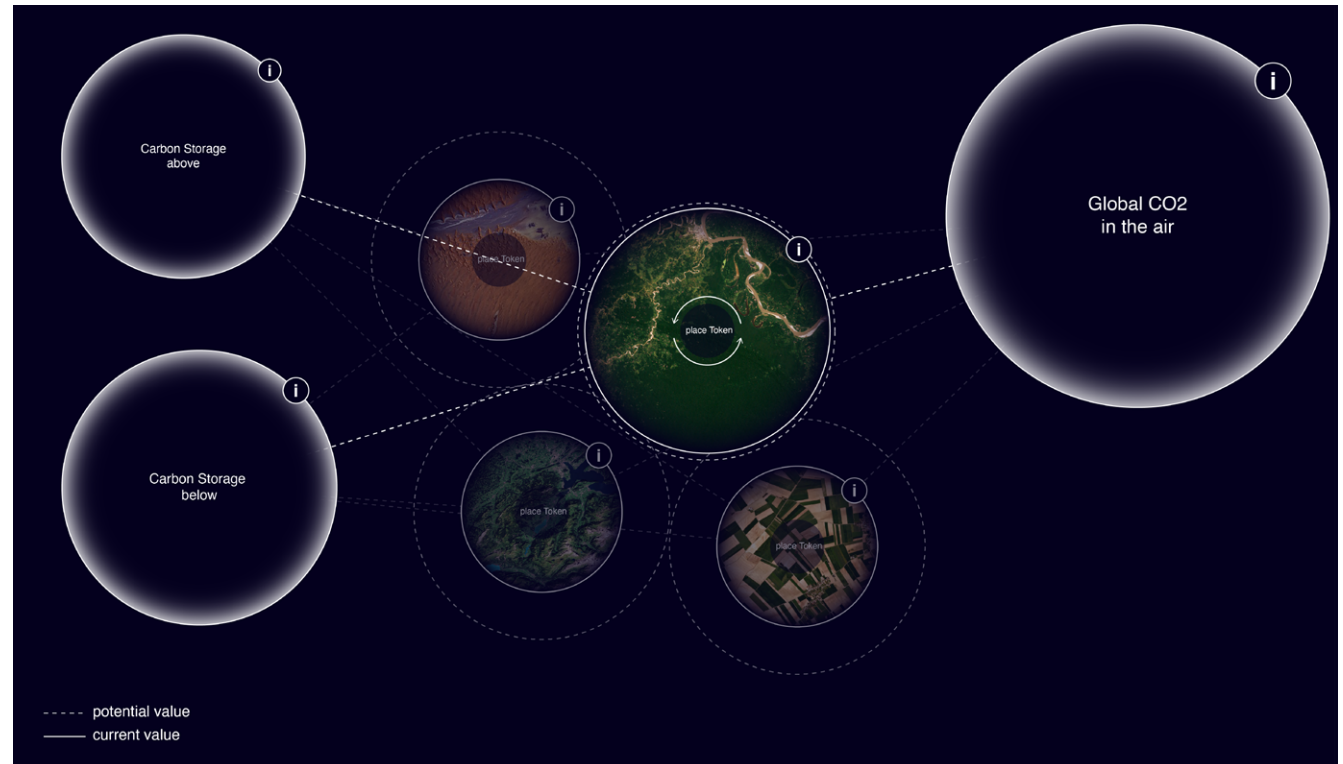# Creation
Outcome
Evaluation

Visual Design

The visual design was a crucial element for us in this project. We aimed to create a product that matched the ETH Crowther Lab style, but we also wanted to give it a simplistic "designy" touch.

We used Helvetica as the font in different sizes to define a hierarchy in the text and opted for thin-lined icons to give a feeling of minimalism and simplicity.

After navigating through various options that didn't fully satisfy us, we used landscape pictures from Unsplash which aligned with the scientific aesthetic of Crowther Lab and *focus*Terra.

We chose to have the CO_2 bubbles simple, with some gradient color in them to reflect pollution. However, we have received feedback regarding the very similar appearance and would change the design in the future so that they would be more distinguishable.

Farmland

Tropical Rainforest

Grasland/Desert

Temperate Forest

······ potential value
—— current value

Global CO2
in the air

Carbon Storage
above

Carbon Storage
below

Mockups

In this phase, we advanced in the process and we created a more realistic overview of the product.

