



Banana Peel Water Filter

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Problem statement

- The *health* of populations in a global context is *drastically unequal*, despite the existence of sufficient *healthcare infrastructure* throughout the world
 - Limitations inherent to developing countries and under-resourced areas complicate foreign intervention efforts
 - Ultimately prevent developing country's progression toward implementation of adequate, self-sustain



Problem statement

- The *health* of populations in a global context is *drastically unequal*, despite the existence of sufficient *healthcare infrastructure* throughout the world

For example:

- Access to clean water
- Malnutrition
- Sanitation of medical supplies

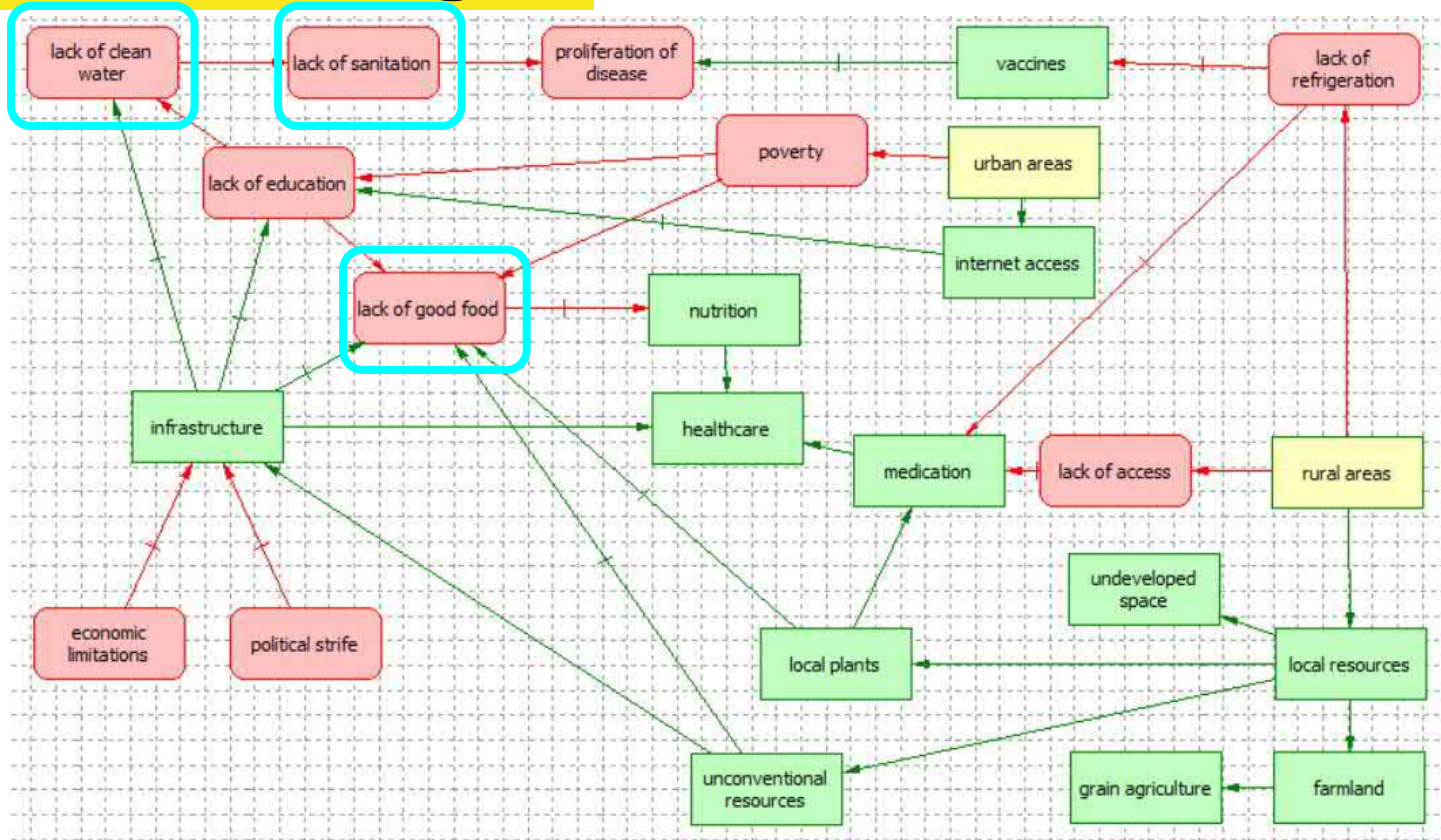


Objectives

- To improve global health care as measured by the following criteria:
 - Decreased mortality
 - Increased access to needed supplies
 - Increased access to safe food and water
 - Decreased infections from unclean equipment
 - Solution using local resources



