

# ECOLOGICAL FOOTPRINT

INTERNET OF THINGS INTERACTION DESIGN

BY JOÃO NOGUEIRA, JOÃO PINA, MANUEL SOUSA & MIGUEL REGOUGA

## GROUP A7



**João Pina**



**João Nogueira**



**Manuel Sousa**



**Miguel Regouga**

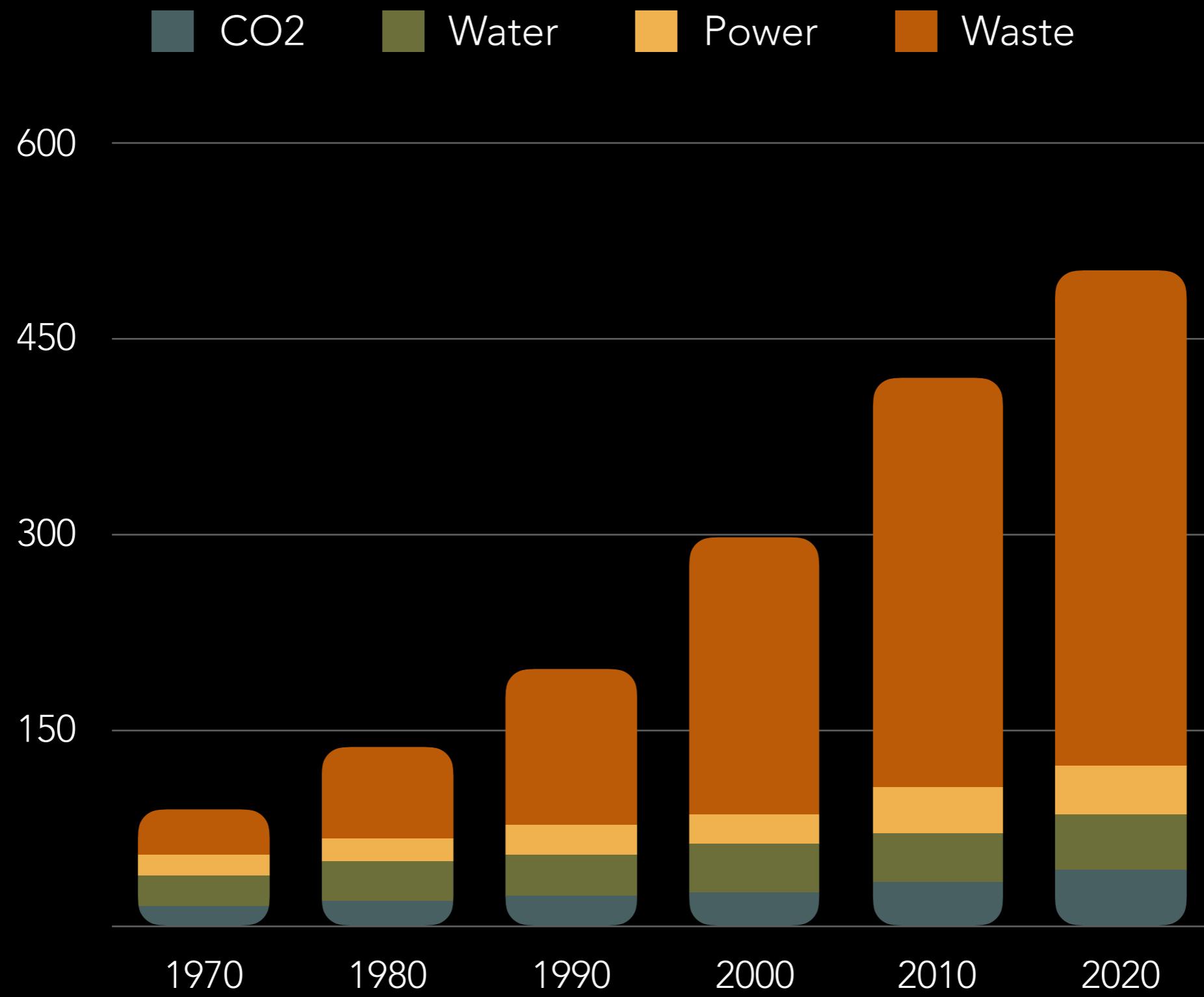




Problem

# ENVIRONMENT

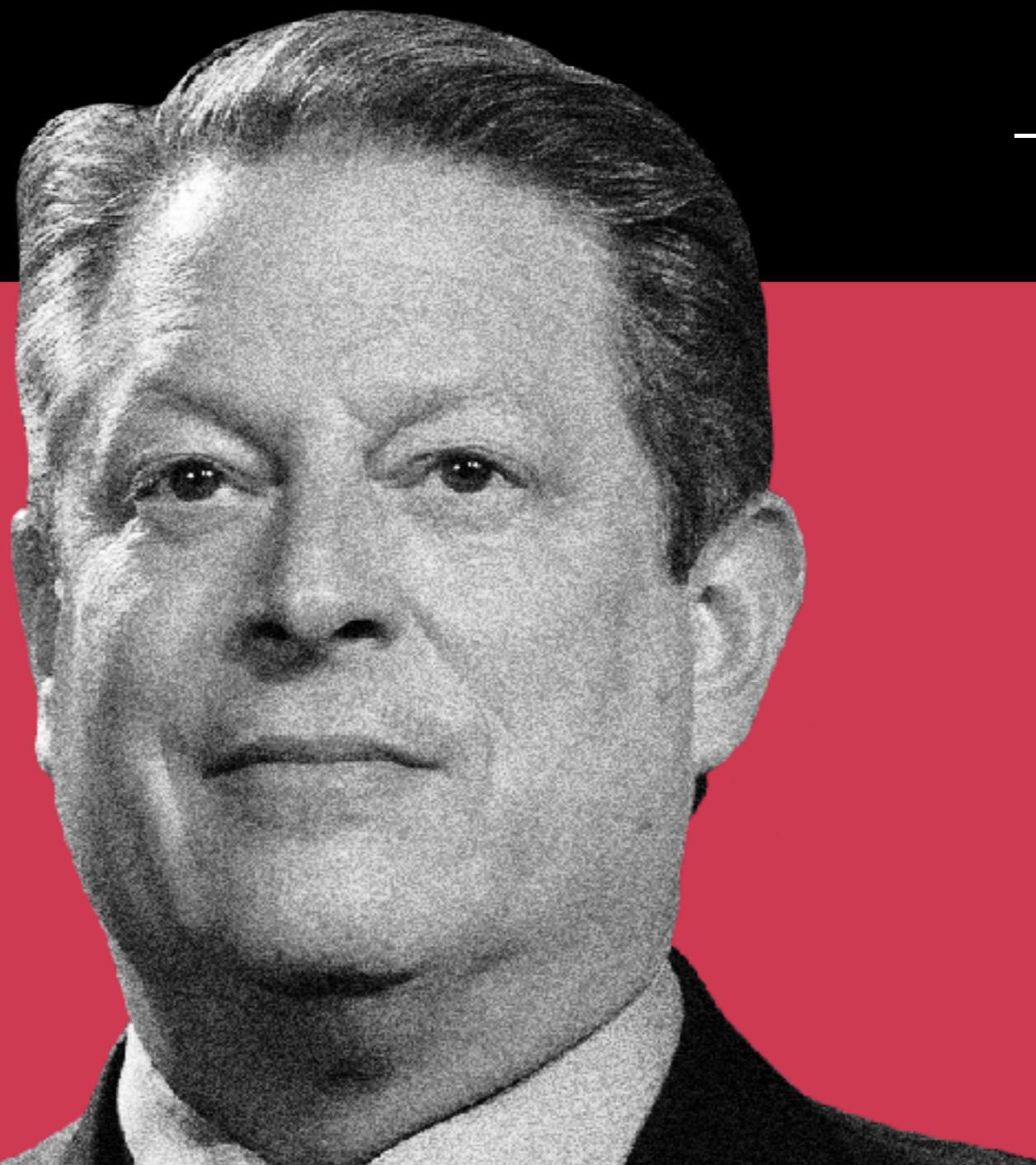






“Solutions to the climate crisis are within reach, but in order to capture them, we must take urgent action today **across every level of society.**”

— Al Gore



What can we do to reduce our impact?

A dark, high-contrast photograph showing a massive, sprawling pile of discarded books and papers. The books are stacked haphazardly, their spines and covers visible in various colors like red, blue, green, and yellow. The overall scene conveys a sense of waste and environmental impact.

