Frequently Asked Questions

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Project

1. Who operates and maintains the plants?
    - Similar to conventional water treatment plants in the US, the plants are operated and maintained by a plant operator selected by the community's Water Board. The plant operator is in charge of monitoring the plant flow rate and must learn when to change the dosage of aluminum sulfate and chlorine. The required chemical dose is highly dependent on the plant flow rate and the incoming turbidity of the water. The chemical dosers need to be manually changed by a plant operator. The operator also keeps a written record of plant operation and water quality so the community can be aware of how well the plant is working.
2. Do all the people in the community know where they are getting their water?
    - AguaClara works in communities that have an established Water Board. This Water Board usually consists of 5-6 people from the community that either volunteer, or are paid to take care of the town's water source. This usually involves collecting a monthly water usage fee and taking care of distribution lines and any maintenance projects. In some towns, a member of the water board adds chlorine to the water, regardless of how turbid it is.
      While most people living in industrialized cities do not know where their water source is, most people in the communities we work take an interest because water is not necessarily taken for granted.
3. What are the sources of water for the plant?
    - AguaClara technology treats surface water, usually from a spring, river or stream above the community.
4. How much electrical energy is necessary to operate a plant?
    - None. We have zero reliance upon electricity.
5. Are all of the materials necessary for operation, including chemicals, locally procurable?
    - Yes. The chemicals are available from multiple suppliers. This will be true anywhere on that planet where there are large cities that treat surface waters because we are using the most commonly used water treatment chemicals (alum and chlorine).
6. Why Honduras and not another country?
    - AguaClara treatment technology can be applied to any country. Honduras was selected as the first country to work in for a variety of reasons, mainly because the director of the project, Monroe Weber-Shirk already had personal contacts working with water projects in Honduras. Honduras is also listed in the Millennium Development Goals as a target site for improved water and sanitation.
7. Where can I learn more about AguaClara?
    - You can learn more about AguaClara by reading our Wiki or contacting anyone from the team. You can also learn more about the technology we use on the course notes available for free online.
8. How can I get involved?
    - Students at Cornell get involved in a variety of ways. Students can join the class by enrolling in CEE255 or CEE455. Depending on the time commitment one can make, students can take the classes for a varying number of credits. Additionally, students can get involved by joining the ESW club to promote more publicity, outreach and awareness. The AguaClara Wiki has information about each student project team as well.
      People who are not located near Cornell can also get involved by contacting a team member. There are always things to do on a busy project. Volunteers can assist in making contacts and helping with a wide array of outreach events.
      Others who might not be able to spend their time volunteering might be able to contribute monetarily. As a student project team with direct community involvement, we rely heavily on private funders. Information on how you can contribute to the project can be found on the home page of the wiki, on the back page of the brochure, and in the donor packet on a fact sheet.

Costs

1. What are the costs associated with building each plant?
    - Including engineering oversight, construction materials, and labor AguaClara plants can be built for less than $20 per community member benefitted. It then costs approximately $2 per person per year to operate and maintain the plants.
2. Where does the money come from?
    - A large share of the construction costs, especially labor and locally-available materials, are paid by the community, with cash or labor contributions from residents. Other construction funds come from private supporters, public grants, and other donor institutions such as Rotary International. Funds to support the design of the plants and the AguaClara research team on campus come from Cornell University, The Sanjuan Fund and other private donors.
3. Once a plant is built, who owns and pays for it?
    - The community water board or the municipality is the owner of the water treatment plant. Households pay a tariff that is approximately 2 to 4 USD per month. This covers the cost of chemicals, paying the operator, and maintenance.

Technology

1. What makes a flocculator better than other water treatment methods that are available or could be made available in Honduras?
    - Flocculation and sedimentation are applied as a first step in many conventional water treatment plants in the U.S. to clean turbid water. Since the problem with most water in Honduras is turbidity, flocculation is an effective treatment option for a community-scale plant. There are also many options for point of use water treatment (POU), however we believe that community-scale treatment plants are the more cost-effective and are more likely to be operated correctly. With point of use systems, every single community member must be trained how to treat their water, while the treatment plant only requires two or three well-trained operators.
2. How big is the plant?
    - This depends on the size of the community. A plant for a community of 3,500 people is about the size of a two-story house.
3. Can the AguaClara technology be used if there aren't mountains?
    - Normallly, the AguaClara technology is used in water systems where water is delivered to the community by gravity, thus requiring some elevation difference between the water source and the community. However, water could be pumped up to an elevated tank and then run through an AguaClara plant under the power of gravity.
4. Is the water leaving the demo plant safe to drink?
    - We often use water, clay, alum, and sometimes food dye for in the demo plant. Even though these chemicals are not hazardous to your health, according to laboratory safety rules no one is allowed to drink the water treated in the demo plant.