Contradiction Diagram



3 Conceptual Solutions

- #1** Find a way to eliminate, reduce, or prevent *lack of clean water* in order to avoid *lack of sanitation* under the conditions of *lack of education*.

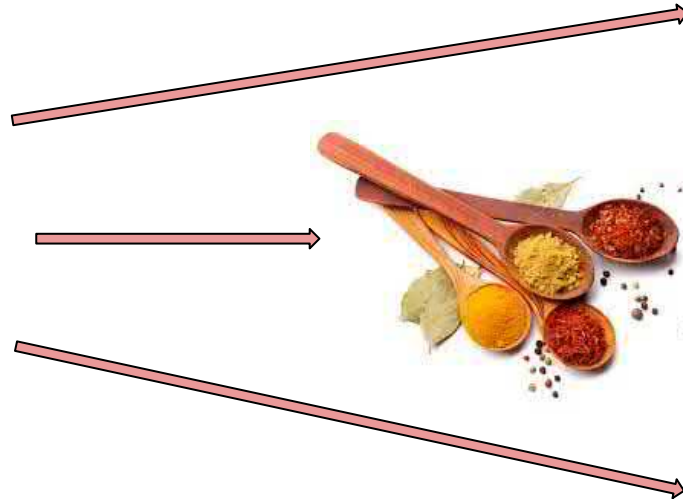
Convert existing equipment and normal techniques for cooking, such as **steamers and pressure cookers**, to **medical sanitation devices**.



3 Conceptual Solutions

#2 Find an alternative way to obtain *nutrition* that offers the following: provides or enhances *healthcare* is not influenced by *lack of good food*.

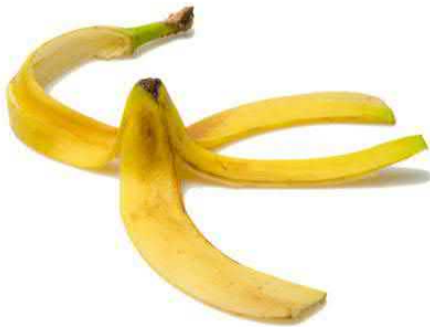
Use **local insects** as alternative food source for **protein**



3 Conceptual Solutions

- #3** Find an alternative way to obtain *infrastructure* that offers the following: provides or enhances *healthcare* eliminates, reduces, or prevents *lack of clean water*, does not require *unconventional resources* is not influenced by *political strife* and *economic limitations*.

Pulverize dried **banana peels** and mass produce **water filters** that extract toxic **heavy metals**.



Our solution:

Use India's existing industries to mass produce banana peel water filters

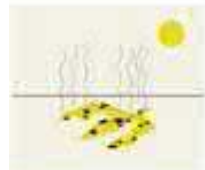
Pulverize dried **banana peels** and mass produce **water filters** that extract toxic **heavy metals**.



Banana peel water filter

- Banana peel powder embedded into textile filters
- Removes heavy metals from water
- Contains **electronegative compounds** (carboxylic acids, nitrogen, sulfur) that bind **positively charged** heavy metals (lead, mercury, arsenic)

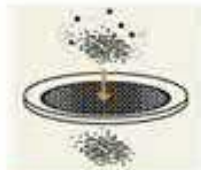
Ready made from the peel of the fruit - a usually discarded material and with low cost - is able to remove pollutants from water



1 The banana skin is placed in pans, and placed under the sun to dry out for about a week



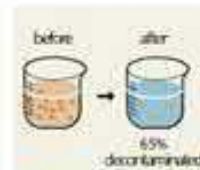
2 After "roasted", this material is ground into a fine powder easier to be worked