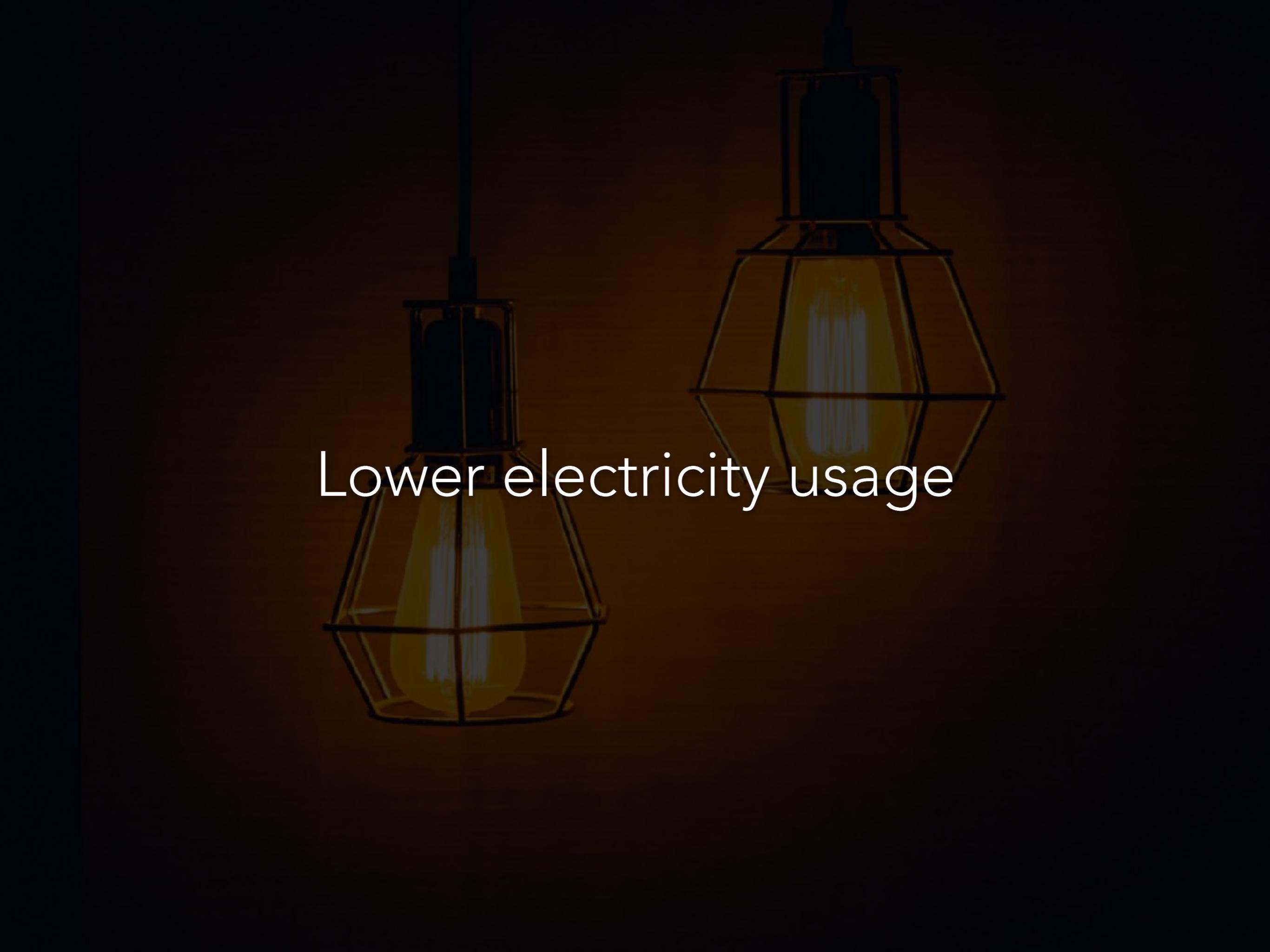
# Reduce, Reuse & Recycle



Less cars, more public transportation

A dark, moody photograph of a bathroom interior. In the upper right corner, a black, modern-style shower head is mounted on a wall. Below it, a bath mat with a textured, marbled or floral pattern lies on a dark surface. The lighting is low, creating deep shadows and highlights that emphasize the textures of the shower head and the bath mat.

Reduce water consumption



Lower electricity usage

# How do we motivate people?



“Protecting our future on this planet depends  
on the conscious evolution of our species.”

— Leonardo DiCaprio



How?

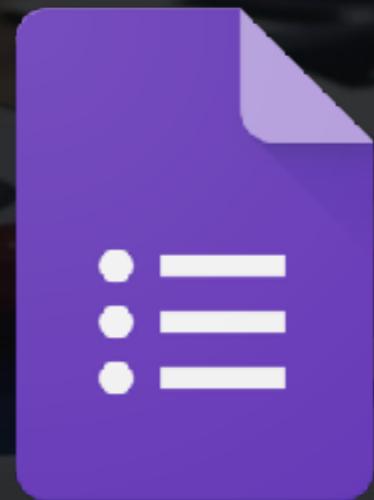




Approach



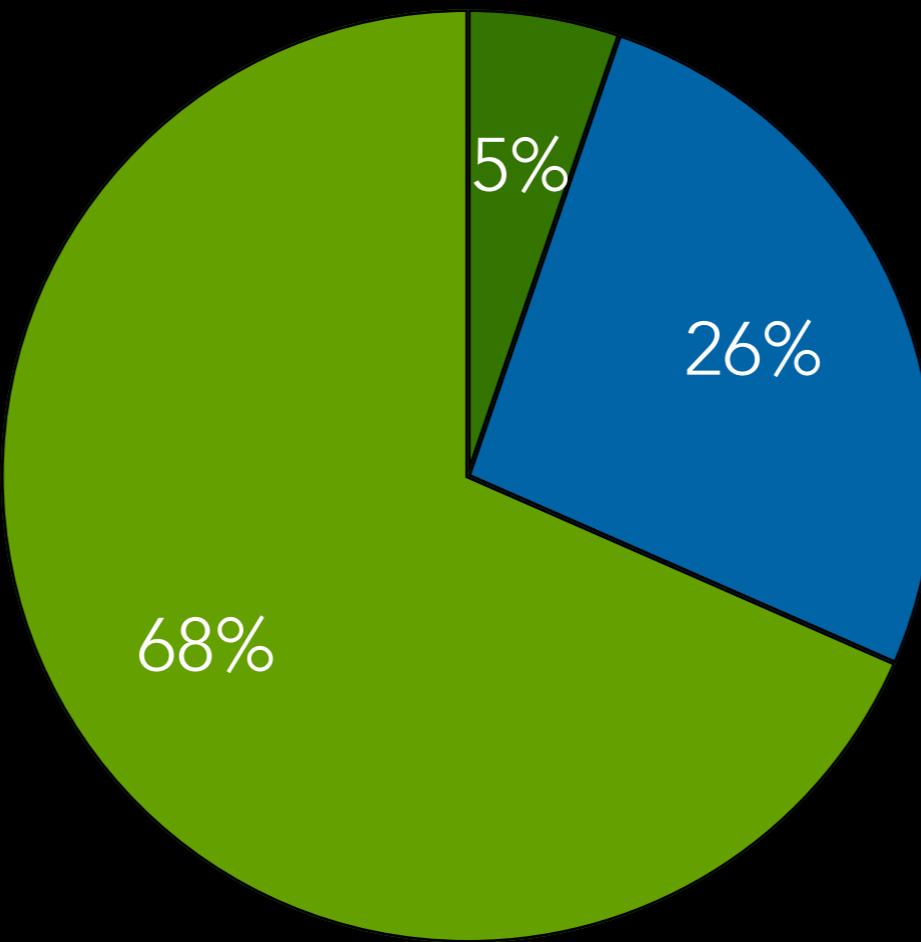
# User Research



Google Forms



In general, is your household **water** consumption above or below the average?