We added one real-life project to each hotspot, which is accessible in the info bubble. In case a person is interested in reading more, we attached a QR code that leads to further readings on the Restor website. Restor is a project of Crowther Lab in collaboration with Google about conservation and restoration of nature.
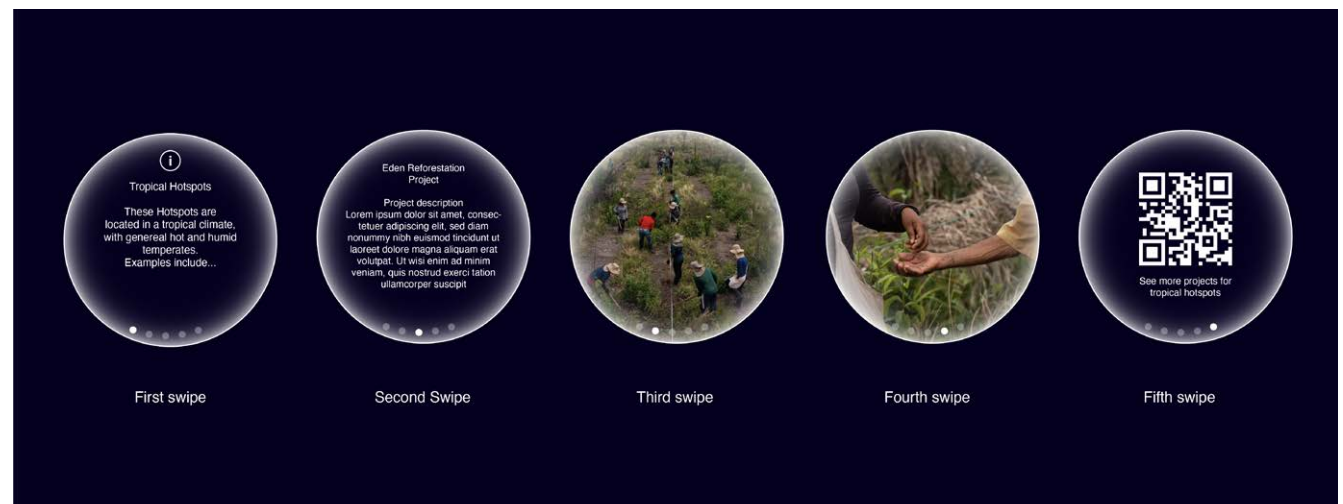
Using the interface

Giving the user the freedom to decide what's relevant to them was an essential part of our concept.

In our design, the user can use the tokens to see the change in the current hotspot and restoring the potential, which leads to CO_2 storage in above and below ground. They can also use the touch function to move the hotspots and the CO_2 bubbles around the table. Furthermore they can use the touch function to see more informations by pressing the info tab on a hotspot or on a CO_2 bubble. While creating our information bubbles, we realized that this was the most text-heavy section of the interface so far. We put extra effort into making sure that we were respecting our pre-established parameters; we wanted a tone of voice that comes off as simple, interactive and also playful.

The hotspots that are not highlighted are hidden with a lower opacity in the backround, but do not disappear from the interface.

Research
Creation
Outcome
Evaluation

User testings

We unfortunately were constrained by time and couldn't test our prototype in a real setting other than with our classmates at the end presentations. Although the results with them were highly positive, but we take into consideration that they were already informed about our project. So we will not fully count these experiences as user testings.

However, this gave us an insight into how user testing can be performed and how we can implement the feedback of the users into the interface.
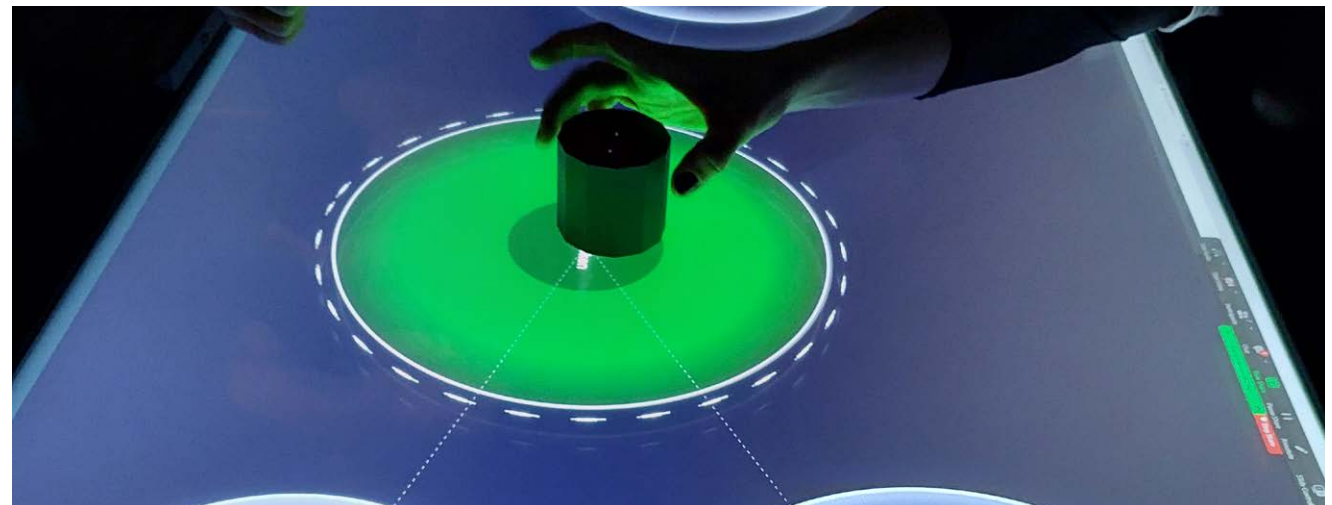
Group reflection

Data visualisation was an interesting module. We were all waiting for it, and looking forward to learning as much as we could. Some of us had more experience than others and therefore they took the lead on the project.

Besides some struggles in the beginning, in general, we were very optimistic and realistic and set us a clear scope in regards to the time we had for the project, which ended up being very short.

We started out with big expectations which helps to think in many directions, but would be a lot of work implement in the given time frame. Luckily everything came through and we have worked out while having fun, supporting and learning from each other.

Having group members with experience with the different software tools was extremely beneficial for us, but understanding the data and how d3.js works in that short time was a challenge.