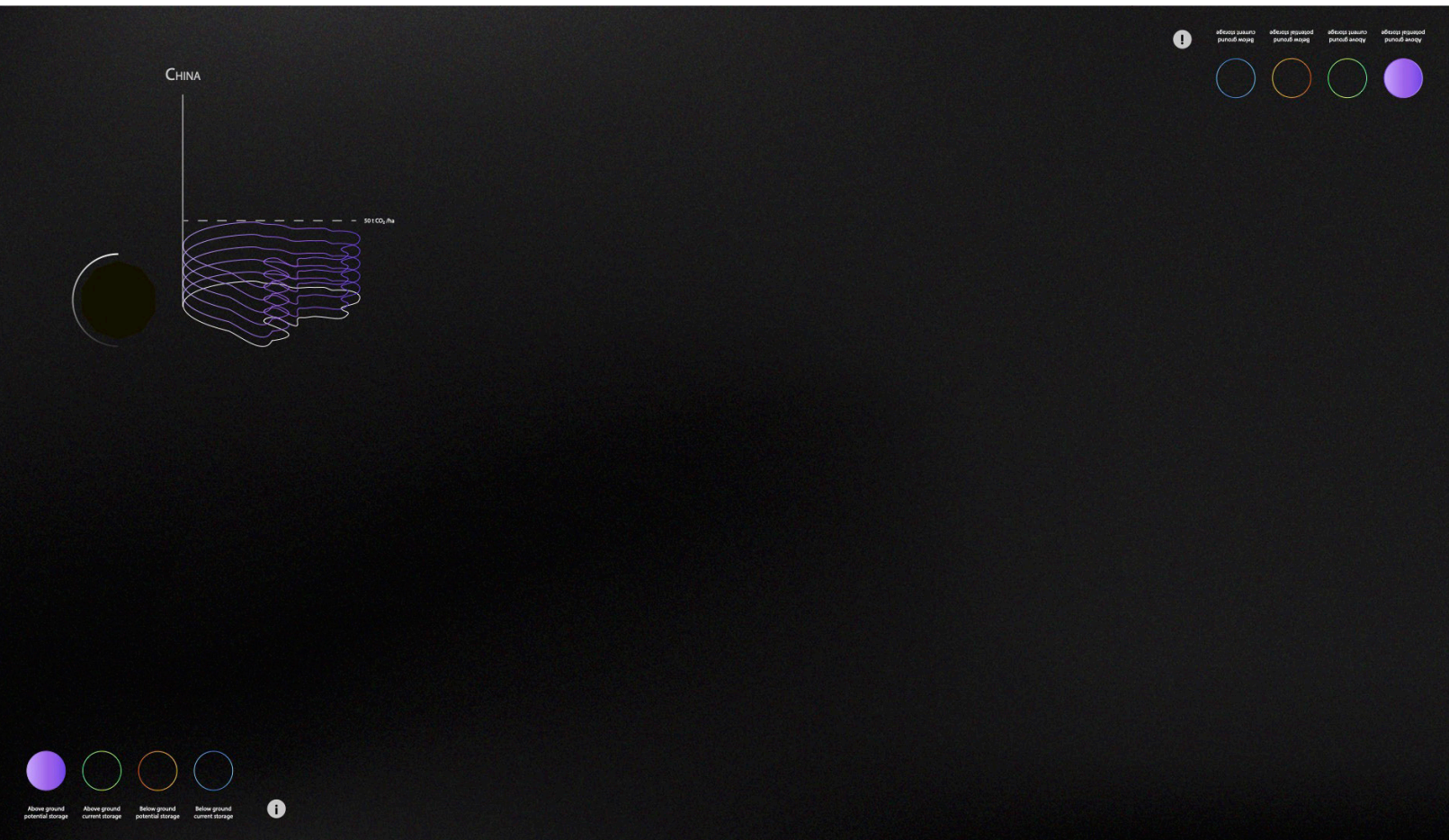


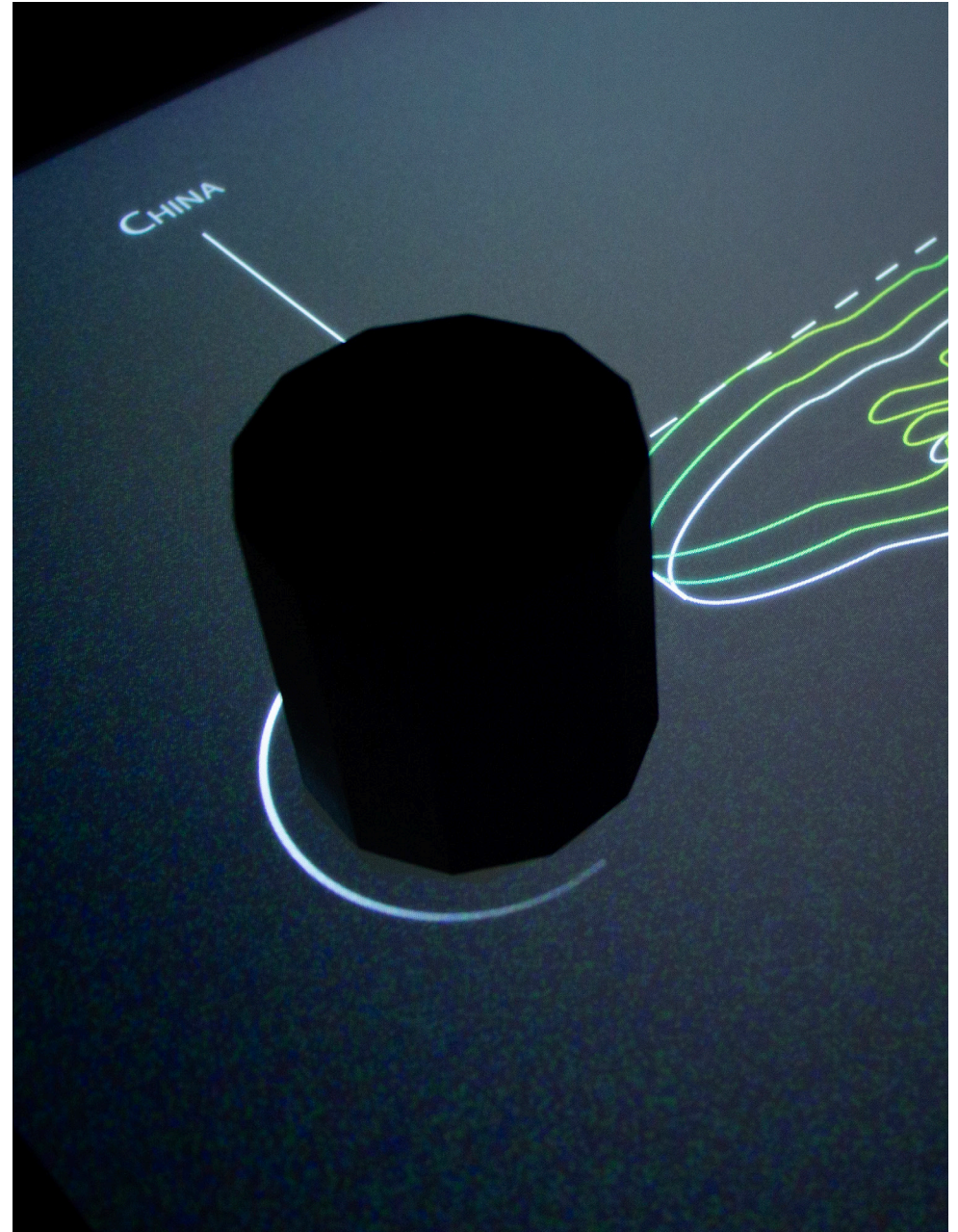
Interactive Data Visualisation