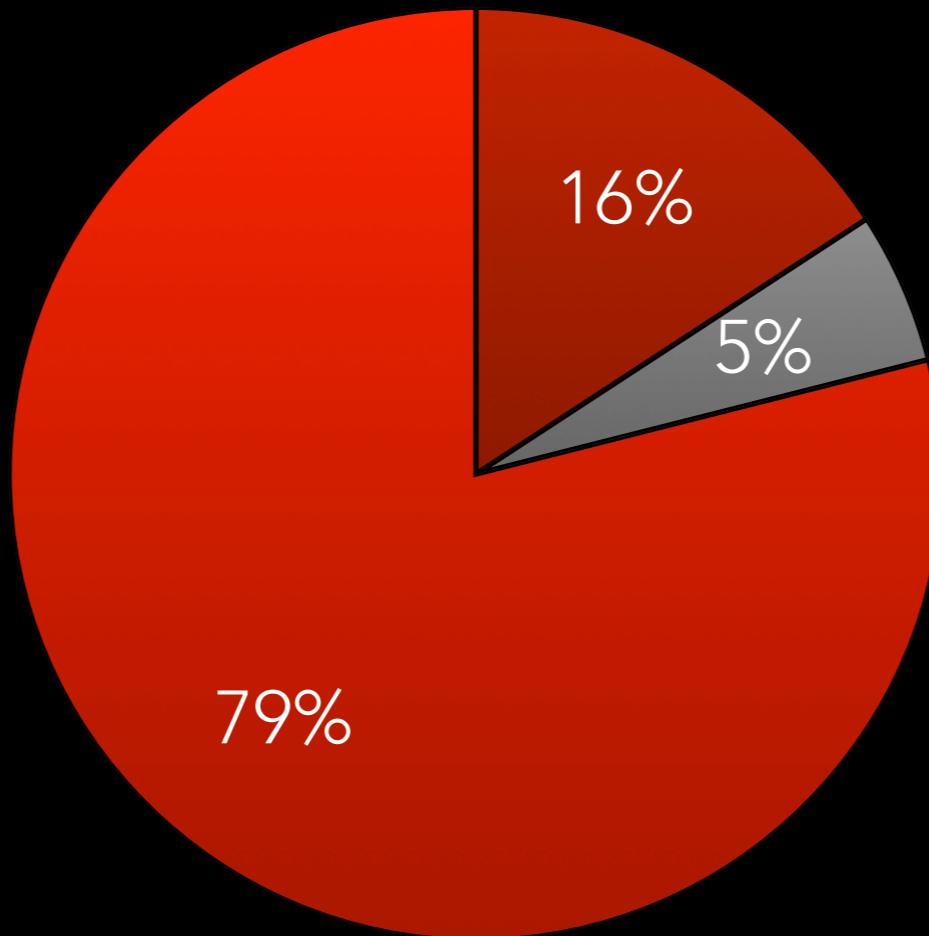


● Above the average

● Below the average

● Not sure

In general, is your household **electricity** consumption above or below the average?



- Above the average
- Below the average
- Not sure

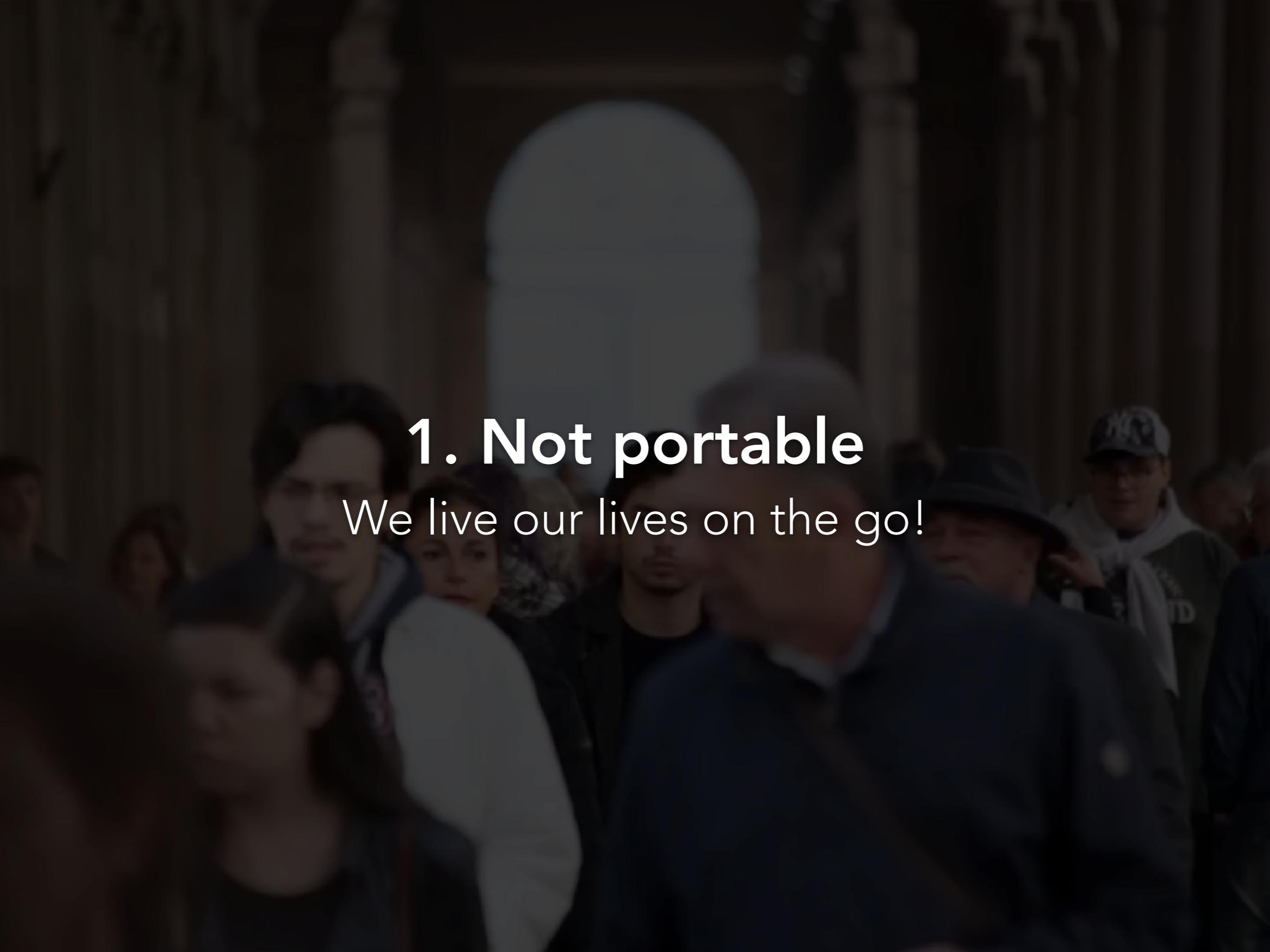
A close-up photograph of a person's eye, showing the iris and pupil. The eye is looking directly at the viewer.

**Self awareness is the key!**

# Ambient orb



- Non-obtrusive
- Easy to get information
- Simple to use and set up

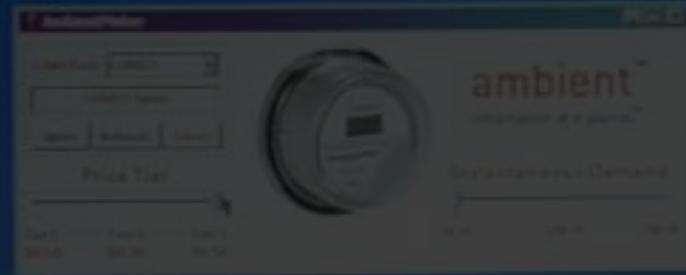
A dark, grainy photograph of a diverse crowd of people looking towards the right. The faces are partially obscured by shadows, creating a sense of anonymity and focus on the collective.

# 1. Not portable

We live our lives on the go!

## 2. Few information

Users want to know more about their habits!



