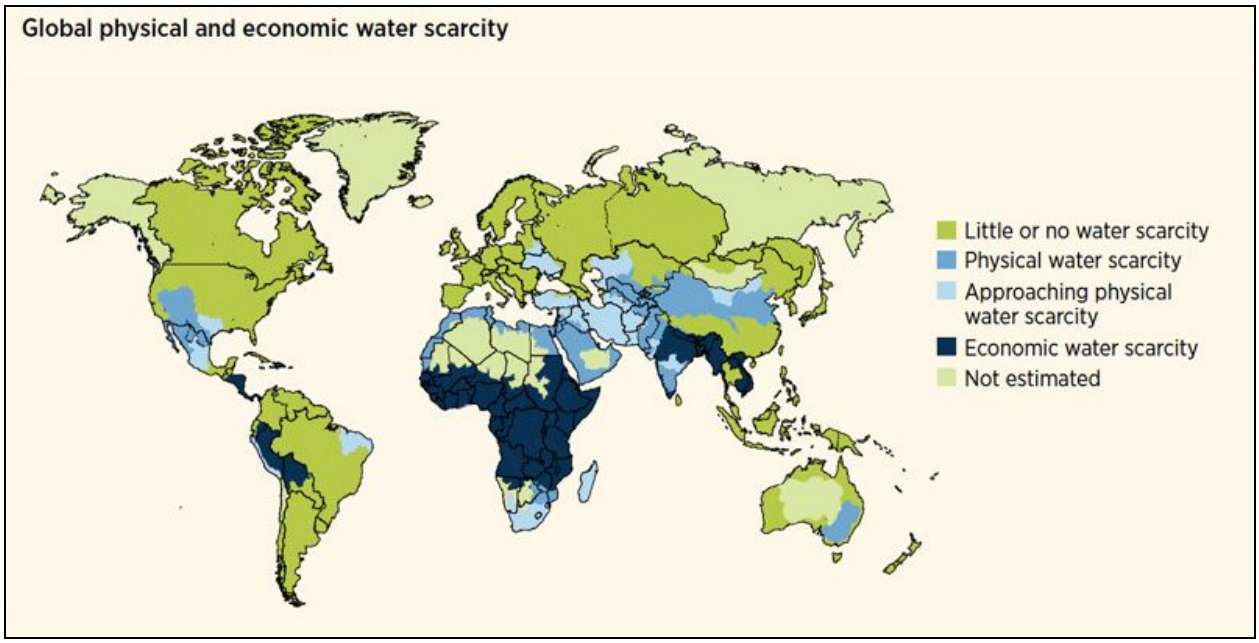
Introduction

Proposed Device

- Portable water testing device
- "Choosing the Detector for your Unique Light Sensing Application"

Reasoning

- Amount of people who suffer from water scarcity
    - Water scarcity is both a natural and a human-made phenomenon.
    - 750 million people in 43 countries suffer from water scarcity. That's one in 10 people on earth. (https://lifewater.org/blog/world-water-day-2018/)
    - By 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the worlds pop could be living in water stressed conditions. (https://www.un.org/waterforlifedecade/scarcity.shtml)
    - Climate change will exacerbate this issue because it will reduce the availability of water by reducing the amount of available freshwater. There is enough freshwater on the planet for 7 bill peopple but it is distributed unevenly, and too much is wasted, polluted, and unsustainably managed.
- Where is there water scarcity? (https://en.wikipedia.org/wiki/Water_scarcity)



- Economic water scarcity is mostly an issue in sub-saharan Africa, Peru, Bolivia, the majority of India, and southeast Asia. Although this seems like a problem outside of the US, we are also experiencing this problem in areas such as California, New Mexico, Arizona, and Texas. And water scarcity issues occur after natural disasters

- Our proposed device will work alongside an ecological water filter that will eliminate the majority of pollutants and suspended particles in water and the filter will test the potability of the water.