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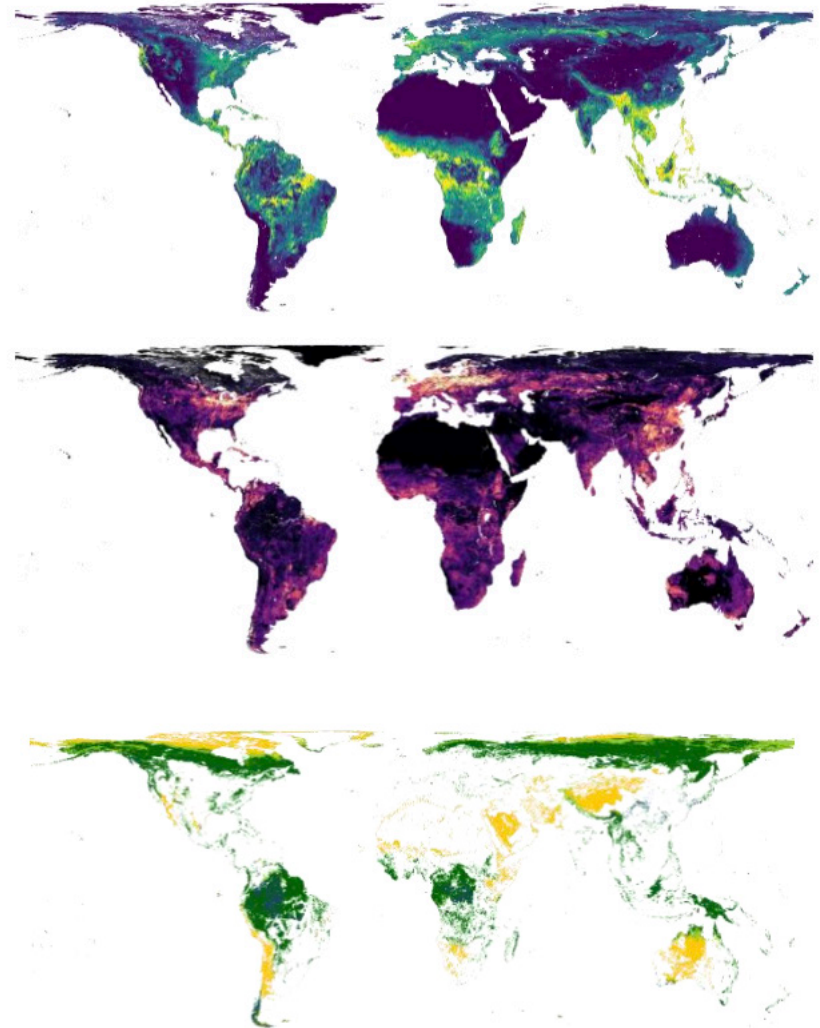
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The Brief