How do we retrain the **glanceability** and  
**ease-of-use** of the ambient orb, while  
dealing with **more information?**

How do we retrain the **glanceability** and  
**ease-of-use** of the ambient orb, while  
dealing with **more information**, and in a  
**portable form factor?**

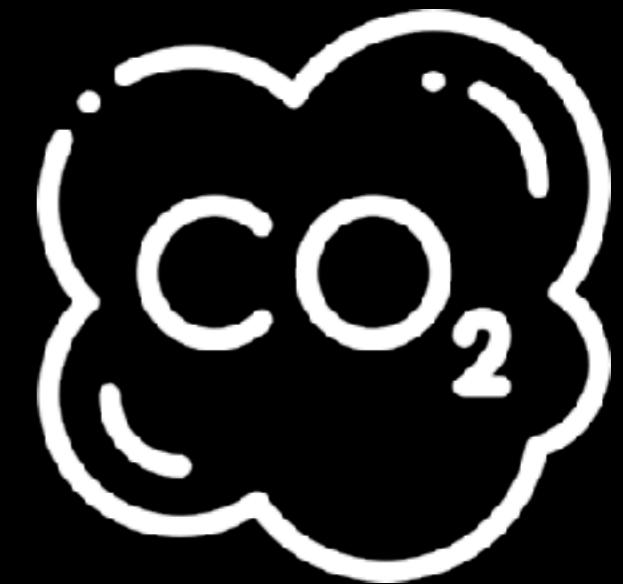


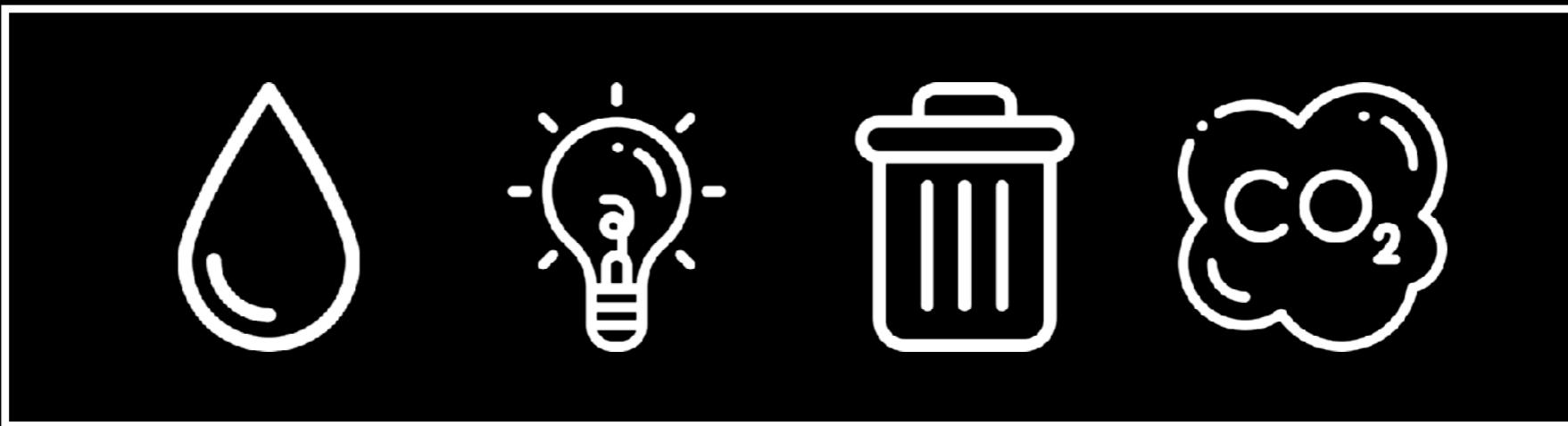


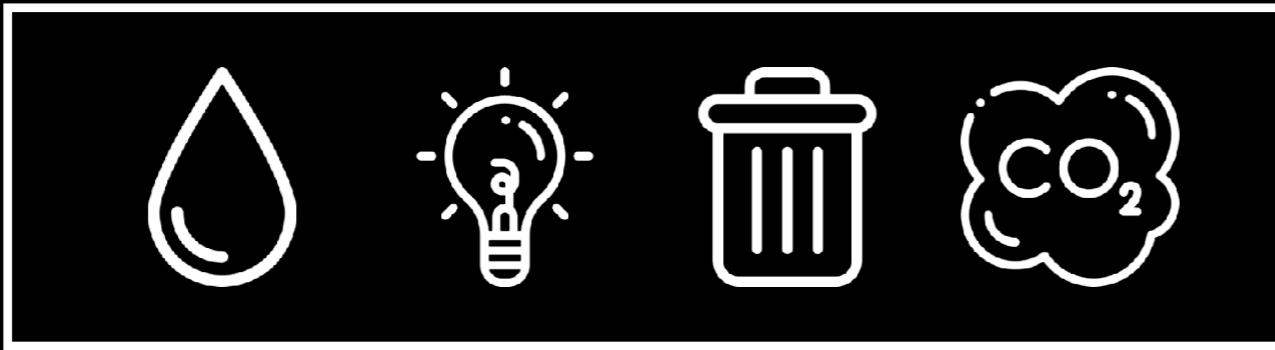
Solution

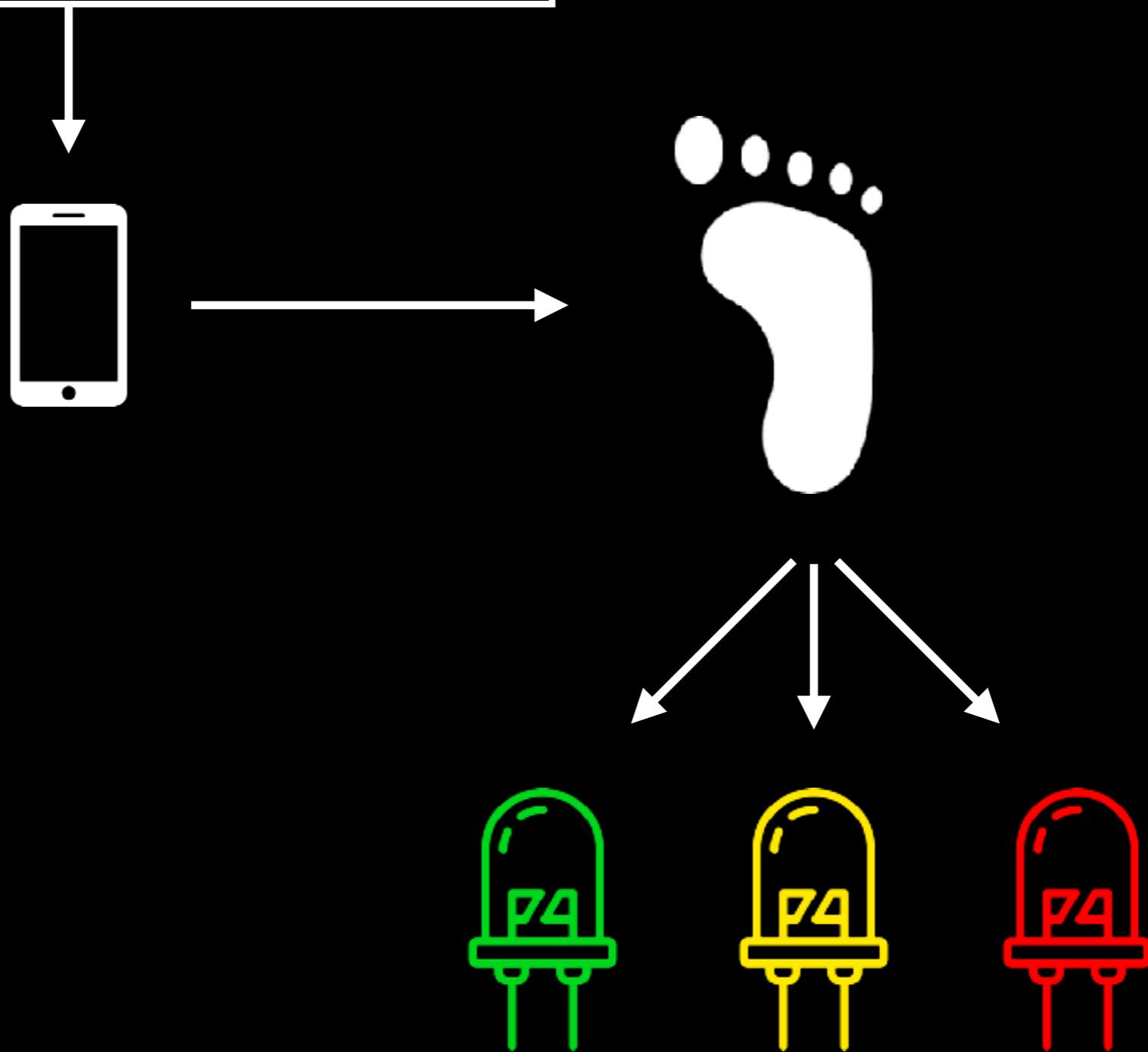
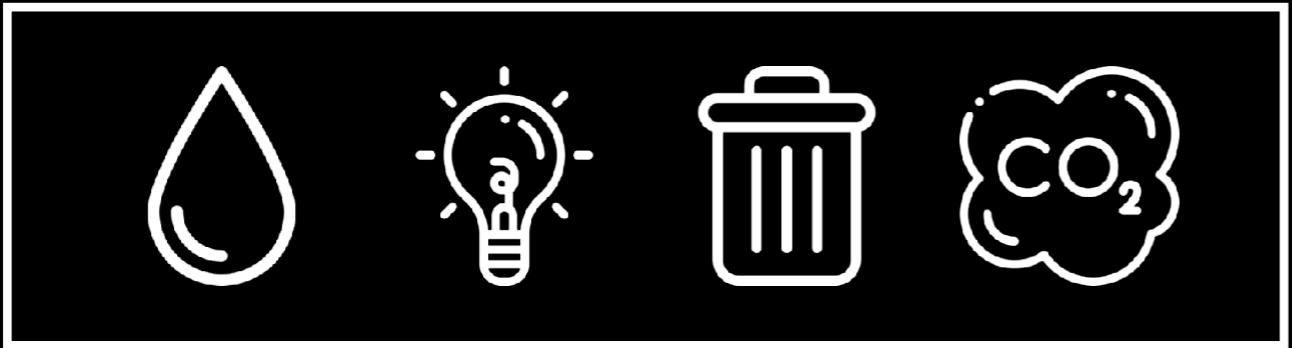
Eco footprint?

