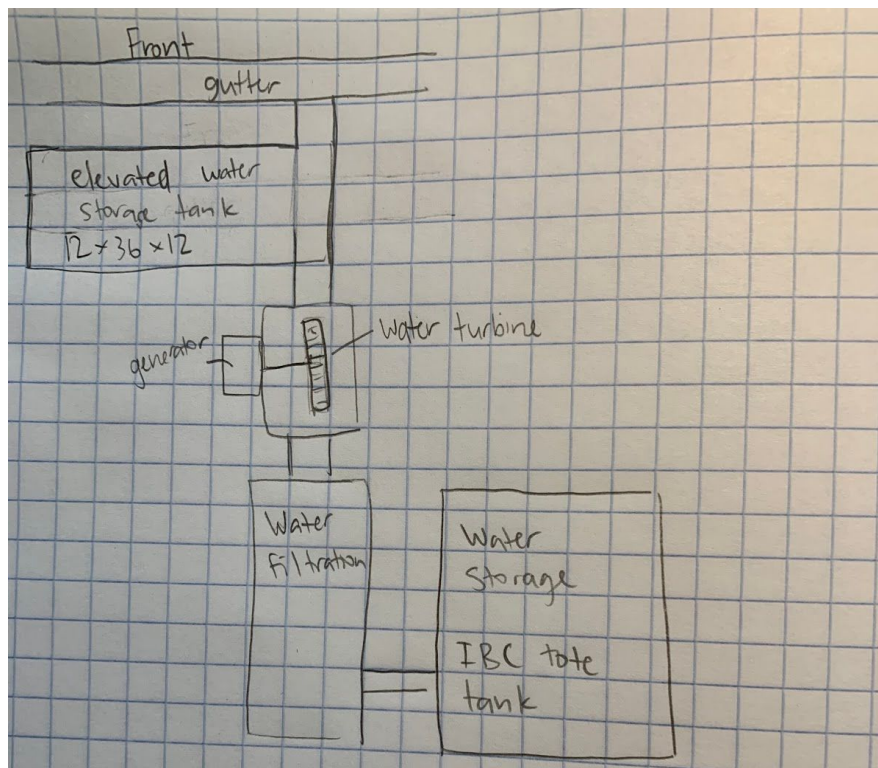
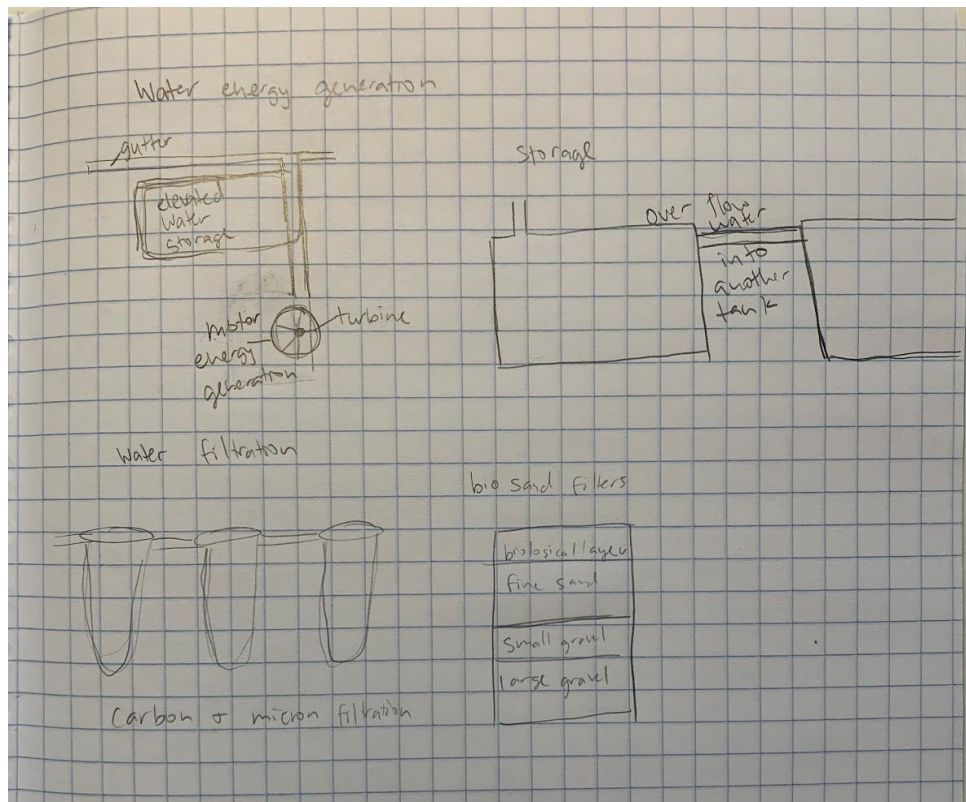


