



# The Natural<sup>TM</sup> Water Purifier

Onyenma & Zeyu



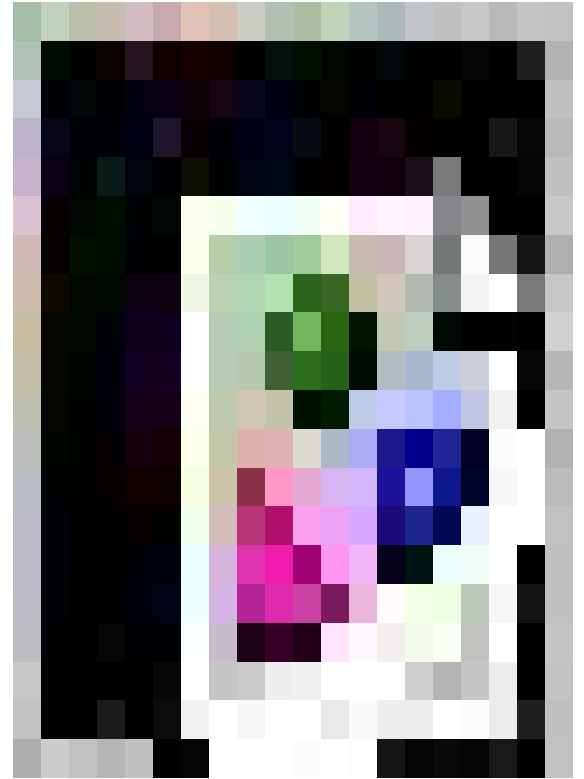
# Introduction

150 million people, 32% live below the national poverty line

Government corruption - lack of infrastructure

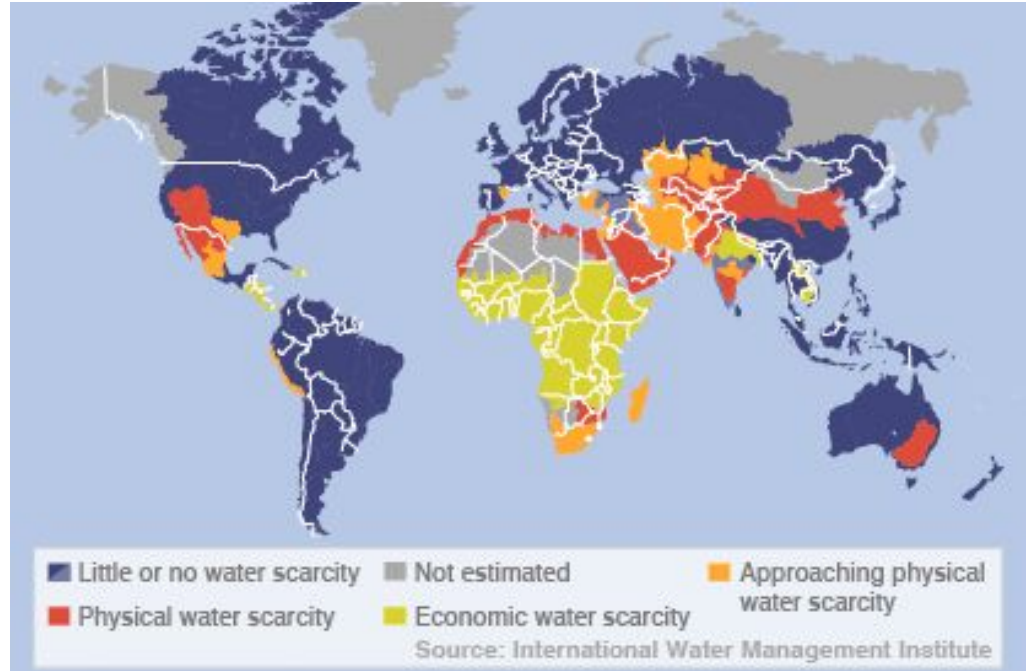
~80% of population live in rural areas and lack services like education, health clinics, etc.