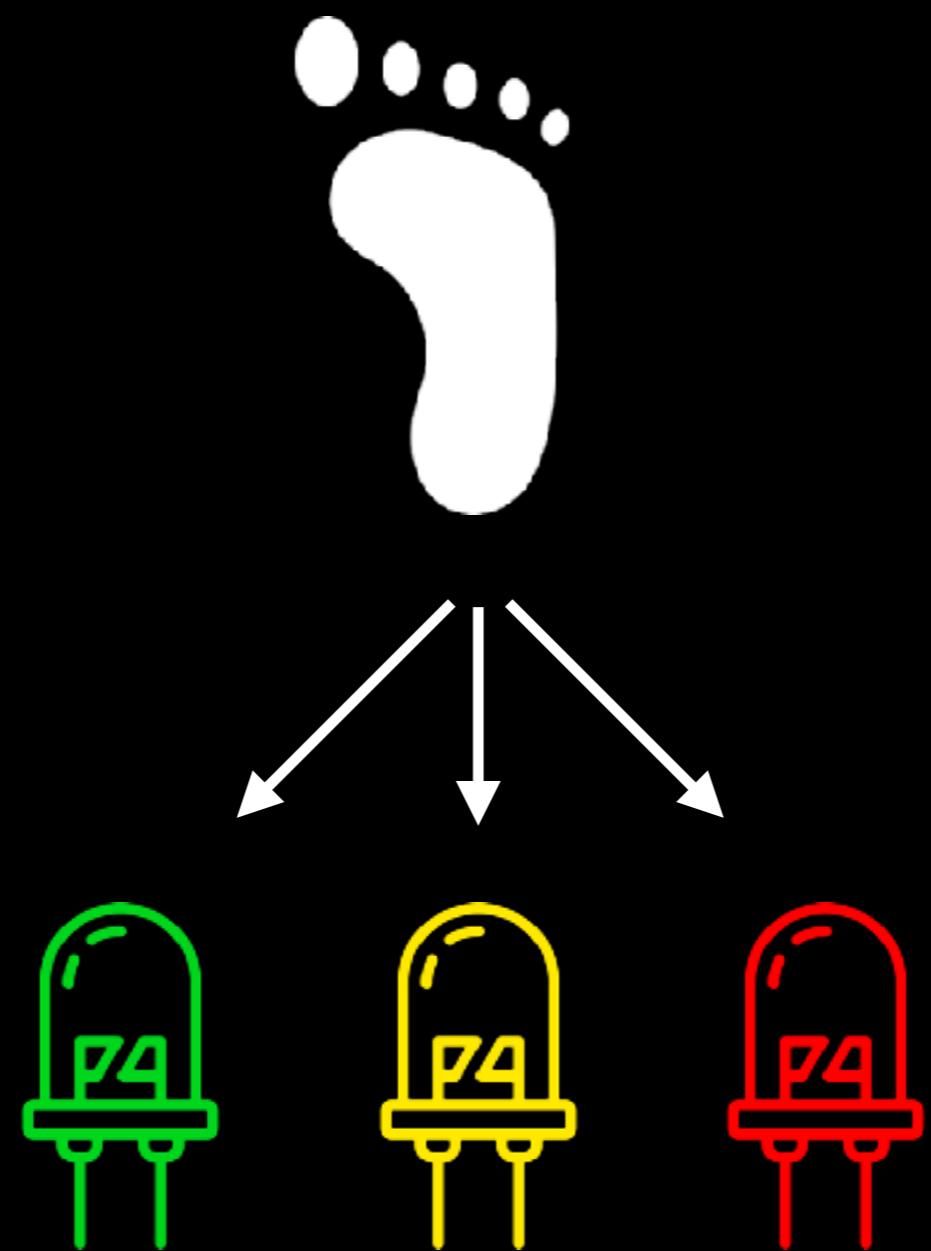
# Eco footprint?