5. How long is the chlorine in contact with the water until people drink it?
    - The chlorine is the last part of the treatment process and is added just before the distribution tanks and a chlorine residual is maintained until the water reaches its point of use.
6. What is flocculation?
    - Flocculation refers to uniting small particles suspended in dirty water into larger particles called flocs. The flocs weigh enough to sediment from the water much more rapidly than the original small particles. In the AguaClara hydraulic flocculator, the water is gently mixed to promote collisions among the particles. Before flocculation, a chemical called aluminum sulfate is added to the water. Aluminum sulfate makes the particles attract each other so that when they collide they stick together to form flocs.
7. Why is filtration not used/not necessary?
    - If the combination of flocculation and sedimentation is done correctly, quite clear water (turbidity below 5 NTU) can be produced. Water below 5 NTU is safe to drink once it is disinfected with chlorine. The AguaClara team is also experimenting with the use of a sludge blanket in the sedimentation tank that could push the effluent NTU even lower. The drawback of filtration is that it relies on clean filters to work. Very turbid water, typical of the rainy season in Honduras, would clog filters very quickly. Pumps are required to clean most rapid sand filters and that requires electricity. Slow sand filters are large and costly to build. They must be cleaned manually, an extensive process.
8. How clean is the water that leaves?
    - Water cleaned with the AguaCLara technology is consistently less than 5 NTU.
9. How do you get rid of the sediment that settles out in the sedimentation tank?
    - Sludge is drained from the sedimentation tank once a day while still maintaining a sludge blanket in the sedimentation tank which further acts as a filter.
10. Do you have to turn off the plant to do it?
    - Normally, the sludge is removed slowly from the bottom of each tank while the tank is still online and functioning. Every couple months, the tanks are thoroughly cleaned, which involves emptying them. Since there are multiple sedimentation tanks, the plant can still be operating while one of the sedimentation tanks is offline.
11. Can you have too much aluminum sulfate used in the plant? How about Chlorine?
    - Aluminum sulfate and chlorine are used in conventional water treatment processes around the world. In normal doses, neither chemical causes health problems. If flocculation is working, nearly all of the aluminum sulfate is removed from the water before it leaves the plant. The plant operator is always careful to avoid overdosing, both to prevent costly chemical waste and high chemical residuals in the drinking water.

Alum

1. How does alum work as a coagulant?
    - The particles in water have slight negative charges, which causes them to repel each other and not form larger particles. When AlSO4 is added to water it forms an AL(OH)3 precipitate, which has a slight positive charge. The AL(OH)3 collides with the negatively charged particles in the water and neutralizes the charge.
2. Is aluminum sulfate harmful to humans? Animals?
    - Any chemical can be harmful to humans and animals in the incorrect dose.
3. Is there aluminum sulfate in the water leaving the demo plant / other AguaClara plants?
    - **Answer needed.**
4. Does treatment with aluminum sulfate do anything about microbes or other disease carrying agents?
    - No, treatment with aluminum sulfate does not kill any microorganisms. It only binds to them together. Chlorine is used to disinfect the water, similar to plants in the United States.

Clean water

1. How do AguaClara plants remove disease carrying agents from the water supply
    - AguaClara plants remove sediment from water through a process known as flocculation and sedimentation, and use chlorine to disinfect the water. Disease carrying agents are killed with the chlorine.
2. Aside from clay, what other things do AguaClara's water treatment plants remove from the water?
    - AguaClara technology removes any suspended particles from the water. These particles can include clay, organic material, bacteria and parasites.
3. How do AguaClara plants remove disease carrying agents from the water supply?
    - With chlorine treatment.
4. How long is the chlorine in contact with the water until people drink it?
    - **Answer needed.**
5. What is turbidity?
    - Turbidity is a measure of the cloudiness of water due to suspended solids. A nephelometric turbidimeter measures the turbidity by passing light through a sample of water. The scattering of light caused by lots of particles contributes to a higher turbidity or nephelometric turbidity unit (NTU) reading.
6. How turbid can the water be entering the plant, for it still to be clean when it leaves?
    - Our experience with the plant in Marcala, Honduras treats water with an incoming turbidity of up to 600 NTU.
7. How clean is the water after treatment?
    - The plants produce water with less than 5 NTU a high percentage of the time. The improvement in water quality is remarkable. And the cleaner water means that it is possible for the first time to maintain a chlorine residual in the treated water.
8. How much clean water is produced?
    - Agalteca 6.3 L/s
      Ojojona 6 L/s
      Tamara 12 L/s
      Marcala 30 L/s
      Cuatro Comunidades 6 L/s
9. How is the clean water distributed? Do we implement a metering system?
    - We choose only sites that have existing distribution systems. They have in-home taps. There is no metering system. We would like to have metering systems, but the meters cost far more than the water treatment system and doesn't seem to be a sustainable option for resource poor communities yet.