3 The powder then passes through a sieve so that the particles remain the same size



4 This material is mixed with contaminated water and then agitated. Thus, the metals bind to the powder

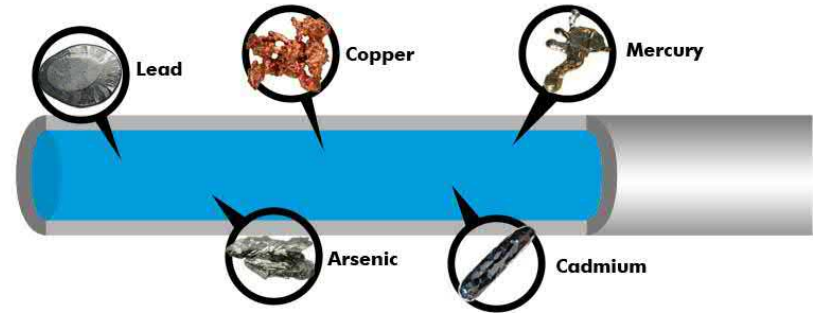


5 The percentage of water decontamination is at least 60%. The process can be repeated

Why this works in India

India water crisis

- 80% of surface water in India is polluted
 - **Heavy metals** from unregulated industrial waste
 - Lead, mercury, chromium, copper, arsenic, nickel, iron, cadmium
 - Long term exposure causes cancer, nervous damage, stunted growth
- Insufficient waste management and purification infrastructure
 - **Reverse Osmosis** at home - \$32 - \$800, technology dependent
 - **Gravity filters** at home - only remove larger particles
 - **Boil water** at home - only kills pathogens



Why this works in India

Mass production using existing banana and textile industries

- India is the #1 producer of bananas in the world - 14.2 million tons annually
- Massive textile industry to supply cloth for filter fabrication
- Sell as individual home filters, or sell to existing filtration systems as additional layer