Prone to flooding - outbreaks of cholera and other waterborne illnesses



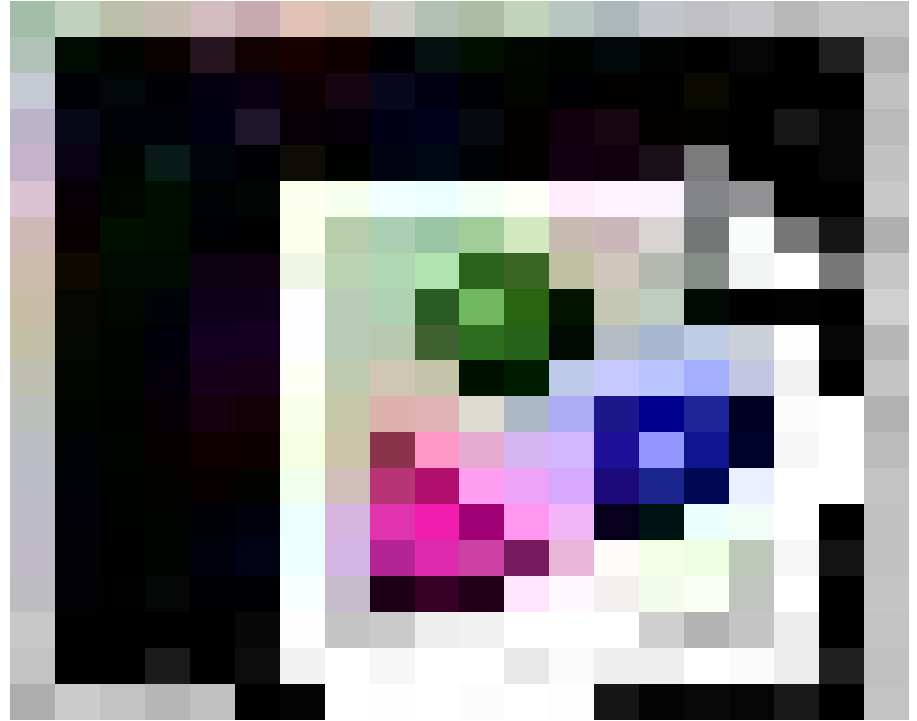
# Introduction

- More than 1.2 billion people lack access to clean drinking water
- More than 3.4 million deaths associated with waterborne illnesses
- Efforts by non-profit organizations (LifeWater, TheWaterProject) primarily concentrated in Africa



# Introduction

- UNICEF dug millions of wells to tap into groundwater supply
- Shallow wells contain arsenic runoff from groundwater
- 35-77 million people affected by arsenic poisoning (28%-62% of Bangladesh population)
- Over 4100 children die under 5 y/o annually from poor water and sanitation



# Introduction

## Arsenic poisoning

Nerve damage

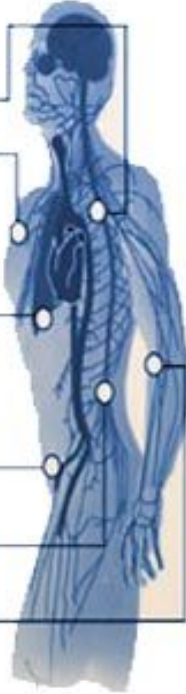
Skin damage:

- Hyperkeratosis (scaling skin)
- Pigment changes

Increased cancer risk:

- Lung
- Bladder
- Kidney and liver cancers

Circulatory problems in skin



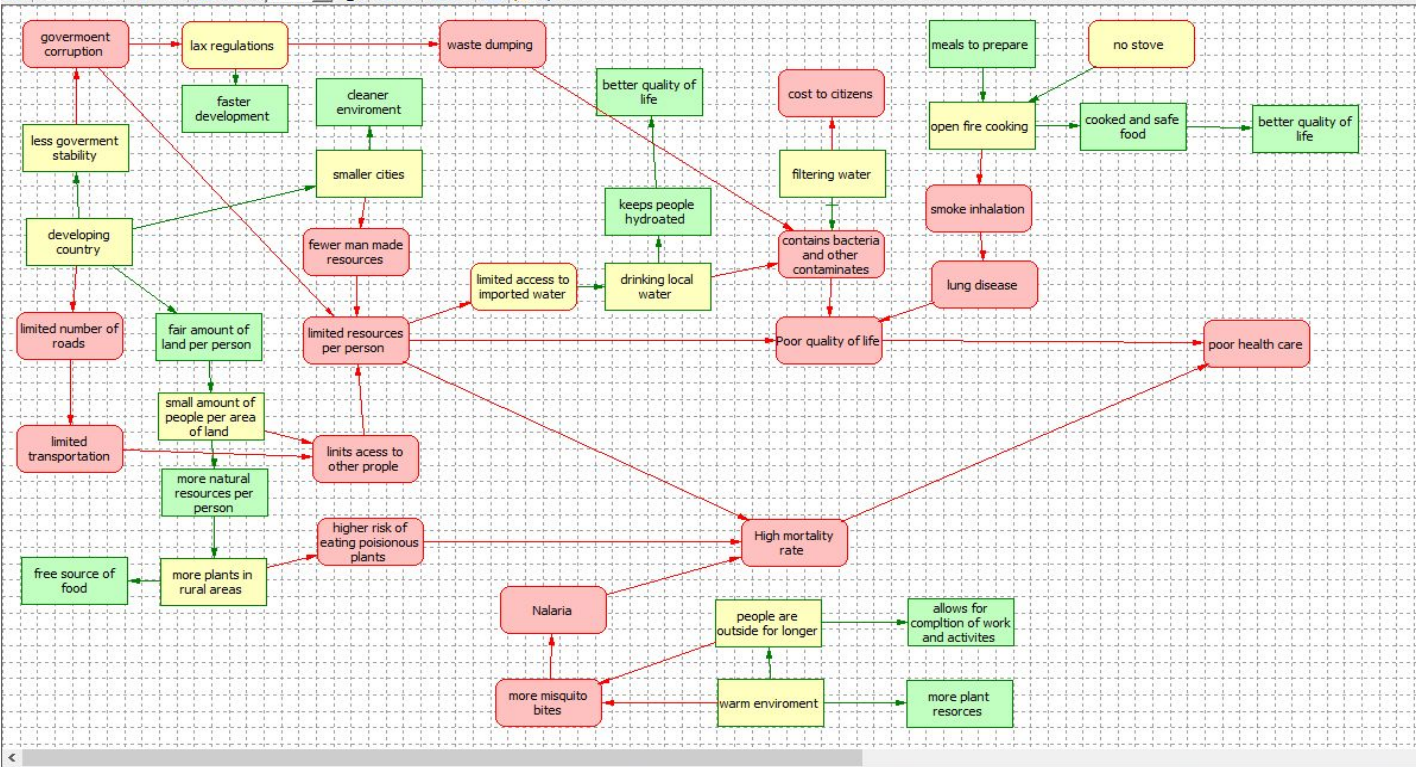
# Problem Statement

More than half of the population in Bangladesh is potentially affected with arsenic poisoning, and a cost-efficient and universal solution remains elusive.

# Objectives

- A device with which residents of Bangladesh can use to:
  - Filter arsenic from water to  $< 0.01 \text{ mg/L}$  (the MCL set by the EPA)
  - Eliminate bacteria and pathogen from water by boiling to  $> 100\text{C}$
  - Reduce number of  $< 5 \text{ y/o}$  deaths from 4100 to  $< 1000$
- Cost efficient to produce/purchase (manufactured 100% locally)
- Safe to use
  - Limit hazardous components

# Contradiction Diagram





# Conceptual Solutions

Find a way to eliminate, reduce, or prevent *smoke inhalation* in order to avoid *lung disease* under the conditions of *open fire cooking*

**Solution:** Do it yourself face mask. Make a face mask out of material like a shirt and natural air filtering materials in the area. The user will wear this mask whenever they are cooking to prevent small inhalation

**Inventive Principle:** 11. Cushion in advanced 27. Using inexpensive short lived object

Find a way to eliminate, reduce, or prevent *limited resources per person* in order to avoid *limited access to imported water*, *High mortality rate* and *Poor quality of life* under the conditions of *limits access to other people*, *fewer man made resources* and *government corruption*

**Solution:** Create a network of people living in the area through phone and text messages to make a list of common medical items needed. Each household will be responsible for having certain items thereby increasing the amount of items available for a given area.