Preliminary Technical Research

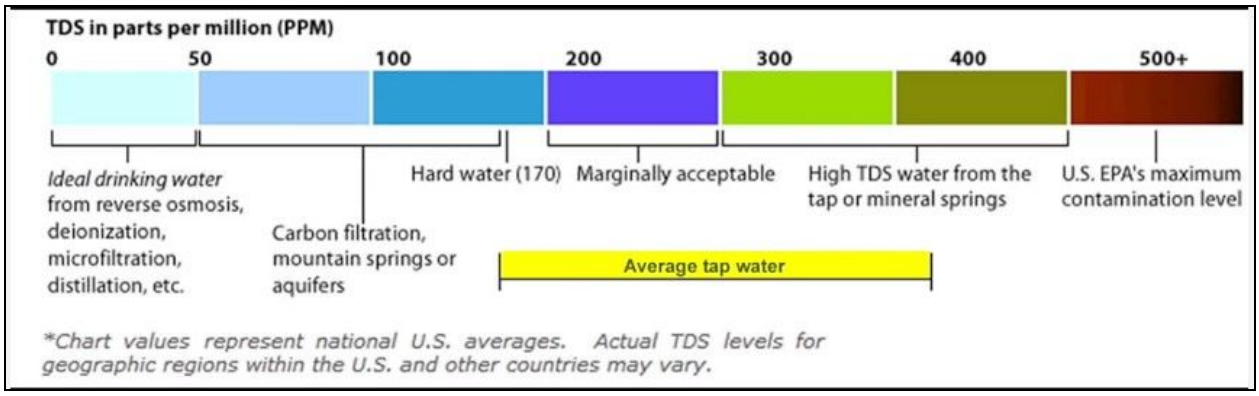
Technical Device

- L. Godfrey, " Choosing the Detector for your Unique Light Sensing Application," 1997. [Online]. Available: https://johnloomis.org/ece445/topics/egginc/tp4.html. [Accessed: Feb-2020].

Documentation

- Preliminary BOM and Research: Possible Hardware/Components for Device, Breakdown
    - Microbial Tech: https://create.arduino.cc/projecthub/open-bioeconomy-lab/microbial-bioreactor-d7f61b
        - Flow-Through Photometer: https://www.hackster.io/alexanderkutschera/flow-through-photometer-0226cb
        - pH Electrode Probe: https://www.ebay.co.uk/p/19028350820?iid=201758085638&chn=ps
        - Mercury Detection Sensor: https://create.arduino.cc/projecthub/biomaker-ghana-mercury-and-lead-sensor/sensor-for-mercury-detection-in-water-16b5d3
        - Lead Test Kit: https://www.fastcompany.com/40439492/this-11-year-old-invented-a-cheap-test-kit-for-lead-in-drinking-water
            - The carbon nanotubes in the cartridge are sensitive to changes in the flow of electrons. Those tubes are lined with atoms that have an affinity to lead, which adds a measurable resistance to the electron flow. When the cartridge is dipped in water that is clean, the electron flow doesn't change and the smartphone app shows that water is safe to drink. But when the cartridge is dipped in contaminated water, the lead in the water reacts to the atoms, causing resistance in the electron flow that is measured by the Arduino processor. The app then shows that the water isn't safe to drink.

- Gravity: Analog Turbidity Sensor For Arduino
    - The gravity arduino turbidity sensor detects water quality by measuring the levels of turbidity, or the opaqueness.
    - www.dfrobot.com/product-1394.html; $10
    - 1 analog input: Example
- Gravity: Analog TDS Sensor/Meter for Arduino
    - Measures TDS (Total Dissolved Solids): Indicates how many milligrams of soluble solids dissolved in one liter of water. In general, the higher the TDS value, the more soluble solids dissolved in water, and the less clean the water is.



    - https://www.dfrobot.com/product-1662.html: $10
    - Sample Code
- Gravity: Analog pH Sensor - Meter Kit
    - https://store.arduino.cc/usa/gravity-analog-ph-sensor: $30
    - Sample Code
- Gravity: Analog ORP Sensor Meter For Arduino
    - ORP (Oxidation-Reduction Potential) is a measure of the ability of oxidation and reduction of aqueous solution, characterization of oxidizing or reducing the relative degree.
    - https://www.dfrobot.com/product-1071.html: $90
- Gravity: Analog Dissolved Oxygen Sensor / Meter Kit For Arduino
    - Used to measure the dissolved oxygen in water, to reflect the water quality
    - https://www.dfrobot.com/product-1628.html: $170
    - Sample Code
- Sensor for Mercury Detection in Water
    - Project Link
- Spectrophotometer for Liquids
    - 5 LED Arduino Spectrometer

- A Simple, Rapid Analysis, Portable, Low-cost, and Arduino-based Spectrophotometer with White LED as a Light Source for Analyzing Solution Concentration — Link
- Will design 3D printed components in CAD/CAM process to keep electronic components waterproof