To create an interactive prototype for a data visualisation highlighting the above and below ground carbon storage (both current and potential), using data taken from various hotspots across the Earth by the ETH Crowther Lab. The projects are to be displayed on the TouchTable at focusTerra's exhibition space in 2024. The target audience is all ages, but mostly high school students looking to study at the ETH.



Constraints

One of the main constraints we came up against was choosing which data to display. It was invaluable to speak with the team from focusTerra, who were able to direct us toward what the data they envisioned. We also needed to take into consideration the affordances of interaction that were available to us - whether or not to use the tokens, if our use of the tokens was adding to the experience, or whether it could be replaced by touch screen interactions instead.

Explore

The above and below ground biomass

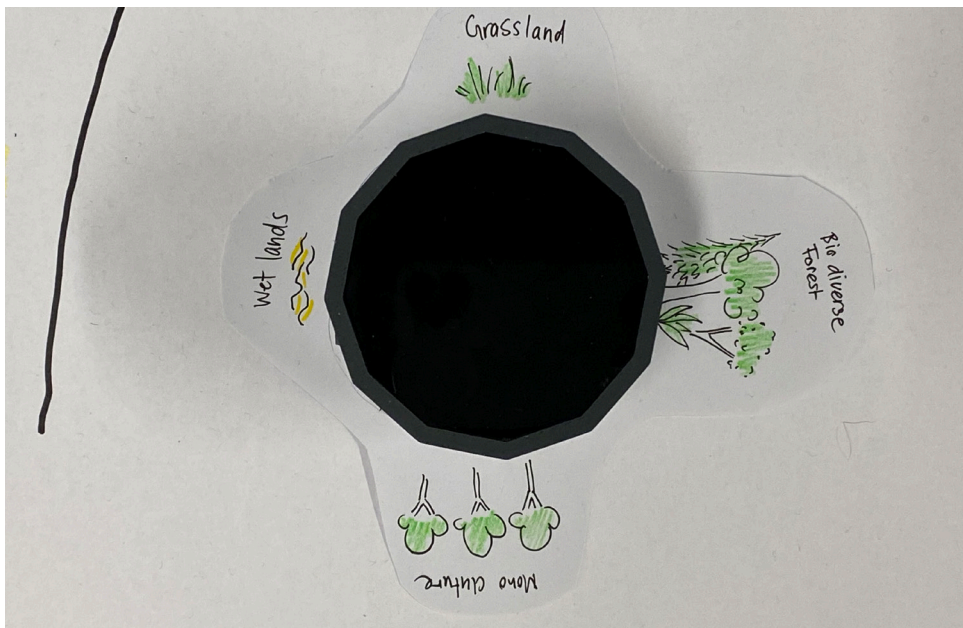
Understand

Show that the Earth is heating up and to compare the biomass of humans and vegetation