**Inventive Principle:** 3. Local Quality, 24. Mediator

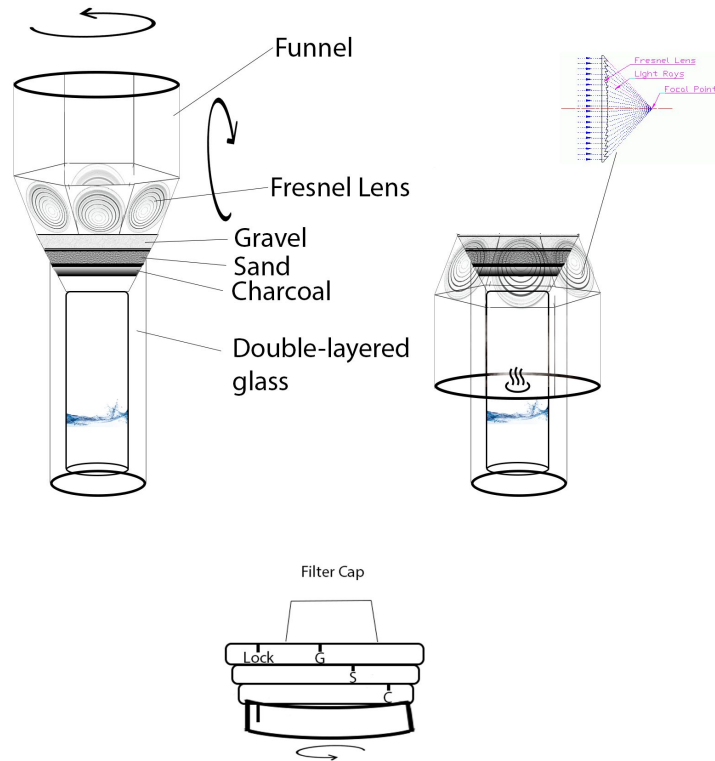
# Conceptual Solutions

Find an alternative way to obtain *filtering water* that offers the following: eliminates, reduces, or prevents *contains bacteria and other contaminants* does not cause *cost to citizens*.

**Solution:** create a filter made from locally available materials that can remove contaminants from water at little to no cost

**Inventive principle:** 24. Mediator, 27. Use of inexpensive short lived object, 9. Prior Counter action

# Description of Invention



- Double glass layer design for heat insulation
- Funnel serves doubly as a protective shield
- Relies only on solar energy
- Can act doubly as a portable water boiler
- Filters use locally-available materials can be easily renewed

# Why is it Great ?

- Boils water to kill bacteria and parasites, decreasing waterborne illness
- Charcoal filters arsenic and other metals to make water taste better
- Technology versatile and can be expanded to other countries

## Next Steps:

- Coordinate with government on distribution of technology
- Scaling up to store larger volumes

# Possible Failure Modes

- Bottle/ lens can break
  - Make out of stronger glass
- Glass will be hot after boiling
  - Double glass layer prevents over-heating
- Filter can clog
  - Filter materials can be easily obtained by residents
- Filter can be misplaced
  - High availability
- Pressure from vaporized water may cause expulsion
  - Filter head will provide an exit for water vapor
- Breaking filter while attempting to change it
  - Pictogram instructions on the filter and bottle

# Vision for the Future

1. Increased complexity then simplification
  - a. Filters last forever
2. Dynamism & Controllability
  - a. Foldable/compressible to make it easier to carry
3. Micro-level and increased use of fields
  - a. Induce magnetism (e.g. induction stoves) to heat water
4. Decreased human involvement
  - a. Throw the bottle into water instead of pouring water through funnel

# Vision for the Future

Clean water should be a right, not a privilege

We envision that our technology will empower everyone (adults and children alike) with a reliable means of obtaining clean and healthy drinking water.

