7th RWSN Forum
Abidjan, Cote D'Ivoire
29th Nov - 2nd Dec 2016

An Understandable Approach to the Development & Use of Groundwater

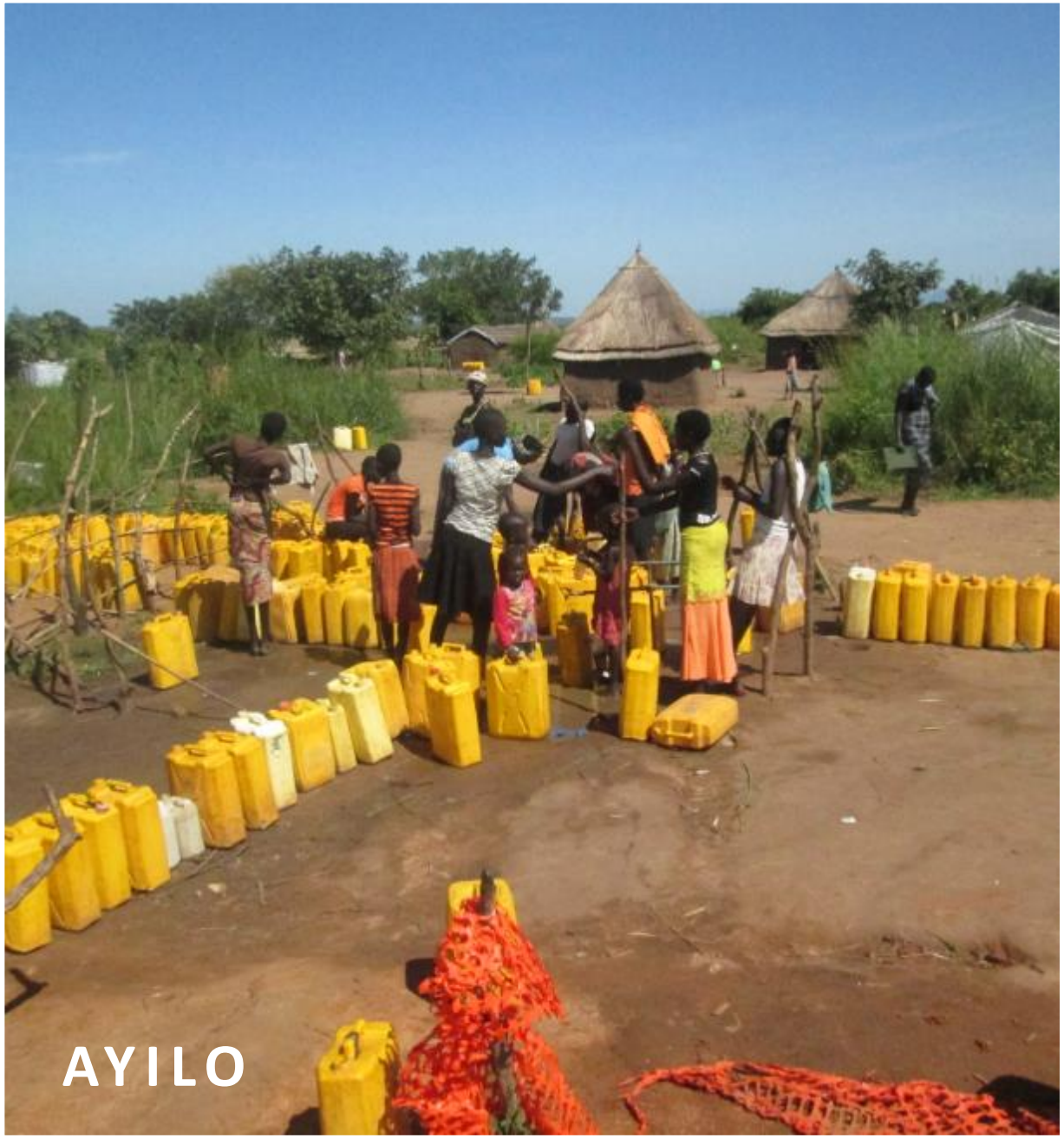
Solar Pumping and Distribution

Sponsored Seminar