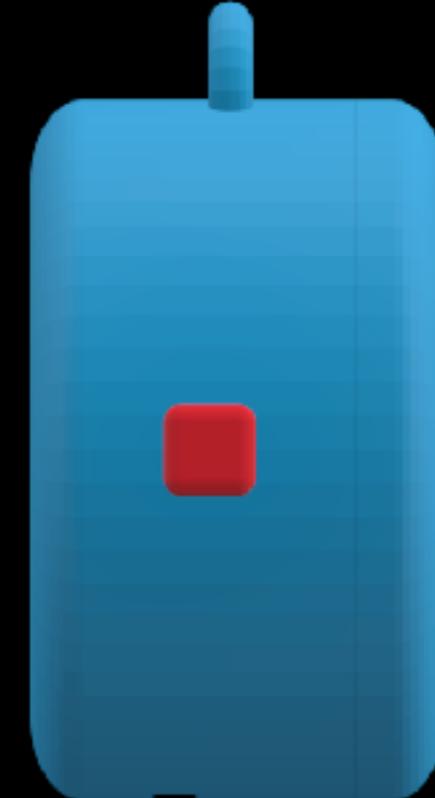


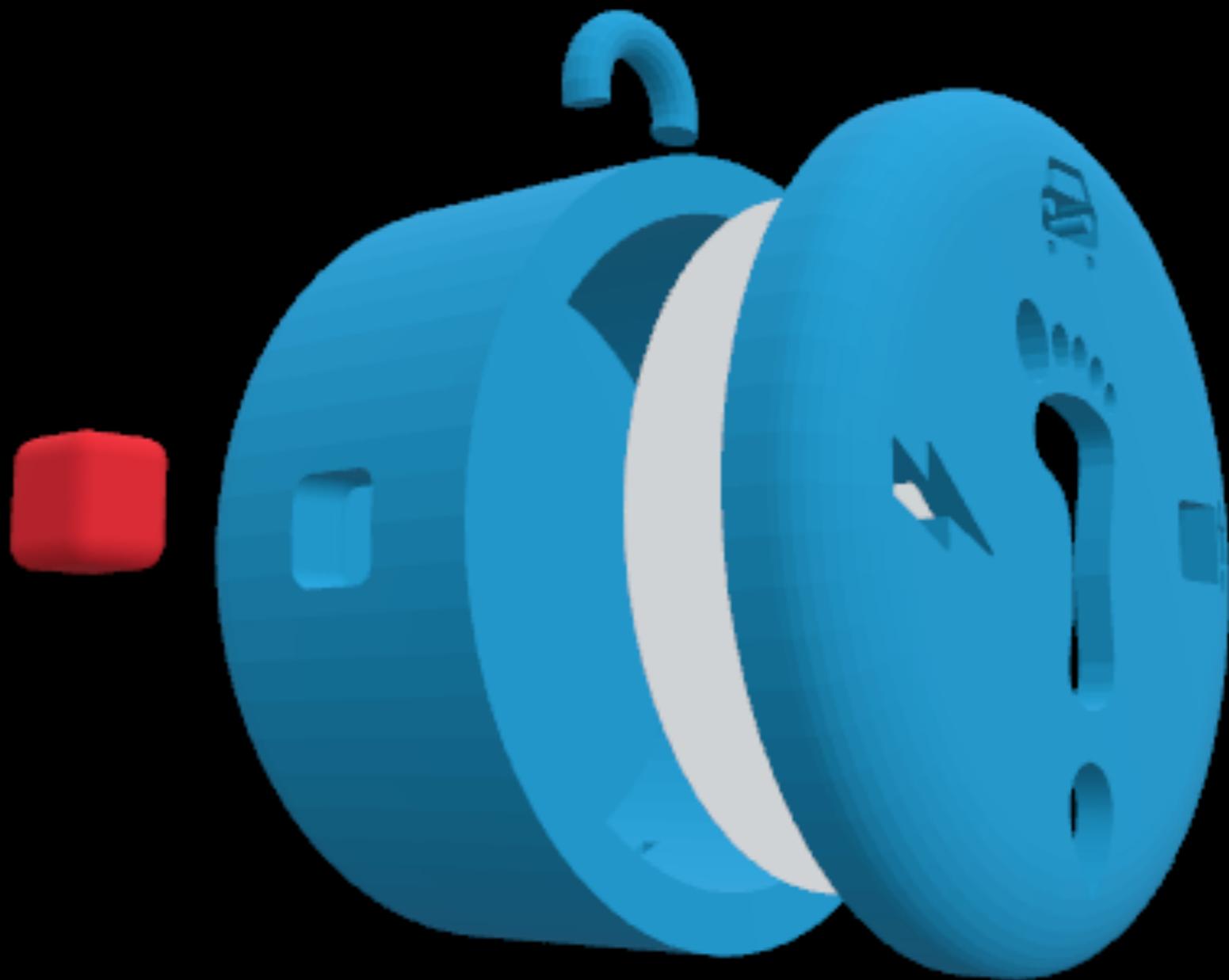








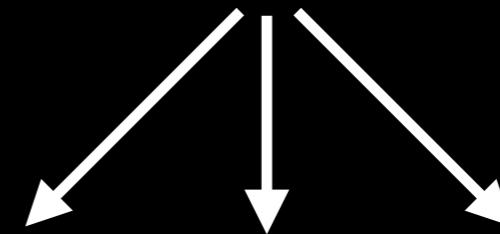
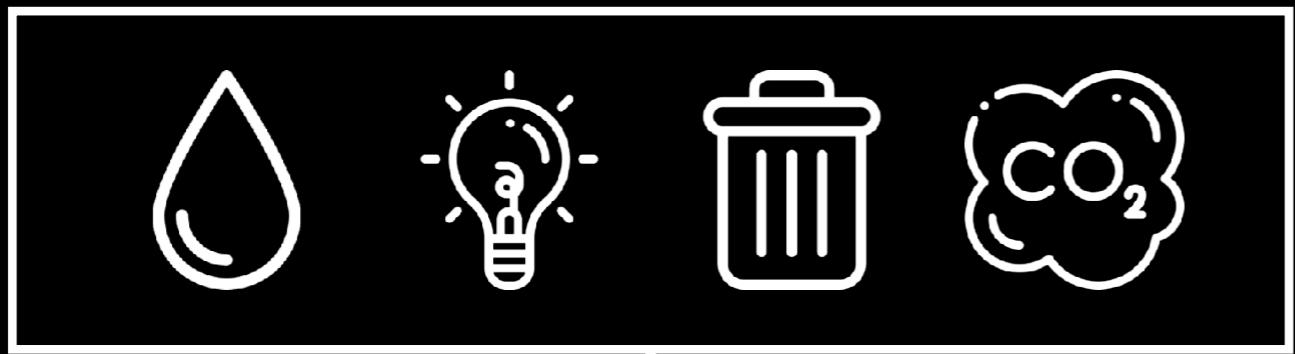