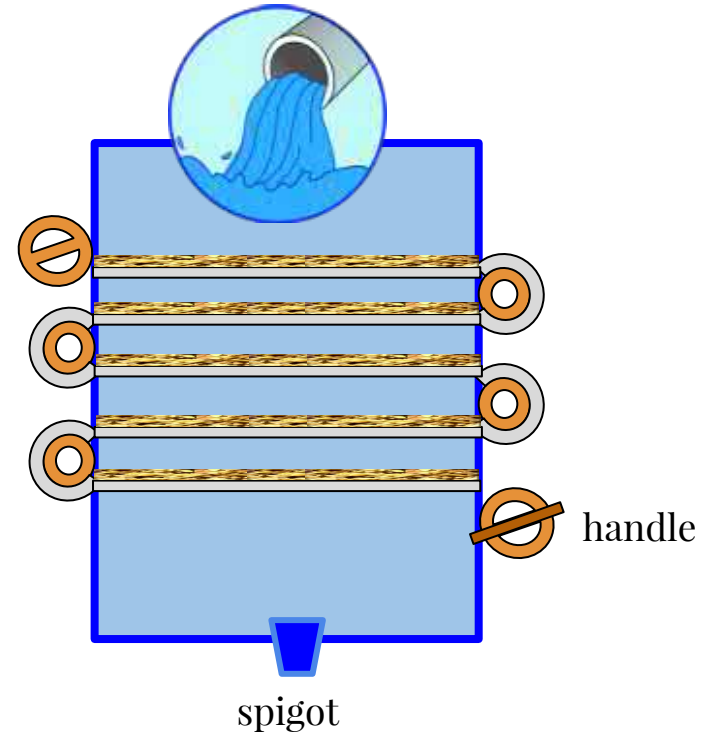


Filter systems

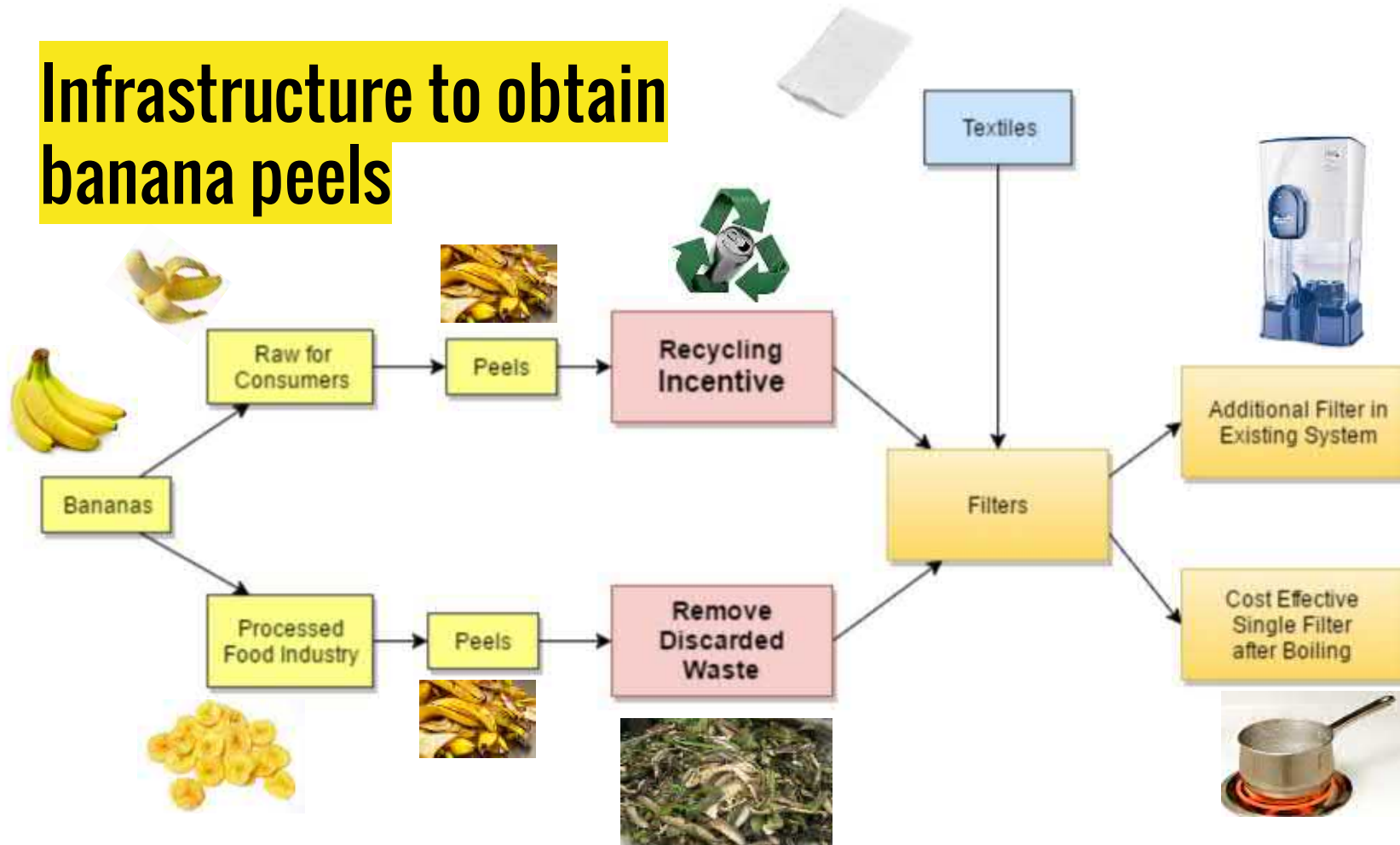
Cost-Effective Single Filter



Multi-layer scroll



Infrastructure to obtain banana peels



Ideality

- Use of **common resources** in India (bananas) and **waste products** (peels)
 - **Reusability** of peels
- Use of **common processes** in India (textiles, banana industry)
- **Lower cost** for filter replacement
- ↑ Useful Substance (potable water)
↓ Harmful Substance (heavy metals in water)



Future directions

- Maximize the system with flowing water through a filter instead of letting the water sit with the banana peel powder
- Other plants with similar properties as banana peels for regions without a large supply of bananas
- Scale up to industrial filters for water treatment plants