February 5th, 2021

Brainstorm sketches:



Existing solutions:

Energy generation from rain gutters <https://www.youtube.com/watch?v=S6oNxckjEiE>



Rain water collection

<https://www.youtube.com/watch?v=MYTNciCplmw> - DIY rainwater collection

<https://www.youtube.com/watch?v=WSRUolvZAg4> -full rainwater harvesting system walkthrough





February 7th, 2021:

Water turbines

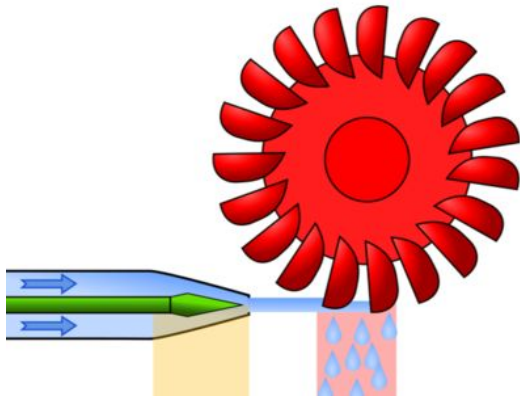
<https://www.explainthatstuff.com/turbines.html>

Impulse turbines vs reaction turbines:

- Impulse turbines use a fast moving fluid to spin the turbine with the impact. The momentum from the water
- Reaction turbines consist of a turbine being submerged in a large volume of fluid. The blades move as the water flows past

This system needs an impulse turbine.

Pelton Turbine



- One of the most efficient types of turbines
- Splitter in the bucket causes the stream of water to split and exit at either side of the bucket
- Momentum change generates torque and rotation

February 8th, 2021:

Today I did some additional research on the problem and used it to draft an outline for the project proposal video.

Significant information and identifying the problem:

-According to [the WHO \(as of 2019\)](#), 2.2 billion people worldwide do not have access to safe drinking water services.

-[840](#) million people do not have access to electricity

-in 2020, only [about 28%](#) of the worlds energy generation came from renewable sources

-One location that I looked into is papua new guinea, `population 8.77 million

-About [90% of the population](#) lives in rural areas, and have little access to reliable electricity.

-only about 33% of the rural population has access to safe water

-annual rainfall is typically [80 to 160 inches](#), although some areas often exceed [300 inches](#).

February 10th, 2021:

Today I filmed and submitted the project proposal video in which I discussed my plan for the project.

The system that im looking to design would use gutters to redirect the rain water from the roof of a house into a elevated storage tank.

-The water would then be funnelled into a downspout of sorts, where it would flow through a impulse turbine to generate energy because impulse turbines do not need to be completely enclosed within the pipe.

-Once used for that, the water would be filtered and stored in a water tank where it could be used in the future for purposes such as

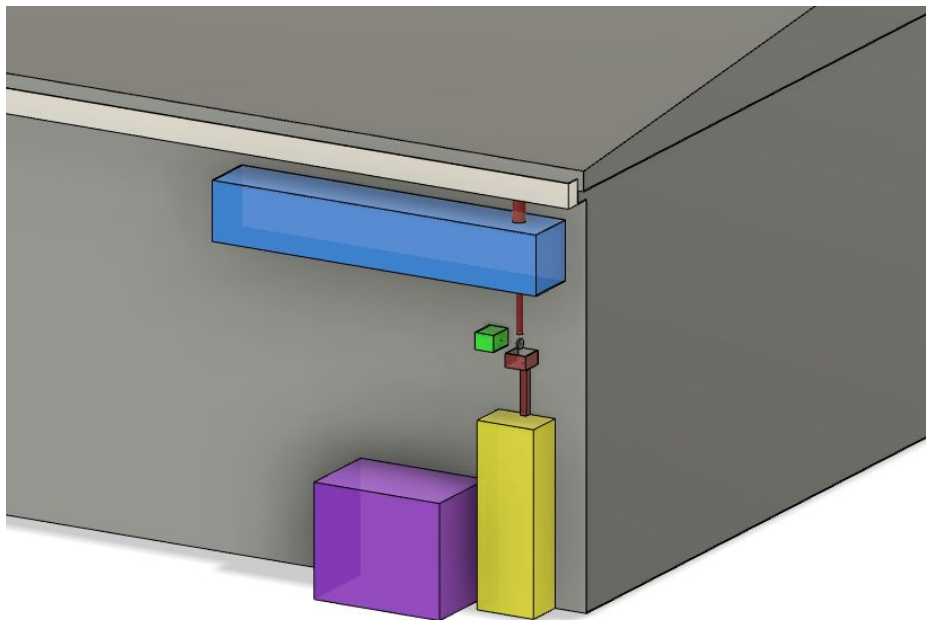
- drinking
- sanitation
- watering plants

