Quality Drinking Water from Economically Sustainable Municipal Infrastructure: Examples from AguaClara in Honduras

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Introduction

Overview and Rationale

- **Improperly treated surface water** is among the most urgent global health challenges.
- **Urban water infrastructure** is inadequate in many places around the world, even as towns and cities have grown.
- **The AguaClara program** has demonstrated a novel approach to municipal-scale water treatment with field projects in Honduras.

Figure 1. "Improved" but unsafe water in Honduras

Economic Background

- Both point-of-use and centralized solutions have often failed for reasons relating to **consumer willingness to pay (WTP)**.
- **Quality of service** often determines WTP, and sustainability requires that WTP exceed the cost of operating and maintaining the system.

1. **Untreated river water** (quality failure)
2. **Mechanized plant** (O&M cost failure)
3. **POU floc / disinfect** (opportunity cost failure)
4. **AguaClara plant** (sustainable zone)

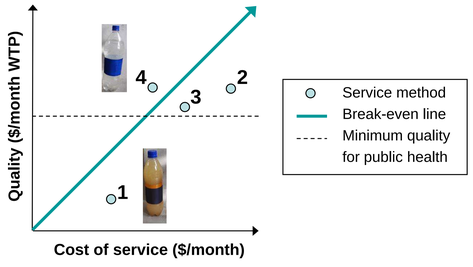

Figure 2. Conceptual diagram of the WTP concept for water treatment systems

(a)

(b)

Figure 3. Abandoned water treatment systems in Central America, including (a) a centralized facility and (b) household point-of-use filters

AguaClara Project Methodology

Technical Innovations

Design philosophy: AguaClara facilities are engineered to be:

- *Affordable:* optimized designs to minimize capital and O&M costs and to utilize local labor and materials
- *Operator-friendly:* robust and easy to run with one operator

The AguaClara process for surface-water treatment

- Plants achieve coagulation/flocculation and sedimentation
- Innovative research was required to re-think traditional unit processes as fully hydraulic systems requiring no electricity

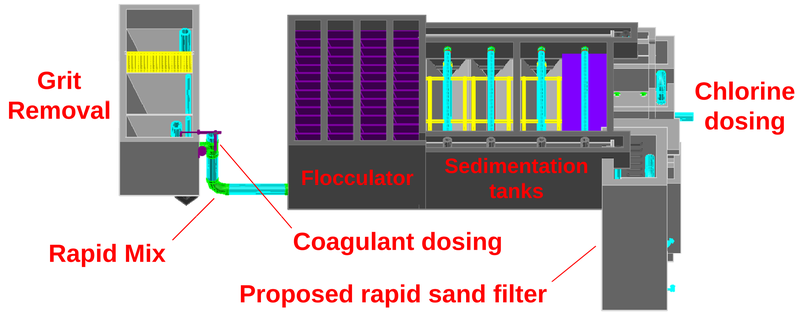

Figure 4. Unit operations in an AguaClara water treatment plant

Governance and Financing Methodology

Multiple organizations are involved in an AguaClara project, but the **municipal water board** is ultimately responsible for running the facility.

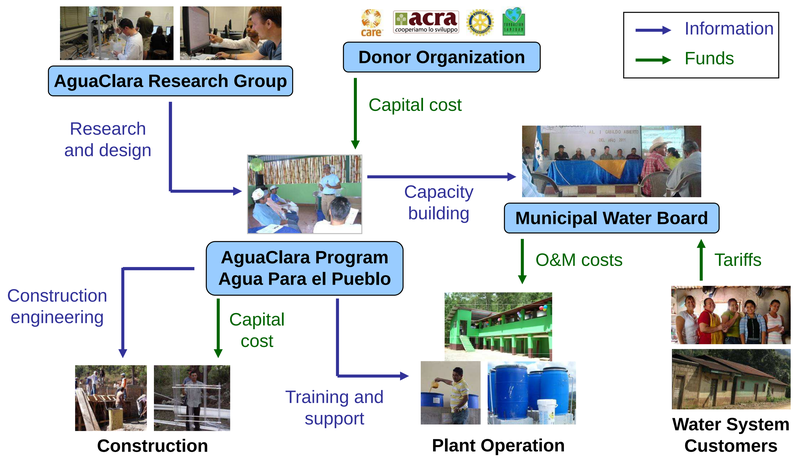

Figure 5. Conceptual diagram of AguaClara project organization

Steps for **community ownership and sustainability**

- Construction employs locally-available materials and local labor
- Capacity building includes water board organizational training and plant operator technical training
- Public meetings and workshops promote transparency, education, and public involvement

Results and Discussion

Facility Operation and Costs

Plant Name	Service Area		Cost per household		Monthly household tariff	
	Population	Houses	Capital	Monthly O&M	Before plant	With plant
Ojojona	2100	350	$ 194.37	$ 2.56	$ 1.59	$ 2.83
Támara	3500	580	$ 106.20	$ 1.62	$ 1.85	$ 2.65
Marcala	6000	1200	$ 53.33	$ 2.78	$ 2.12	$ 3.18
Cuatro Comunidades	1500	280	$ 175.23	$ 2.33	$ 1.59	$ 3.18
Agalteca	2160	380	$ 153.37	$ 2.19	$ 1.06	$ 2.65
AVERAGE			**$ 136.50**	**$ 2.29**	**$ 1.64**	**$ 2.90**

The plants remain in operation producing potable water, and **consumer WTP** has increased with service quality. The water boards raise enough revenue to run the plants and invest further in their water infrastructure.

Figure 6. Agalteca plant in operation

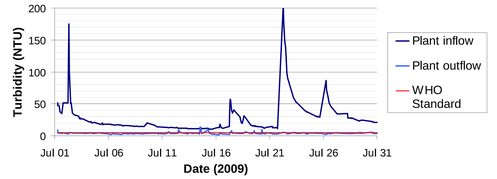

Figure 7. Cuatro Comunidades water quality

Comparison to Alternatives

- An AguaClara treatment plant represents **considerable cost savings** in construction and operation compared to a conventional facility.
- **High service rates** (>80%) are observed for all AguaClara plants, in contrast to point-of-use systems whose usage rate after implementation may be as low as 20%.

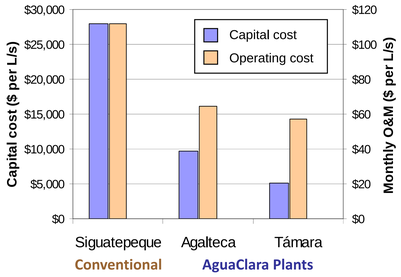

Figure 8. Comparison of AguaClara plant cost with a conventional facility

Conclusions and Future Research

The AguaClara project in Honduras has demonstrated the **successful implementation of municipal-scale water plants** through innovative design and good governance. The project will continue to expand the number of facilities, improve their design, and experiment with means by which beneficiary communities can finance the capital cost of the plants.

References

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Other references available upon request.