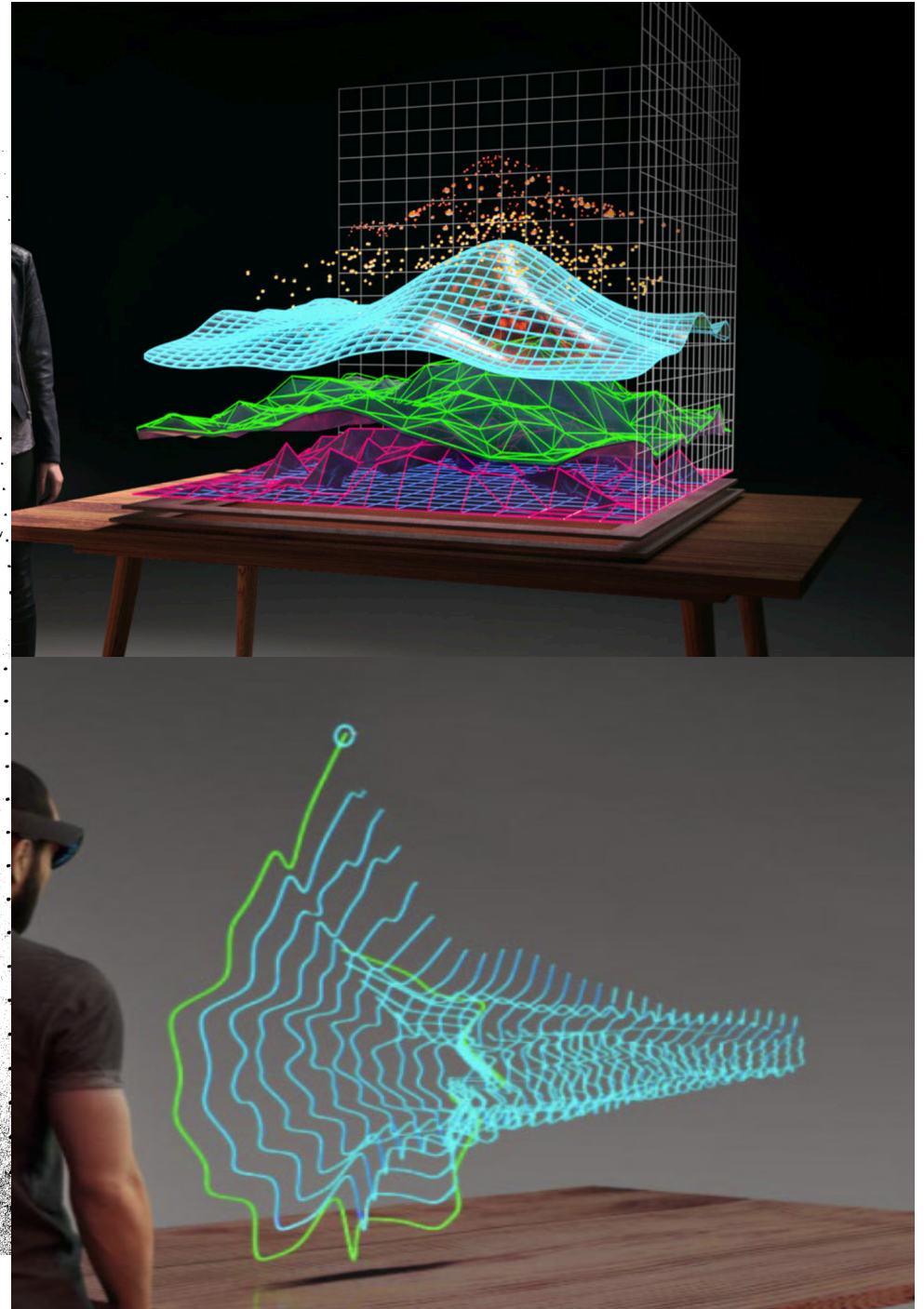
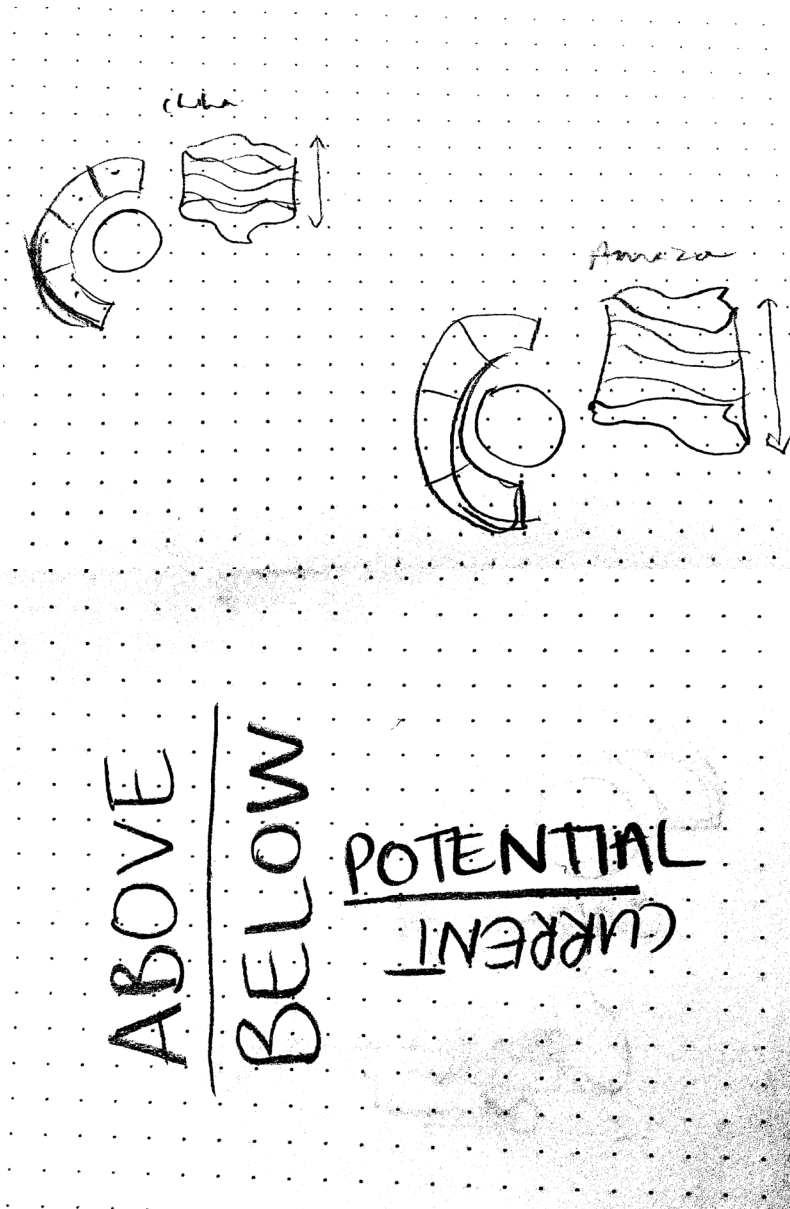
Act

What can we do now?