-I plan on developing a 3D model to represent all of the components of the system with the correct dimensions and to show how they would fit/work together

-Additionally, I will make a small scale physical model to demonstrate the flow of water throughout the system and to show how the components work as a whole.

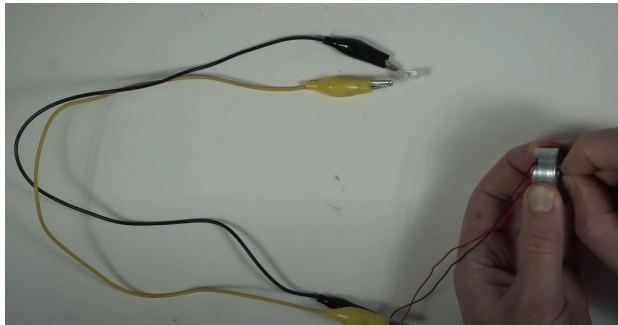
February 12th, 2021:

First CAD iteration, basic ideas



February 15th, 2021:

Energy generation:



<https://sciencing.com/parts-ac-generator-5610017.html>

Direct Current generator can be used. The rotational shaft from the turbine can be connected with the rotor of the motor. When rotating, electricity will flow and the leads can be attached to a lithium ion battery.

A waterproof barrier would be set up between the generator and the turbine to ensure that components stay dry as needed. A cover will be placed over both the generator and turbine to protect the parts from outside elements.

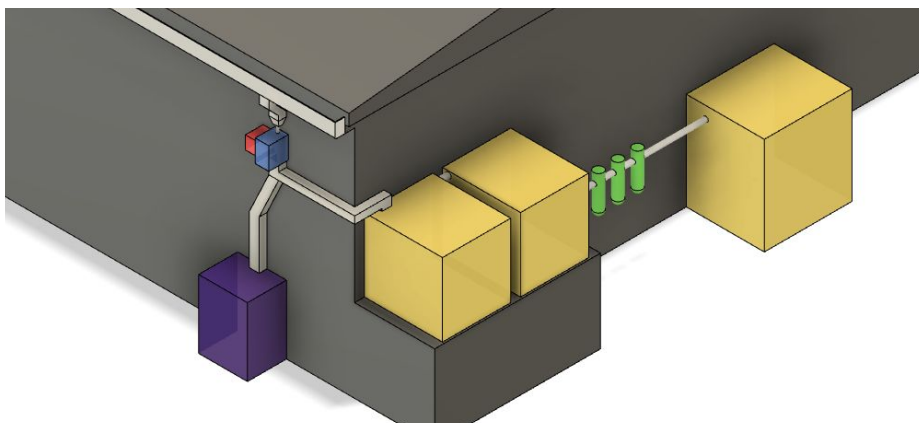
Water filtration:

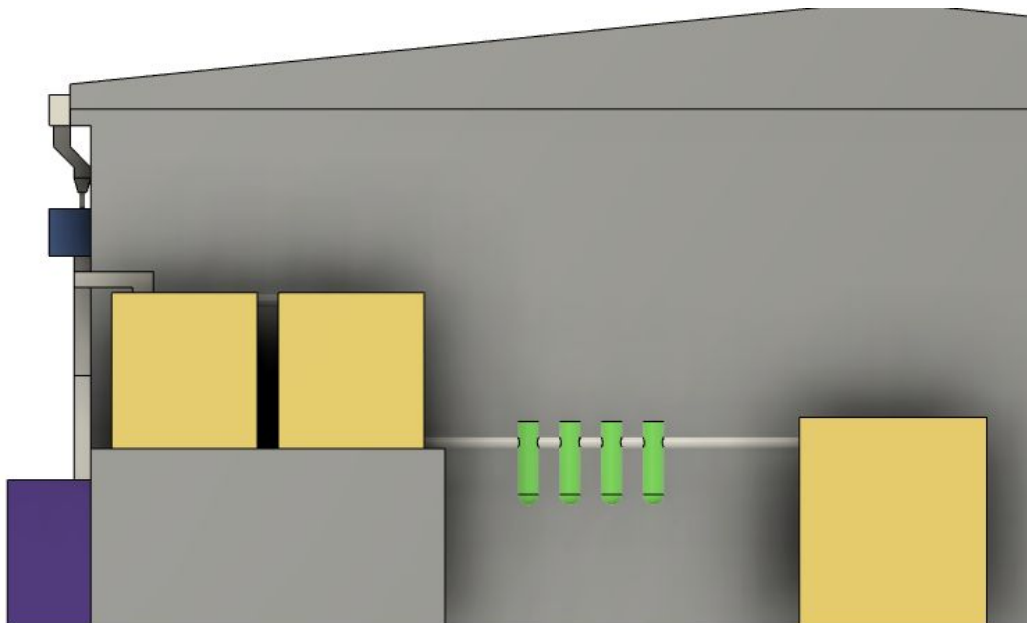
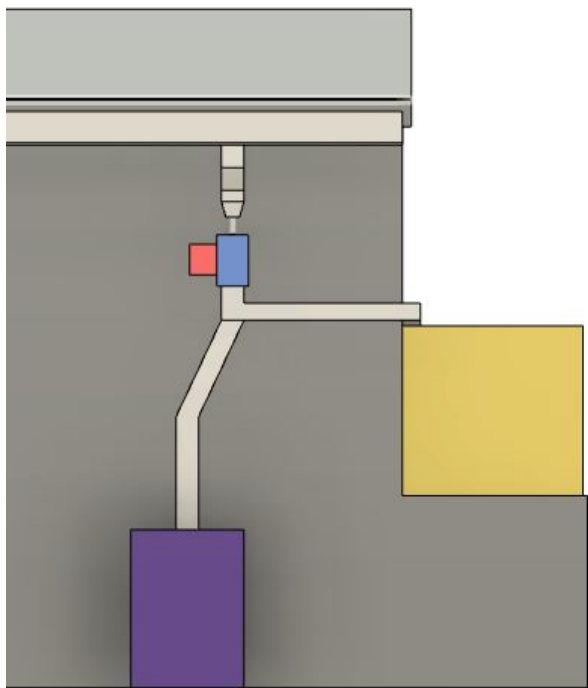
- First flush diverter- diverts and collects the first few millimeters of rain
- Filtration system:
 - Sediment filters of different microns filter out sediment
 - Activated carbon filters remove negatively charged contaminants
- Storage- water can be stored in large IBC tote tanks, designed for the handling, transportation, and storage of water.

February 21st, 2021:

Improved CAD structure

- Added more storage tanks
- Platform to utilize gravity





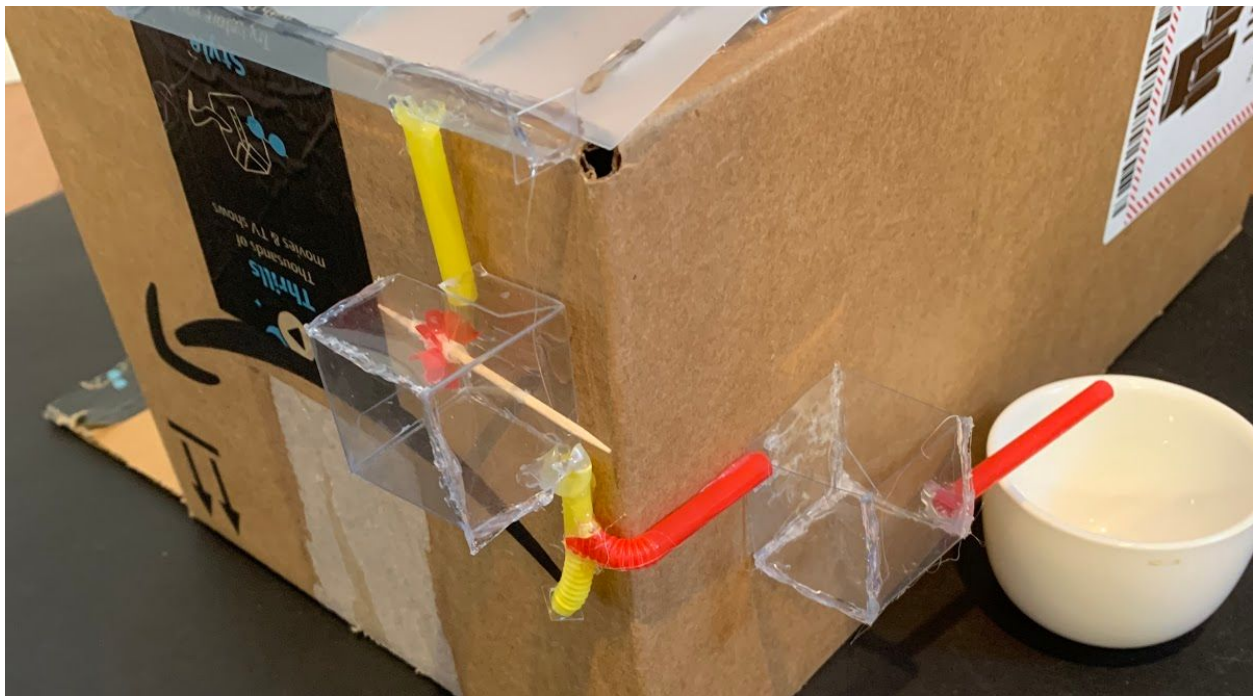
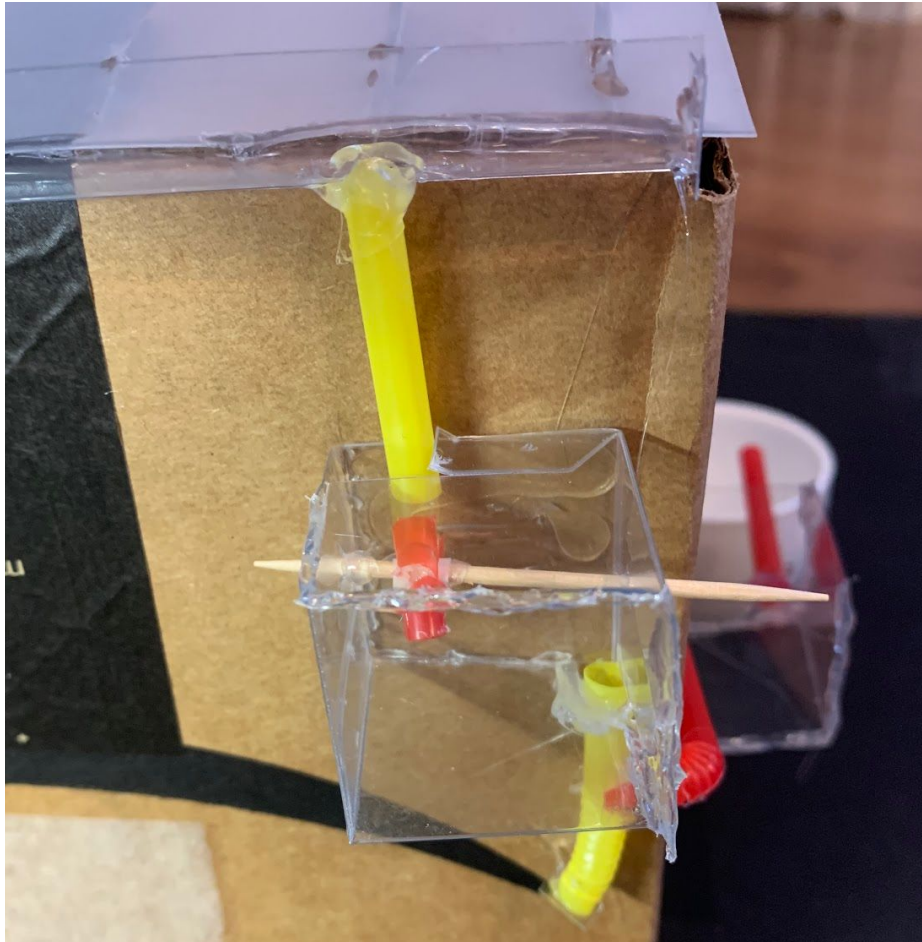
February 23rd, 2021:

Physical model

Doesn't contain the first flush diverter, but demonstrates the flow of water throughout the system.

Keep in mind the effect of gravity on water- pipes must be angled down/horizontal. Cannot be angled up.





Link to slides:

<https://docs.google.com/presentation/d/1KFPvuT4p5nlvdk5yliWkO5TRee8HazFOPhmtOeRmOIE/edit?usp=sharing>