Fri, 2nd Dec, Bamako Room

UPGro Unlocking the Potential of Groundwater for the poor
upgro.org

NGWA The Groundwater Association

water mission



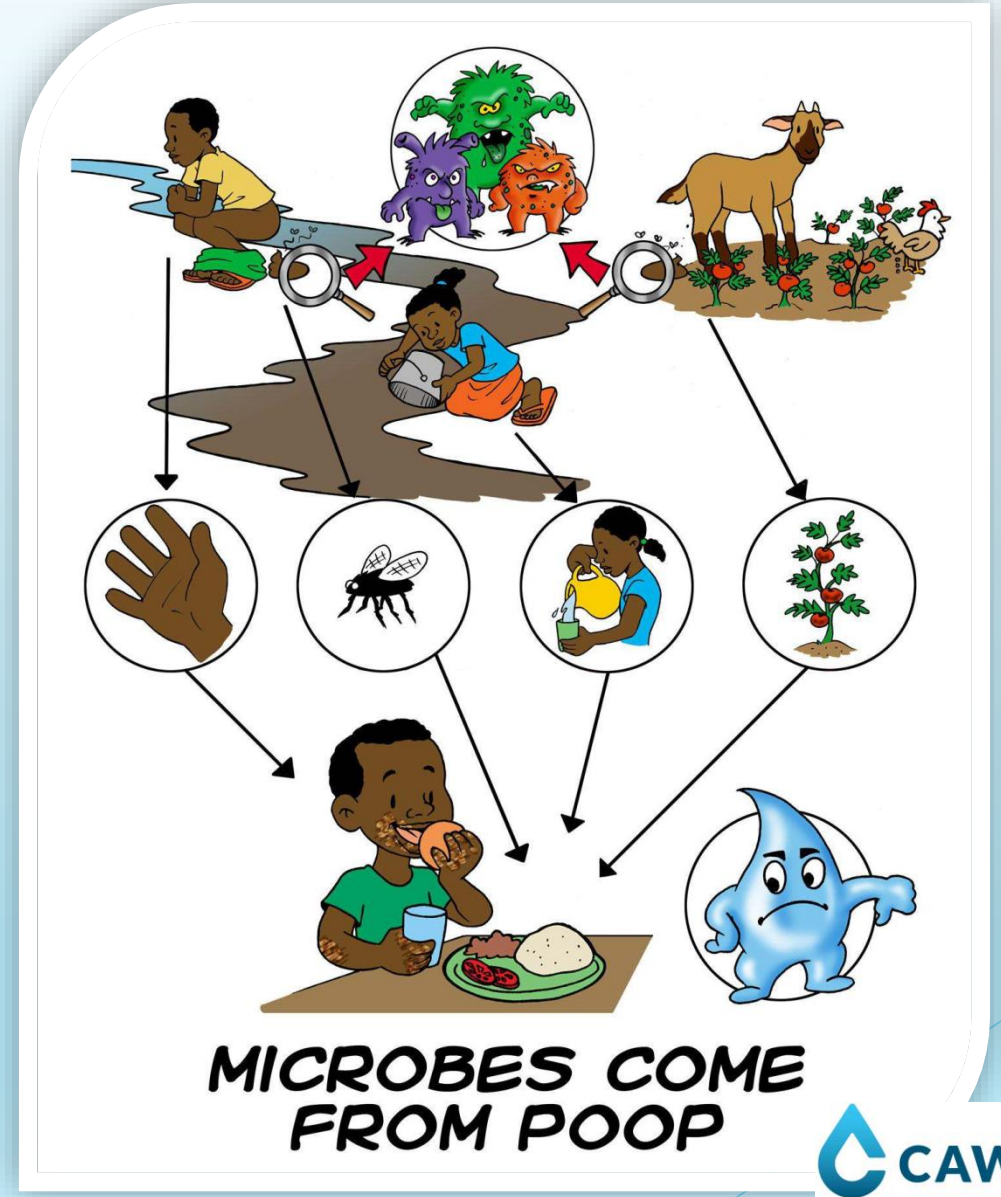
AYILO

Solar water pumping in rural settings:

1. Simple
2. Cost Effective
3. Technically and financially viable

Problem

- Water Access
- Water Use
- Water Related Illnesses
  - Diarrhea
  - Typhoid
  - Cholera
  - Trachoma
  - Malaria
  - Hepatitis



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CAWST

RWSN

Problem

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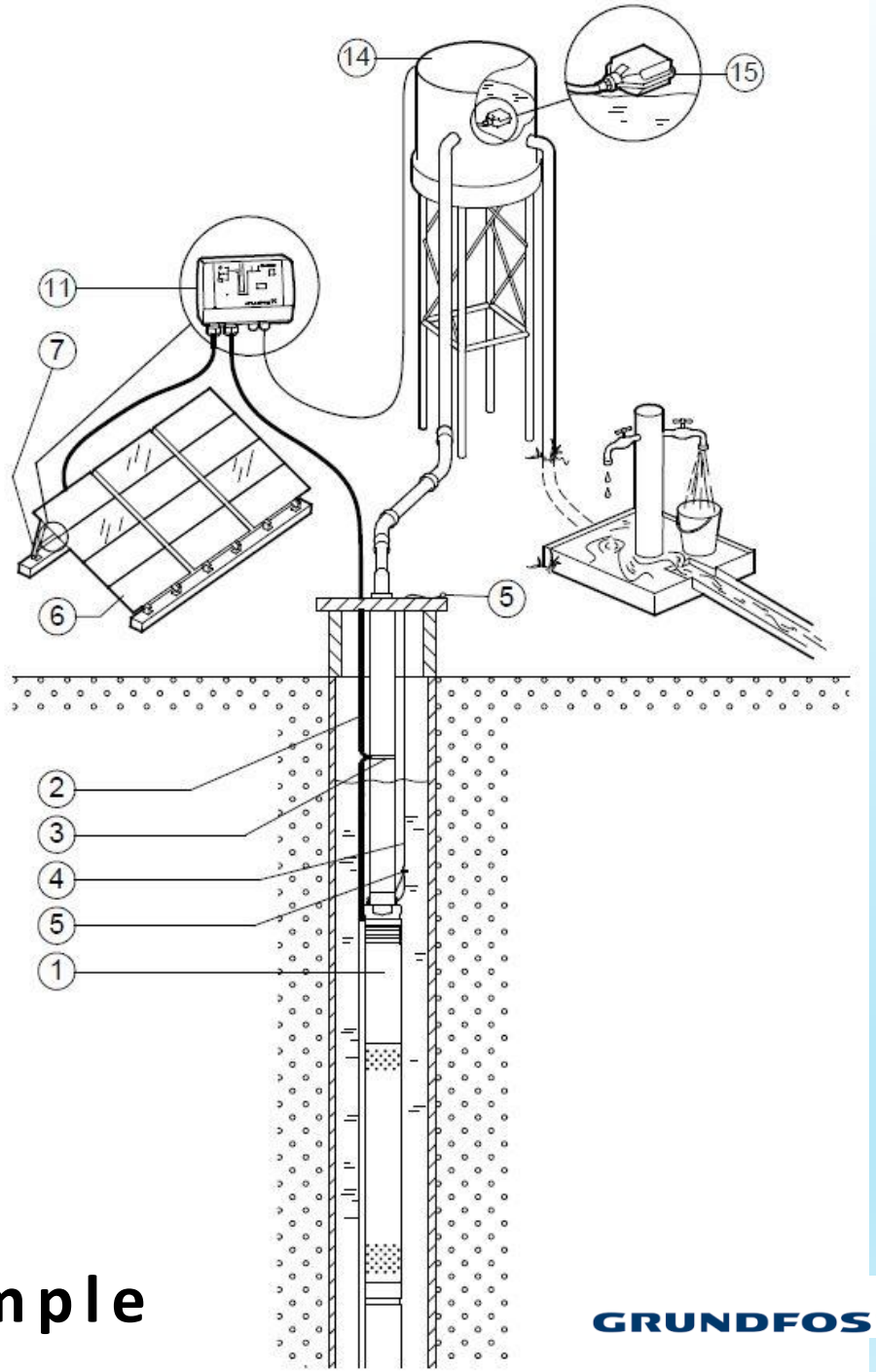
Problem



