

Low-Cost Water Wells for Developing Countries

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Abstract

Environmental justice and equity should include access to clean water for all. It is expensive to drill borehole wells, typically over \$10,000 US dollars, and so organizations working to provide wells in developing countries have typically installed community wells at some common gathering place. This requires that many users must walk long distances to access these water sources. This limits the quantity of water available to a family, and also creates vulnerabilities for the family member, usually a woman or child, sent for the water since the journey is often made early in the morning or at night in the dark. I have been drilling wells with a Kenyan team since 2010 using a simple, manual percussion hydraulic method developed by WaterForAllinternational.org whereby we can install a well generally for less than \$200 US dollars excluding labor. Through their own participation in the drilling process, this low-cost enables families to pay for and drill their own well. In this way, they gain access to a much larger supply of water at or close to home, and eliminate the need and vulnerability associated with walking long distances to procure water for their family. Both the drilling apparatus and the cased well, including the pump, is constructed from materials available off-the-shelf at local hardware stores. Over the years I have made several modifications to the pump design, other infrastructure, and manufacturing process to improve the longevity, simplicity, and interchangeability of the final product. The drilling method is primarily applicable to aquifers lying above bedrock and it is feasible to drill wells to a depth of several hundred feet. The greatest challenge in the endeavor is earning the trust and cultivating the participation of the local community. This presentation will address the drilling process, the well infrastructure, and some socio-cultural aspects of the project.



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LOW-COST WATER WELLS FOR DEVELOPING COUNTRIES

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Children/Women:
Vulnerability



Limited water quantity

ALTERNATIVE CONTAMINATED WATER SOURCES





Typical Water Source



COMMUNITY-DRIVEN PROBLEM SOLVING

APPROPRIATE TECHNOLOGY: PERCUSSION HYDRAULICS



Passive ejection of cuttings in drilling mud



DRILL TIP

Drill Tip: Leaf spring
from automobile

Bell
Reducer

2 Straight
couplers





I

FINISHED WELL INFRASTRUCTURE

Supplementary Material



PUMP

FINISHED-WELL INFRASTRUCTURE CRITICAL CHARACTERISTICS

- Locally available components
- Repairable (no proprietary parts)
- Inexpensive materials (\$150-\$200 USD)
- Simple construction

SOCIO-CULTURAL ASPECTS OF THE WELL PROJECT

POVERTY

**LACK OF RESOURCES AND/OR
KNOWLEDGE**

VERSUS

SHAME & POWERLESSNESS


A group of approximately 20 men are gathered outdoors under the shade of a large, thick-trunked tree. One man stands in the center, wearing a tan jacket and trousers, holding a hat. The other men are seated on the grass, some wearing hats and jackets, others in casual clothing. The setting appears to be a rural or semi-rural area with lush greenery and a wooden fence in the background. The overall atmosphere is one of a formal yet accessible community gathering.

COMMUNITY ENGAGEMENT

COMMUNITY-IDENTIFIED CHALLENGES

- Personal Safety
- Distance & Time
- Children's Education
- Water Quantity & Hygiene
- Disproportionate Impact on Women & Children

Well Cooperatives



Ten Households:

- Provide Labor
- Buy materials

We:

- Provide drill equipment
- Training (first two wells)



My goal is not to rescue or create dependency but to equip and empower communities to provide clean, accessible water for themselves.