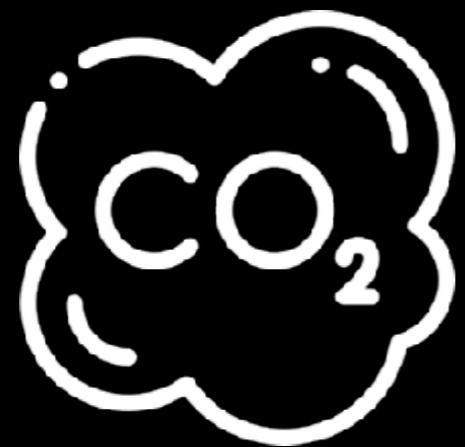


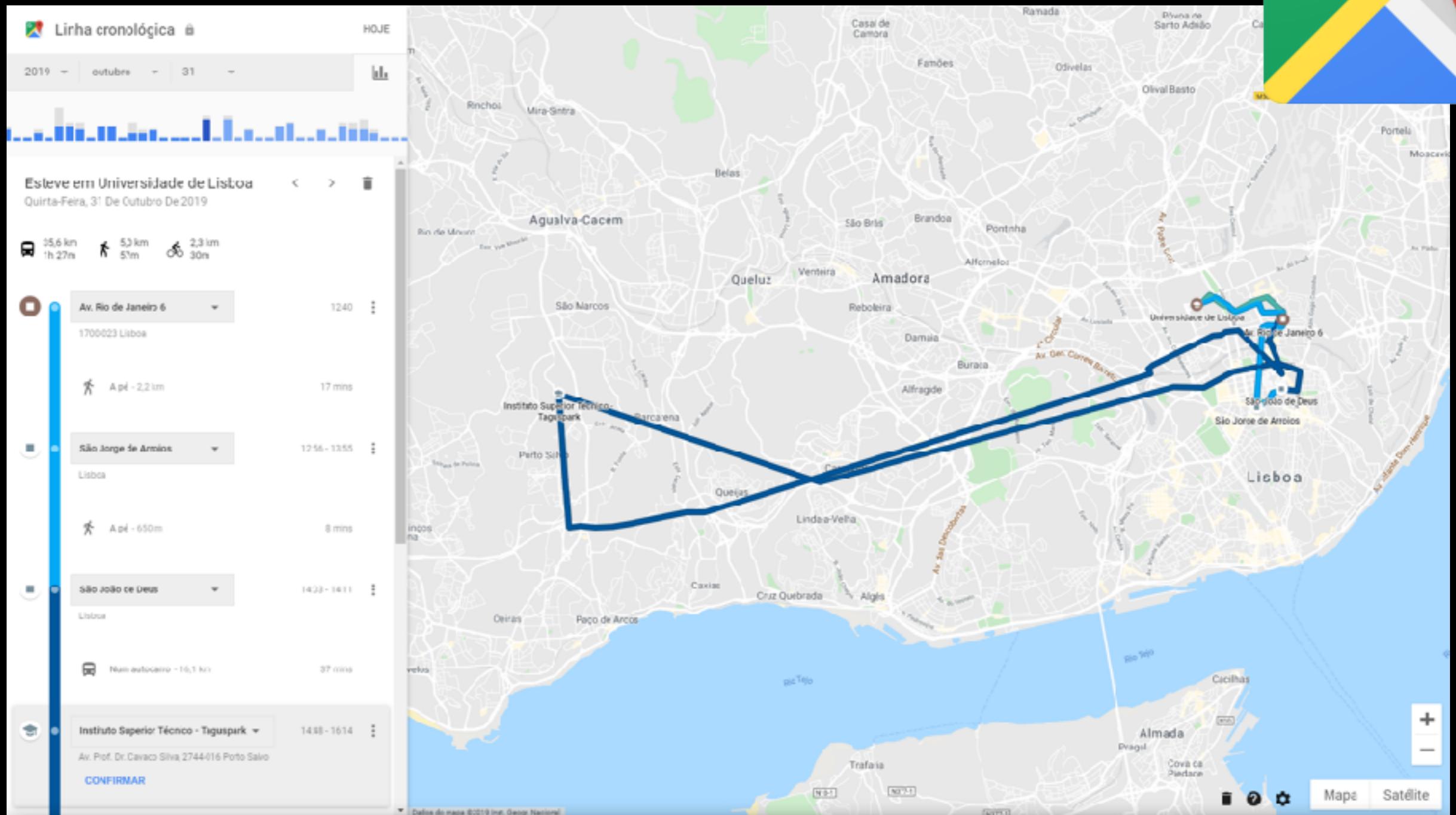














Esteve em Universidade de Lisboa

Quinta-Feira, 31 De Outubro De 2019



35,6 km  
1h 27m

5,0 km  
57m

2,3 km  
30m



Av. Rio de Janeiro 6



12:40

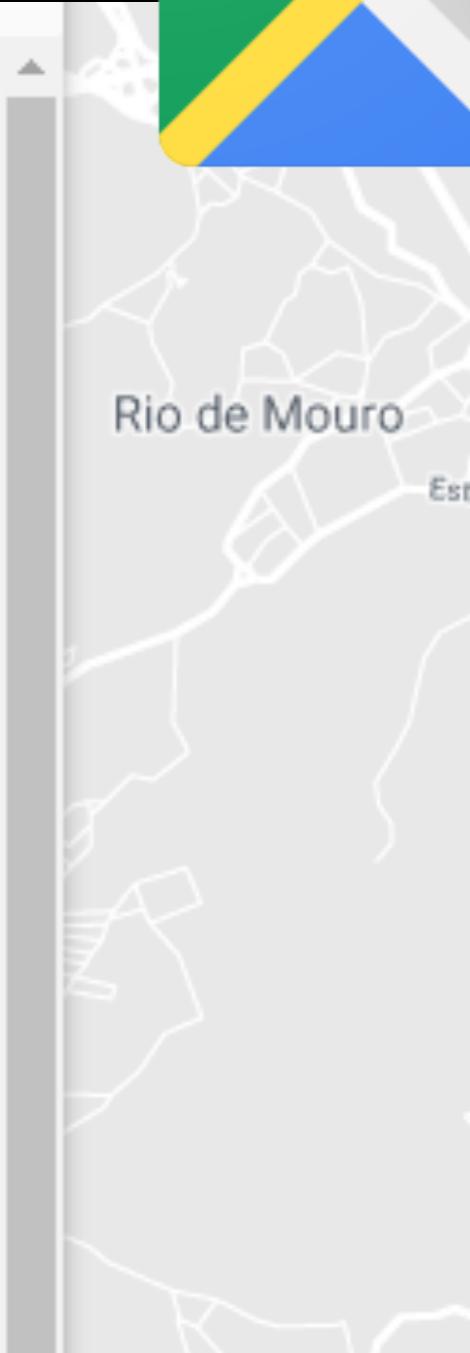


1700-023 Lisboa

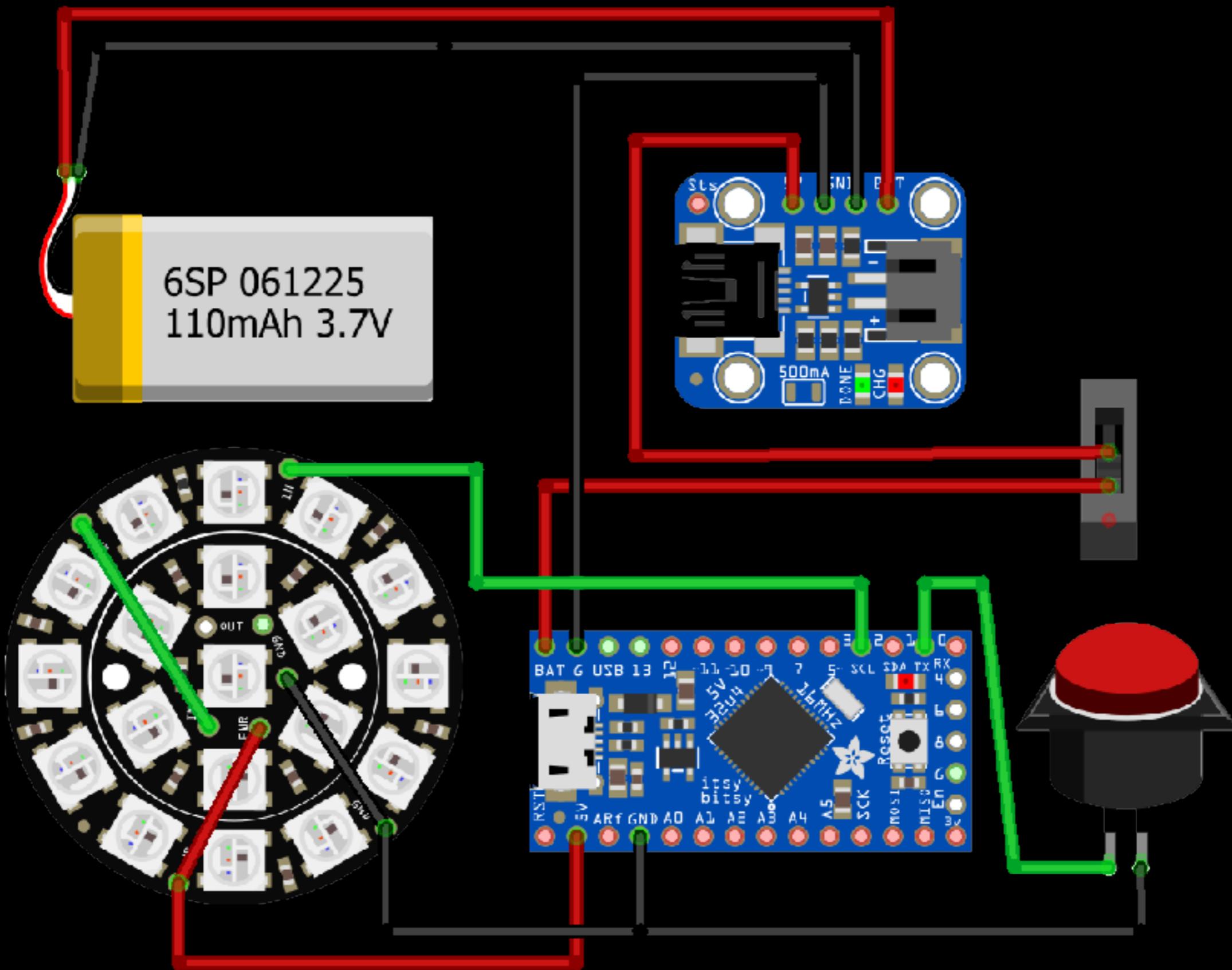


A pé - 2,2 km

17 mins



```
<Style id="multiTrack_h">
  <IconStyle>
    <scale>1.2</scale>
    <Icon>
      <href>https://earth.google.com/images/kml-icons/track-directional/track-0.png</href>
    </Icon>
  </IconStyle>
  <LineStyle>
    <color>99ffac59</color>
    <width>8</width>
  </LineStyle>
</Style>
<Placemark>
  <name>Casas do Patio L.da - Country Houses & Nature</name>
  <address>Tv. da Calçada, 3525-207 Vale de Madeiros</address>
  <ExtendedData>
    <Data name="Email">
      <value>manuel.sousamvs@gmail.com</value>
    </Data>
    <Data name="Category">
      <value>Hotel</value>
    </Data>
    <Data name="Distance">
      <value>0</value>
    </Data>
  </ExtendedData>
  <description><description> Hotel from 2019-09-18T19:01:29.756Z to 2019-09-19T08:41:38.901Z. Distance 0m </description>
  <Point>
    <coordinates>-7.864908499999999,40.488895299999996,0</coordinates>
  </Point>
  <TimeSpan>
    <begin>2019-09-18T19:01:29.756Z</begin>
    <end>2019-09-19T08:41:38.901Z</end>
  </TimeSpan>
</Placemark>
```



```
void loop() {  
    int value = 0;  
  
    if(Serial.available()){  
        Serial.println("New values received");  
        for(int i=0; i<5; i++) {  
            int value = Serial.read();  
            Serial.print("Value: ");  
            Serial.println(value / 100.0);  
            curr_color[i] = toColor(value / 100.0);  
        }  
        update_leds = true;  
    };  
  
    if (digitalRead(BUTTON_PIN) == LOW) {  
        update_leds = true;  
        delay(200);  
        buttonStuff();  
        Serial.println("Button pressed");  
    }  
  
    if (update_leds) {  
        Serial.println("Updating LEDs");  
        curr_selection = curr_selection % NUMPIXELS; i++) pixels.setPixelColor(i,  
        if (curr_selection == -2) {  
            for(int i=12; i<NUMPIXELS; i++) pixels.setPixelColor(i, 0);  
        }  
        pixels.show();  
        update_leds = false;  
    };  
}
```

New values received

Changed measure

Update LEDs

```
void buttonStuff() {  
    int shift = 0;  
    if(curr_selection >= 0) pixels.setPixelColor(curr_selection * 3 +  
        curr_selection++;  
    if (curr_selection == 4) {  
        curr_selection = -2;  
    }  
    if(curr_selection >= 0) pixels.setPixelColor(curr_selection * 3 +  
        pixels.Color(0,0,0.1*255));  
}
```