1 Simple

GRUNDFOS

Design

- Gather elevations from survey
- Import into Google Earth for layout
- Input into EPANET for hydraulic modeling
- Select the pump and panels
- Estimate cost of the project

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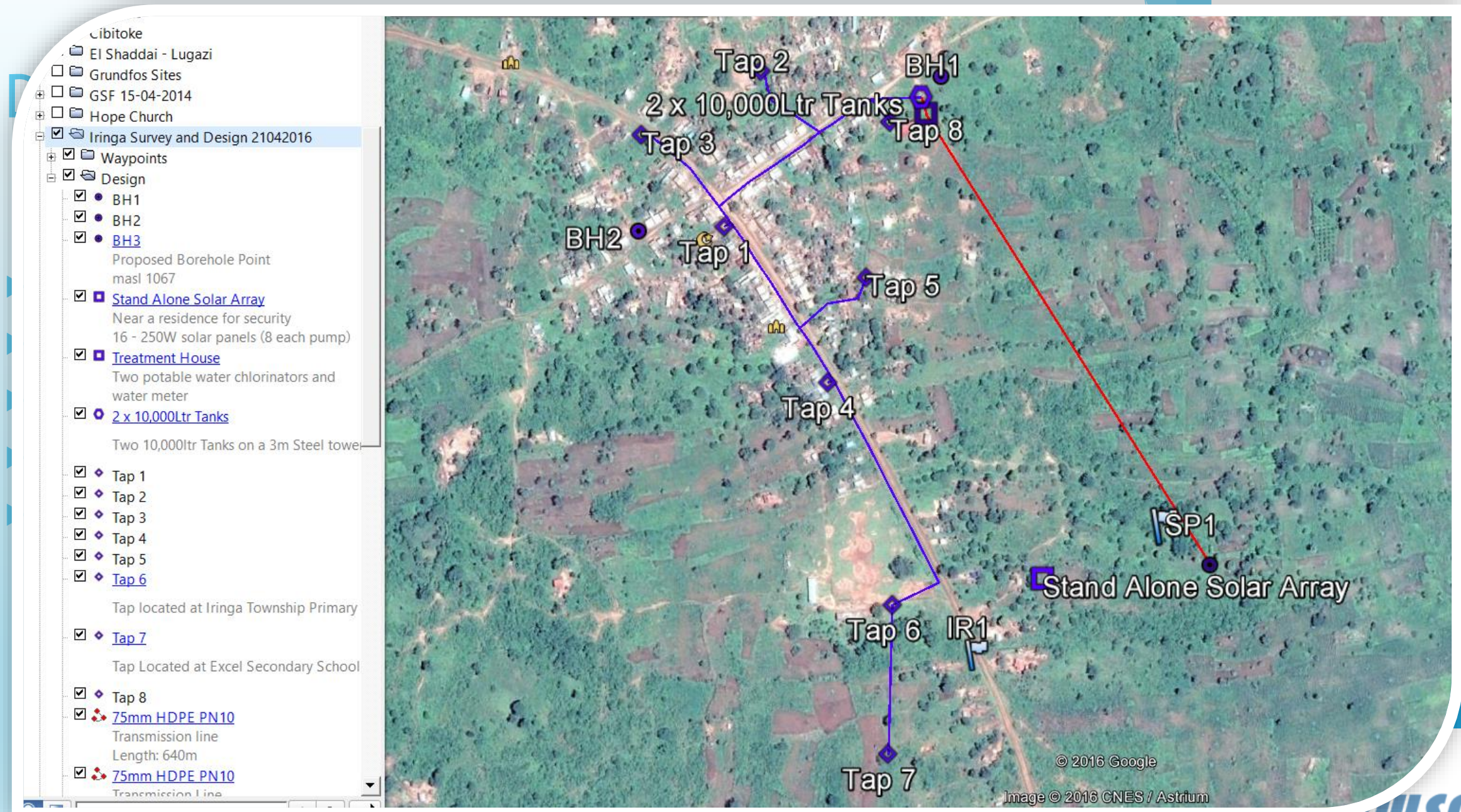
Cibitoke
El Shaddai - Lugazi
Grundfos Sites
GSF 15-04-2014
Hope Church
Iringa Survey and Design 21042016
Waypoints
Design
BH1
BH2
BH3
Proposed Borehole Point
masl 1067
Stand Alone Solar Array
Near a residence for security
16 - 250W solar panels (8 each pump)
Treatment House