What's already being done?



Ideation



Prototyping

We first started with a divergent phase, where we tried to think in many different directions and created several different low-fi paper prototypes.

Then we narrowed down our concept and refined it in more iterations in more detailed paper prototypes. This proved to be effective, as we could work out and prove or refute ideas quickly, without having to write lines of code or spend a lot of time in figma.

In the end we combined the two paper prototypes to form our final concept - particularly the drag function, and landtype toggle.

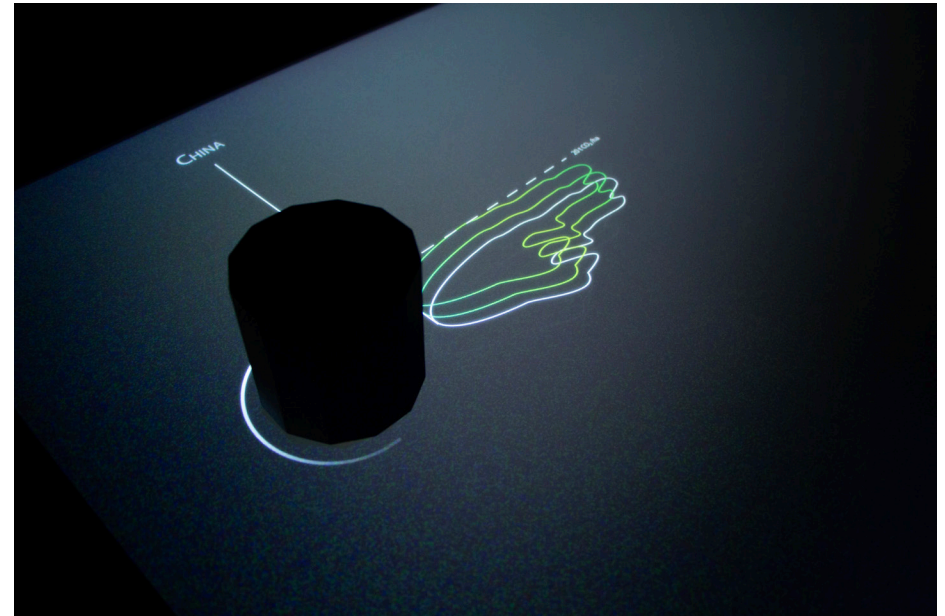


Final Prototype

Concept

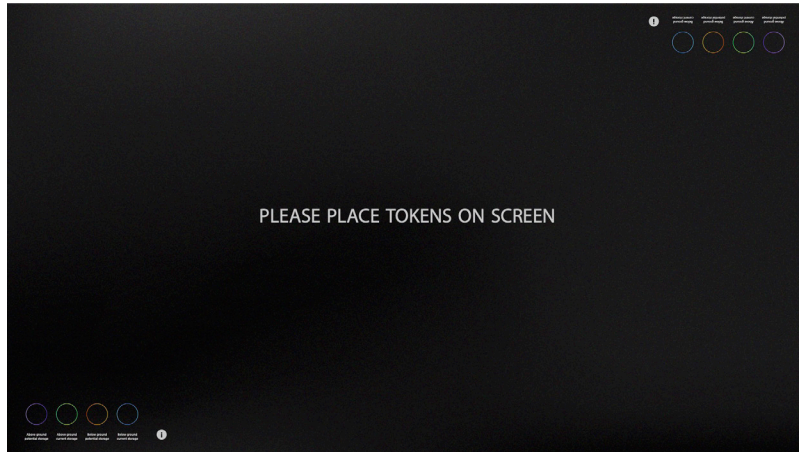
To display the current and potential carbon storage in an interactive data visualization, highlighting the hotspots identified by Crowther Lab. The aim is to make the information accessible to highschool students and to use engaging interactions.

Each token represents a hotspot identified by the Crowther Lab. The user is able to place the tokens onto the touch table to view a hotspot. There is a set of four global parameters, representing the four main data sets: Above and Below ground Current and Potential Carbon Storage which can be toggled by the user once they place it on the TouchTable. This will affect each hotspot on display.