Change  
selection

```
uint32_t toColor(float value)  
{  
    int red, green, blue;  
    blue = 0;  
    if (value < 0.5) {  
        red = 255;  
        green = (int) 255*2*value;  
    }  
    else {  
        red = (int) 255 - 255*(value-0.5)*2;  
        green = 255;  
    }  
}
```

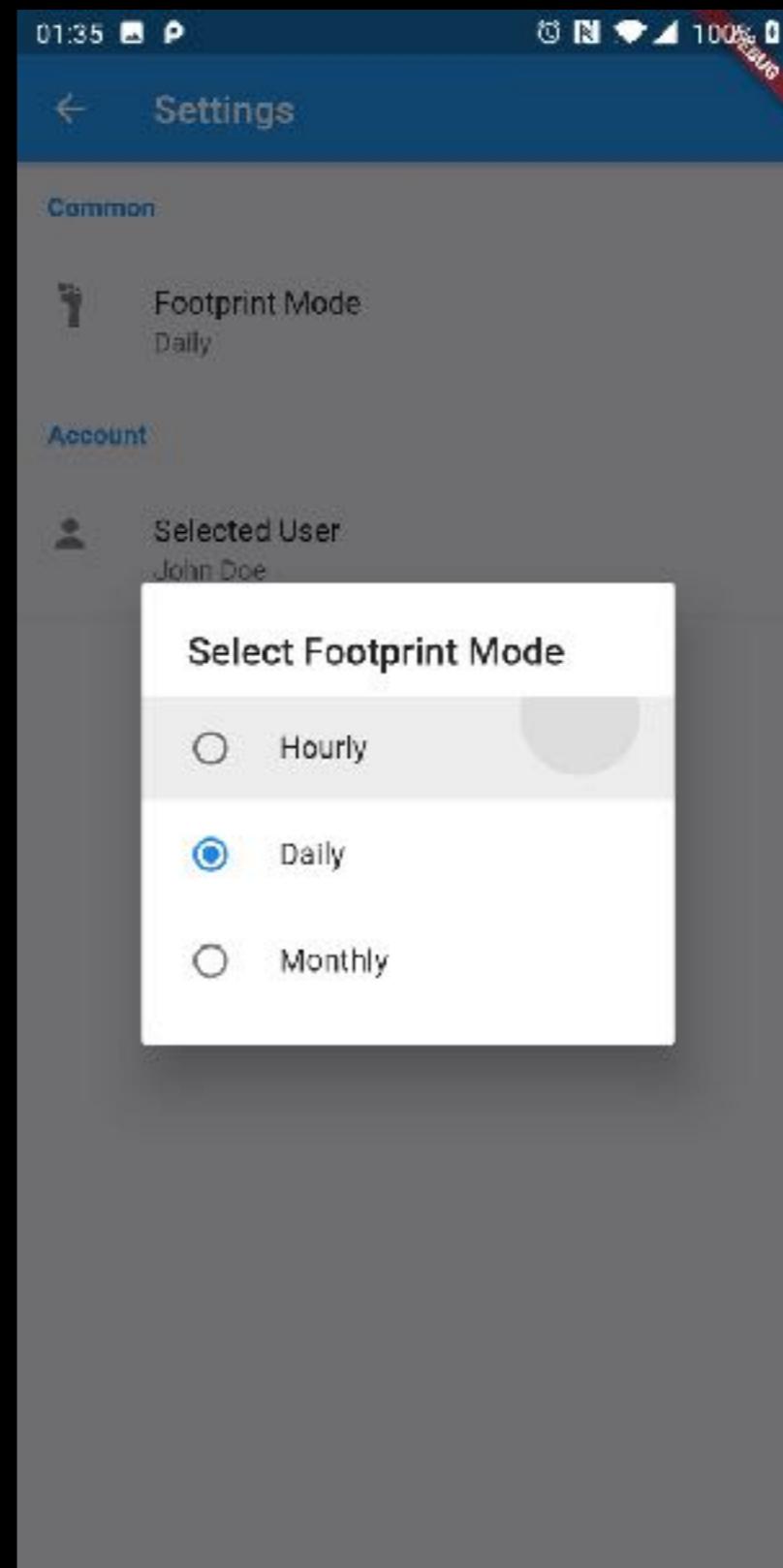
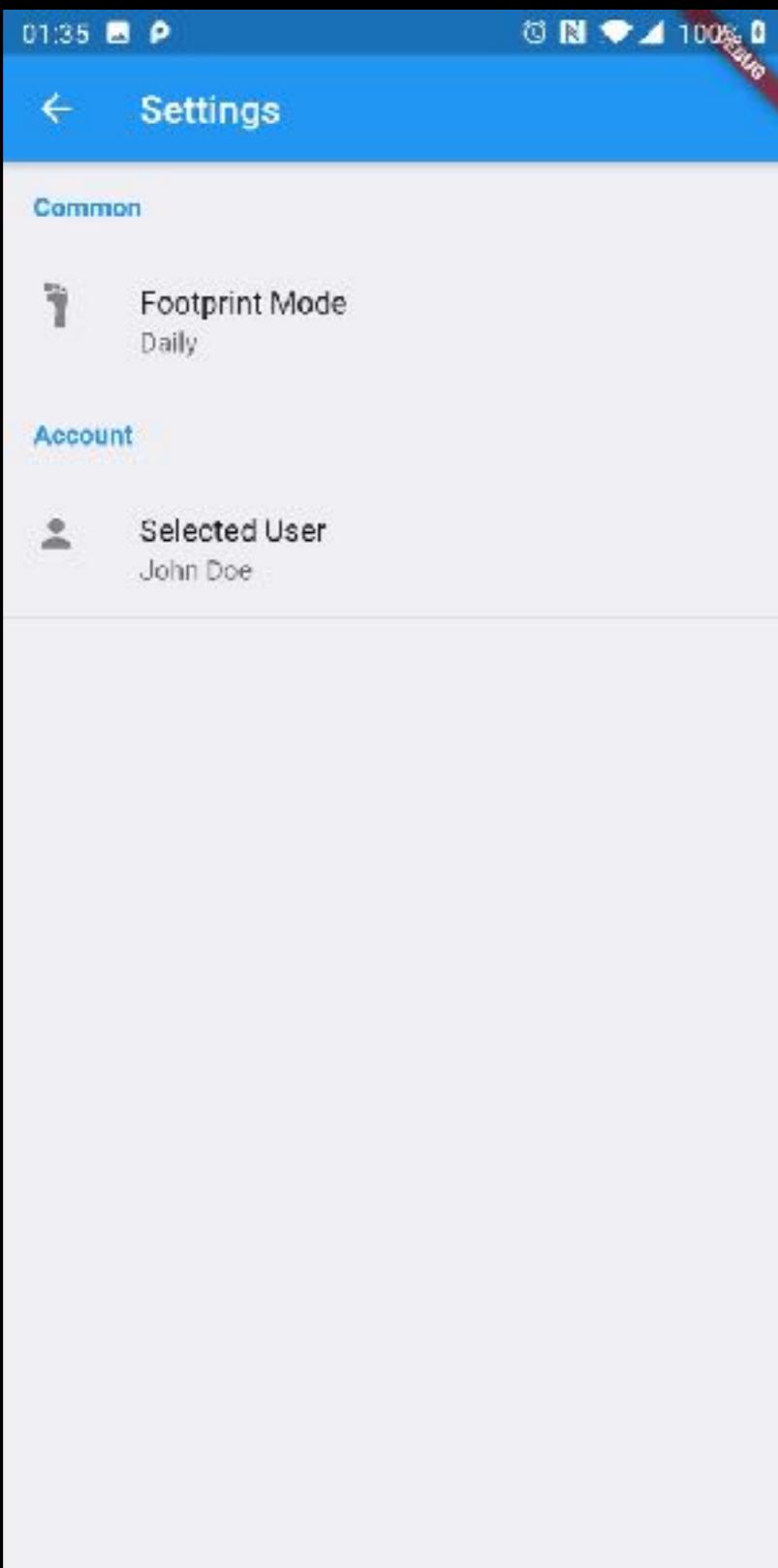


Convert to color

```
char stringos[50];  
sprintf(stringos, "Color: (%d, %d, %d)\n", red, green, blue);  
Serial.println(stringos);  
return pixels.Color(0.1*red,0.1*green,0.1*blue);  
}
```









# Demo

Does our solution work?



3 personas



Semi-structured interviews



Satisfaction surveys

# Measures



Acceptability



Effectiveness





- Multi-purpose
- Portable
- Glanceable
- Ease-of-use
- Multiple information

# Q&A