Two potable water chlorinators and water meter
2 x 10,000Ltr Tanks
Two 10,000ltr Tanks on a 3m Steel towe
Tap 1
Tap 2
Tap 3
Tap 4
Tap 5
Tap 6
Tap located at Iringa Township Primary
Tap 7
Tap Located at Excel Secondary School
Tap 8
75mm HDPE PN10
Transmission line
Length: 640m
75mm HDPE PN10
Transmission Line
Tap 2
BH1
2 x 10,000Ltr Tanks
Tap 3
Tap 8
BH2
Tap 1
Tap 5
Tap 4
SP1
Stand Alone Solar Array
Tap 6
IR1
Tap 7
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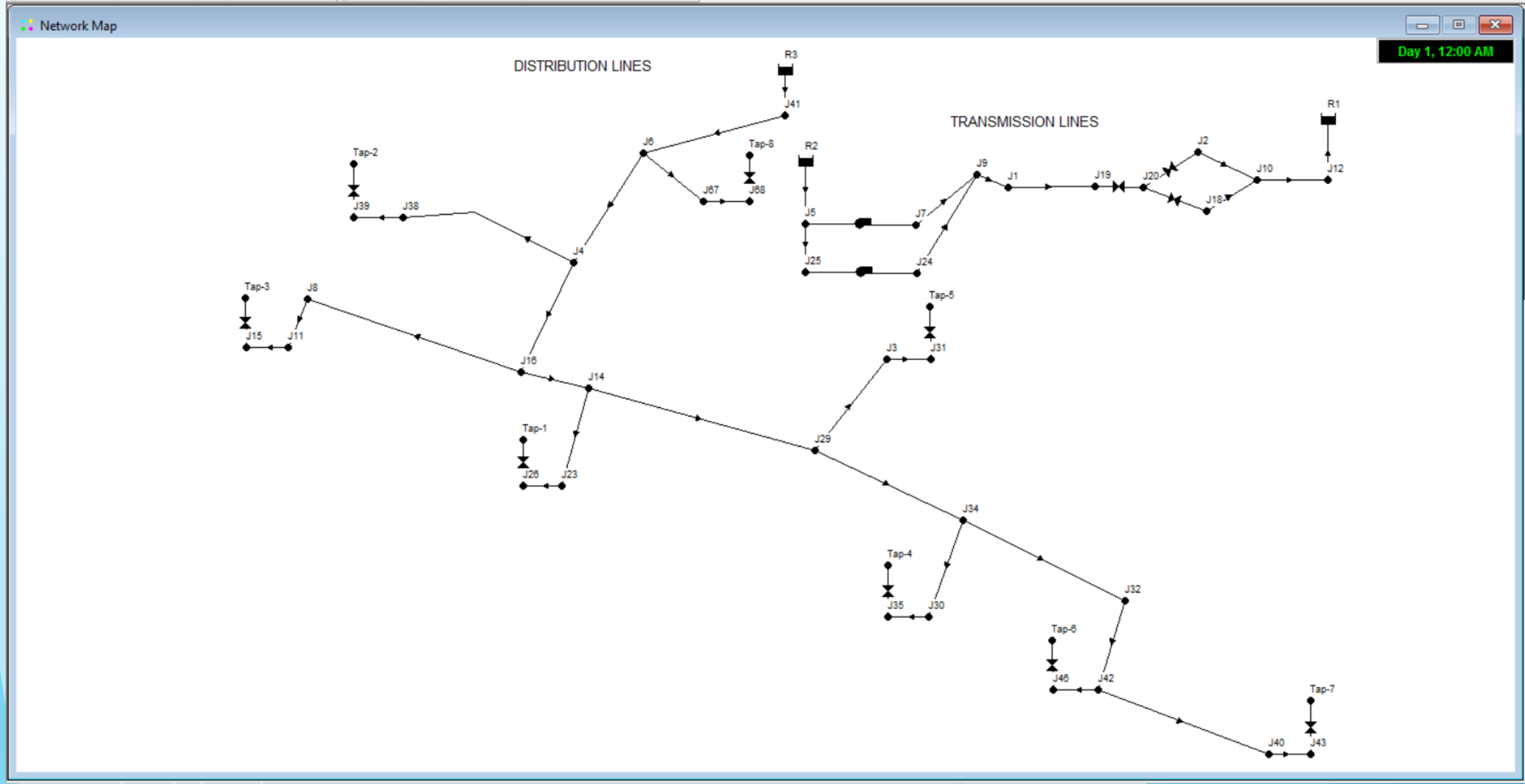
EPANET 2 - Iringa Hydraulic Design 17032016.net