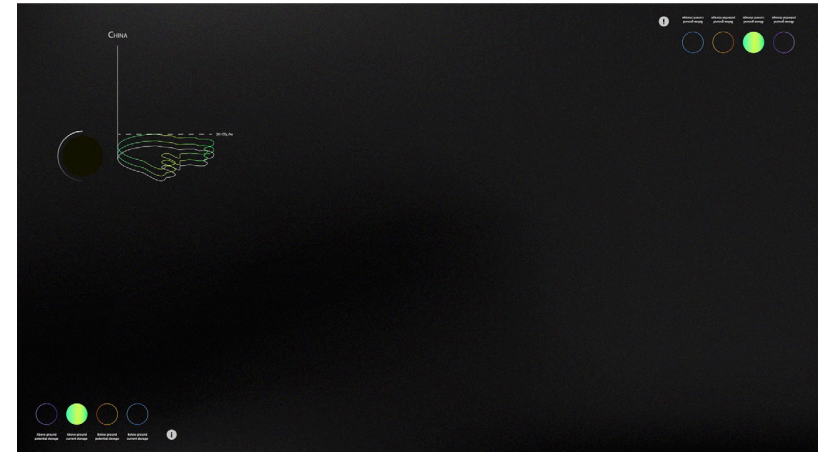


For each token there is a second UI. It is a scroll through menu controlled by the rotation of the token. This allow users to toggle between different land types located within the hotspot. This data visualisation will be individually manipulated for each token. The land types include: Cropland, Grassland, Mangroves, Treecover, Permanent, Bodies of Water, Builtup and Moss & Lichen.

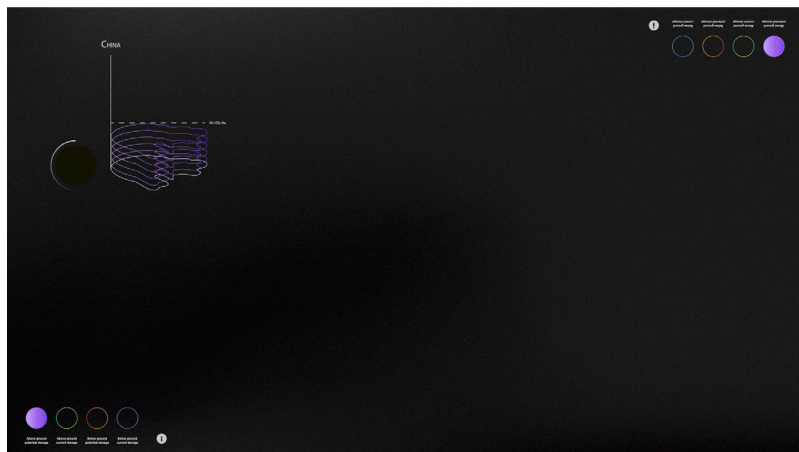
User Journey



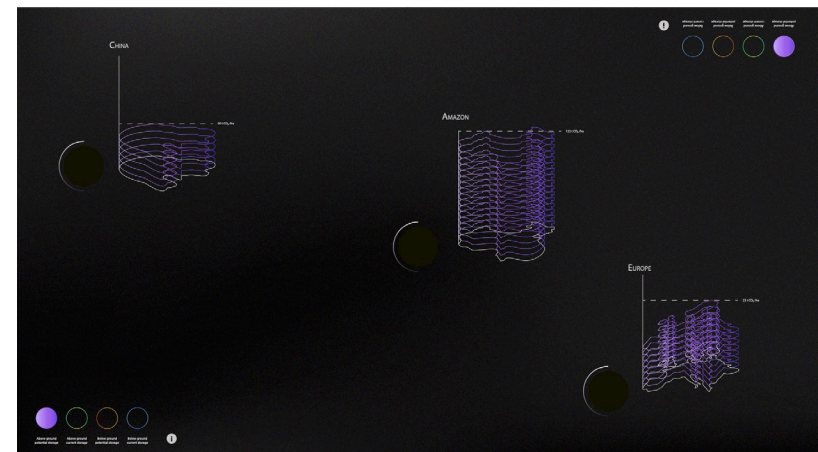
Initial prompt, text fades in and out to provide an awareness of interaction



