Combatting Global Water Poverty

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Basis for the Project

- **According** to the World Health Organization (WHO 2015), by 2025 half the world's population will be living in areas of water stress.
- **Addressing** this concern; water harvesting technologies such as fog-harvesting nets used in Chile, Nepal, Morocco, and the newly designed WarkaWater tower, have created a way forward in combatting global water poverty.
- **These** technologies rely on harvesting water from the air by using mesh-nets that allow fog and water vapor to condense on its surface and thus be collected for use.
- **Improving** the effectiveness of the material used to capture water, reducing the cost of the structures, and furthering ease of access allow for an effective, sustainable, low-cost platform which can be used to combat water poverty in locations such as Mongolia and Kenya.
- **Providing** access to water for nomadic tribes for which traditional methods of water collection are not possible.
- **Answering** the need for water within California communities such as those found on Catalina Island, which have limited ground-water resources.
- **Raising** awareness of both global water poverty and water catchment technology to encourage further research and support.
- **Created** by student efforts to create a sustainable adaptation of these technologies in order to demonstrate a sustainable proof-of-concept model on the CSULB campus.

Figure 1. The Proof-of-Concept model located in front of the Global Studies Institute at LA3-100 CSULB.

Methods and Materials

Figure 2. Construction of the proof-of-concept model.

Materials:

- 22 Pieces of 15 feet by 1.5 inch diameter bamboo rods
- 4 Twisted wire ropes 30 feet in length and1/8 inch in diameter
- 4 Steel clamps
- 300 Feet of white twisted mason line
- 100 Feet of Orange Paracord
- 15 Orange stakes 16 inches long by 1.87 inches wide
- 1 Black and gold 100 foot rope
- 2 Green mesh fabrics 6 feet by 20 feet.
- 1 Garden Pot 5 Gallons
- 1 Black and Gold CSULB banner 2.5 feet by 12 feet.

Tools:

- 1 Mallet
- 1 Staple Gun with 3/8 inch staples

Methods:

- The bamboo was laid on the ground one piece across the other in an X formation forming the skeleton of the structure.
- Mason Line used to create lashings tying bamboo together
- Mesh laid across the width of lattice and stapled at every bamboo cross section.
- The tower was then lifted vertically and wrapped around itself forming a 7 foot diameter circle.
- The two ends of the lattice joined together using knots.
- Lattice joined to ground stakes
- Guy wires created and rope run along base
- Water collection bucket placed under the mesh center-point

Conclusion

- Created awareness within the CSULB campus and won "Exceptional Achievement in the Sustainability Project Showcase" at the CSULB 2016 Green Generation Mixer
- Towers such as the one created for this project are cheap and relatively easy to create
- Re-use of wastewater, to recover water, nutrients, or energy, is becoming an important strategy. (WHO 2015)
- Further research can make these technologies a strong contender for reducing global water poverty
- Existing technology for collecting water vapor is far from optimized and an improved mesh could extract up to 10% of the water available from fog (Park, et al. 2013)
- This technology could address current domestic needs

According to the Catalina Conservancy (Mack 2015) there is a need for:

- "A water system adapted to the Island's natural cycle of rain and drought years that could be operated so that the Island has sufficient reserves to get us through the drought years without serious economic disruption or harm to the natural environment."
- "A water system that would use the Island's valuable and limited groundwater resources only for essential human uses and as a backstop for extraordinary droughts or the loss of other sources."
- "A diversified water system using all viable sources of water so that we are not reliant on any one source."
- "A decentralized water system for the Island's interior that would only incorporate centralized water delivery and treatment systems where they are absolutely necessary. Decentralized household, apartment building and neighborhood-scale technologies could also be deployed in Avalon, especially for all non-potable uses"

Figure 3. Fog-Harvesting net in Chile's Atacama desert.

Credit: Neil Hall

Future Research Required

- Improved materials used for the water-collection mesh
- Mapping the regions of the world that are affected by water poverty and meet the hydrologic conditions necessary to support this technology
- GIS maps highlighting the ideal locations for water collecting devices within these regions
- The environmental affects that large scale fog collecting has on the local climate and ecology
- Longer lasting materials that require less maintenance
- More efficient methods of reducing or preventing algal growth on the systems

Figure 4. A FogQuest net in Tanzania

Credit: FogQuest

Works Cited

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