File Edit View Project Report Window Help

Network Map



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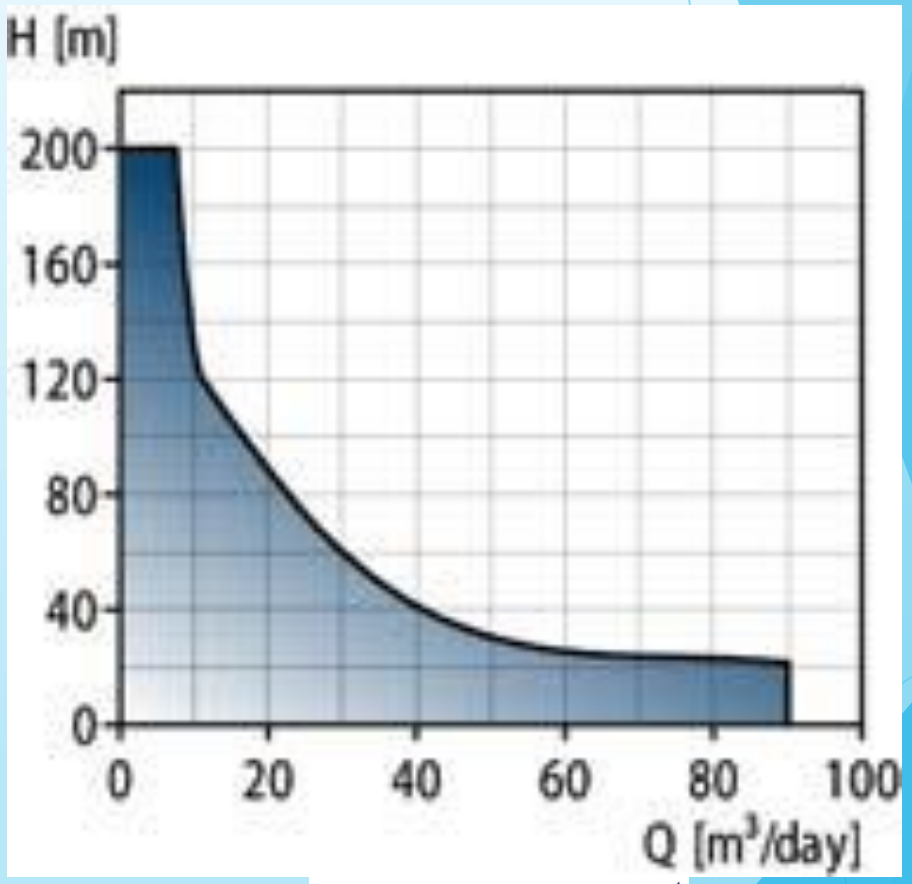