User places first token, is able to move it around the TouchTable freely



User toggles the global parameters located in the top and bottom left corners

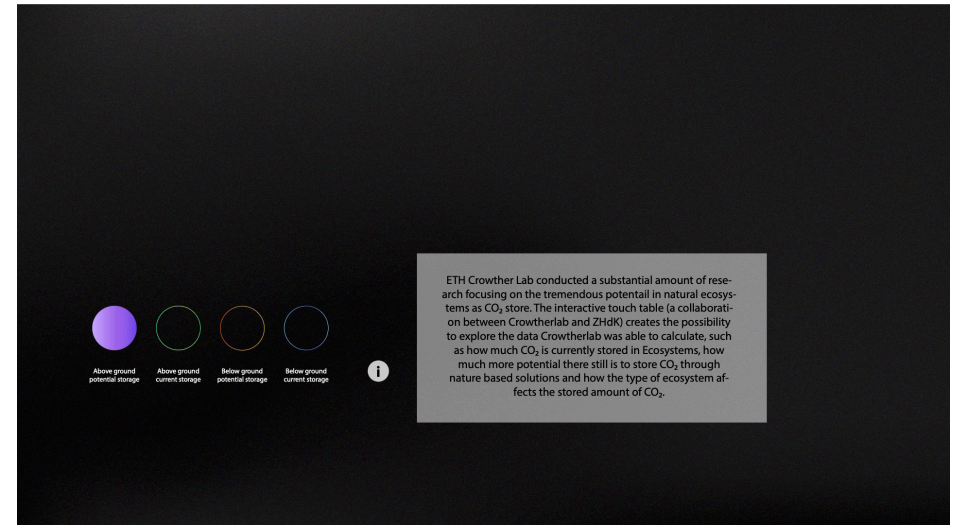


Global parameters applied to every token in user allowing for comparison of hotspots

UI Elements

The Info Popup

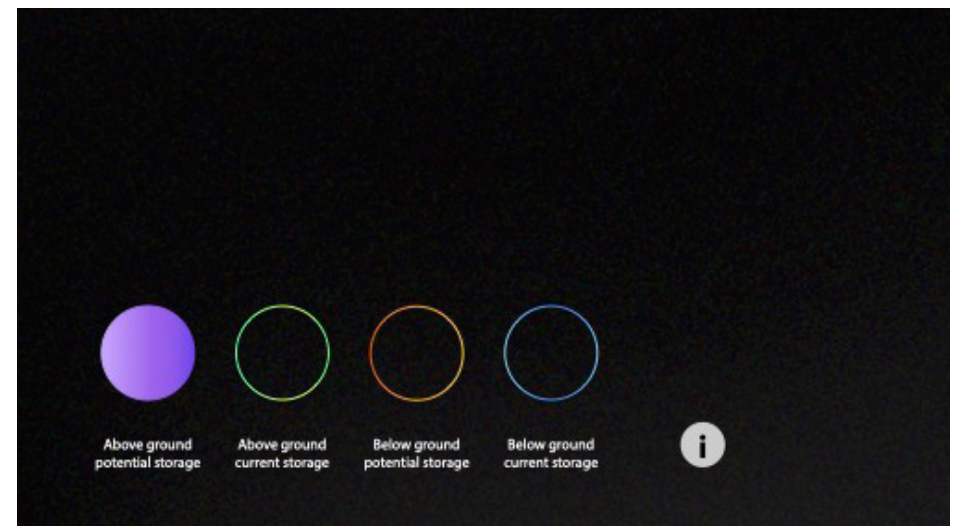
Represented by an 'i' icon. This is intended to provide context for the project.



Global Parameter Toggles

Four touch buttons which select one parameter at a time:

Above Ground Current Storage
Above Ground Potential Storage
Below Ground Current Storage
Below Ground Potential Storage



Code

We first thought about using a 3D environment for the code, but because it would have been too time consuming we decided to create pseudo 3D graphics by drawing the outlines of the region over and over again, so it looks like it has been extruded. The extruded regions are placed near the token, on the opposite side of the token UI.

Using HTML and CSS we created the user interface for the global parameters, and info buttons. The toggle was controlled using Javascript, and then the button state was fed to p5 to inform the data which was being portrayed on the hotspots.

```
function shapeViewEurope() {
  const widthAGP = select('.--agp').width;
  const widthAGC = select('.--agc').width;
  const widthUGP = select('.--ugp').width;
  const widthUGC = select('.--ugc').width;
  let EuropeGrassland = null;
  // let AmazonGrassland = null;
  let color1 = null;
  let color2 = null;
  let isUnderground = false;

  //console.log(widthAGP);
  //const widthAGP = agcBtn.clientWidth;
  if (widthAGP > 179) {
    EuropeGrassland = int(round(float(table.get(9, 'EsaWorldCover_BareOrSparseVegetation_AGB_current_MgC')))/1500000);
    color1 = _color[0];
    color2 = _color[1];
    // AmazonGrassland = int(round(float(table.get(3, 'EsaWorldCover_BareOrSparseVegetation_AGB_current_MgC')))/1500000);
    isUnderground = false;
  }
  if (widthAGC > 179) {
    EuropeGrassland = int(round(float(table.get(9, 'EsaWorldCover_BareOrSparseVegetation_AGB_pot_MgC')))/1500000);
    color1 = _color[2];
    color2 = _color[3];
    // AmazonGrassland = int(round(float(table.get(3, 'EsaWorldCover_BareOrSparseVegetation_AGB_pot_MgC')))/1500000);
    isUnderground = false;
  }
  if (widthUGP > 179) {
    EuropeGrassland = int(round(float(table.get(9, 'EsaWorldCover_BareOrSparseVegetation_Underground_pot_MgC')))/1500000);
    color1 = _color[4];
    color2 = _color[5];
    // AmazonGrassland = int(round(float(table.get(3, 'EsaWorldCover_BareOrSparseVegetation_Underground_pot_MgC')))/1500000);
    isUnderground = true;
  }
  if (widthUGC > 179) {
    EuropeGrassland = int(round(float(table.get(9, 'EsaWorldCover_BareOrSparseVegetation_Underground_current_MgC')))/1500000);
    color1 = _color[6];
    color2 = _color[7];
    // AmazonGrassland = int(round(float(table.get(3, 'EsaWorldCover_BareOrSparseVegetation_Underground_current_MgC')))/1500000);
    isUnderground = true;
  }
}
```

p5 snippet to toggle between global parameters

```
class Amazon{
  constructor(posX, posY, stackHeight, color1, color2, baseVal, isUnderground){
    this.posX = posX;
    this.posY = posY;
    this.stackHeight = stackHeight;
    this.color1 = color1;
    this.color2 = color2;
    this.baseVal = baseVal;
    this.isUnderground = isUnderground;
  }

  upd(posX, posY, stackHeight, color1, color2){
    this.posX = posX;
    this.posY = posY;
    this.stackHeight = stackHeight;
    this.color1 = color1;
    this.color2 = color2;

    push();
    //translate(posX, -stackHeight);
    fill(150);
    textAlign(RIGHT);
    text('AMAZON', this.posX+90, this.posY-385);
    pop();
    push();
    //translate(posX, -stackHeight);
    fill(200);
    textSize(15);
    textAlign(LEFT);
    text('0 MgC CARBON', this.posX+710, this.posY+15);
    pop();

    // push();
    // //translate(posX, -stackHeight);
    // // fill(255);
    // text('AMAZON', this.posX, this.posY);
    // pop();

    if (this.isUnderground) {
      print("WE ARE UNDER GROUND. GO BELOW");
      // let stackHeight = (this.stackHeight * -1);
      for(let i = 0; i < this.stackHeight; i++) {

```

p5 Sketch for the hotspot extrusion

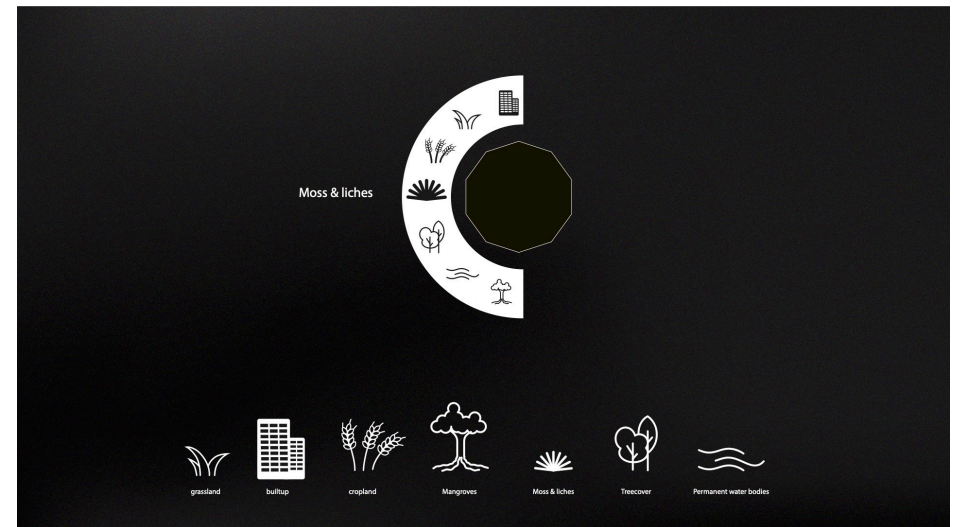
```
<div>
  <div class="btn-inner">
    <button class="--agc" id="agc-top"></button>
    <div class="--caption-style top-caption">ABOVE GROUND<br>CURRENT STORAGE</div>
  </div>
  <div class="btn-inner">
    <button class="--ugp" id="ugp-top"></button>
    <div class="--caption-style top-caption">UNDER GROUND<br>POTENTIAL STORAGE</div>
  </div>
  <div class="btn-inner">
    <button class="--ugc" id="ugc-top"></button>
    <div class="--caption-style top-caption">UNDER GROUND<br>CURRENT STORAGE</div>
  </div>
  <div class="pointer" id="info-btn-top">
    <div class="info-style" id="info-inner-top">i</div>
  </div>
  <span class="hidden popup-style" id="info-popup-top">Humans have altered the Earth greatly and em
  <br>In collaboration with the [ETH Crowther Lab] and the ETH science museum [focusTerra], this in
</div>
```

HTML UI for global parameters

Future Additions

Token Interface

A scroll-through menu controlled by the rotation of the token. This menu allows the user to select a parameter for each specific region - separate to the global parameters located at each corner. This element could still do with some work via user testing.



Comparison Mode

When the user place a token close to another token, the hotspots will enter "comparison mode", in which the selector of landtype on the token will become a global parameter for the clustered tokens.