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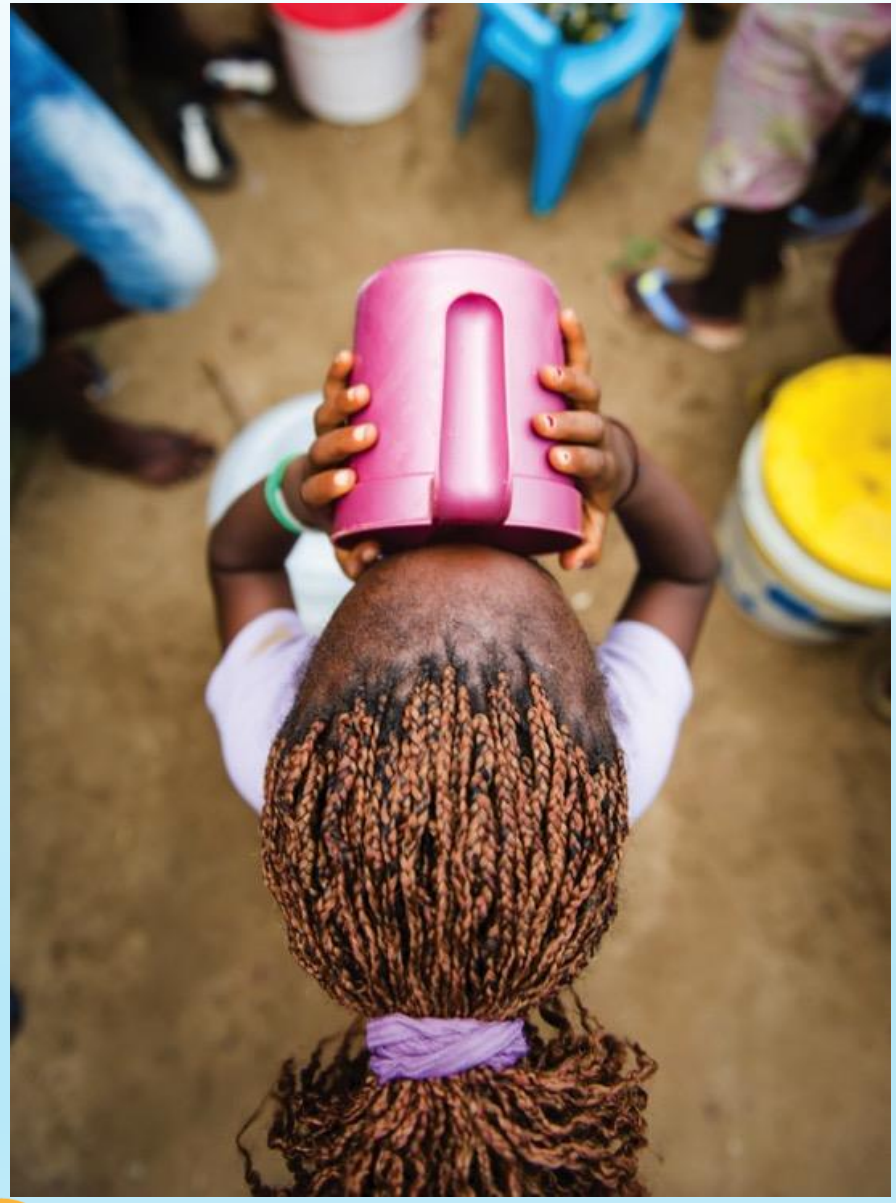


Community Water Demand

2,000

People

15

Liters per Person per Day

30,000 L

Daily Water Demand

Ground water source only
Well depth is <50 m (165ft)

Assumptions

2 **Cost Effective**

Option 1: Hand Pump

2 Cost Effective

Water Capacity

800 L/hr

Max Flow (13 lpm)

50%

Operating Eff during a 12 hr day

4,800 L/day

Capacity for 320 people

7 wells

Required number of wells for 2,000 people

2 **Cost Effective**

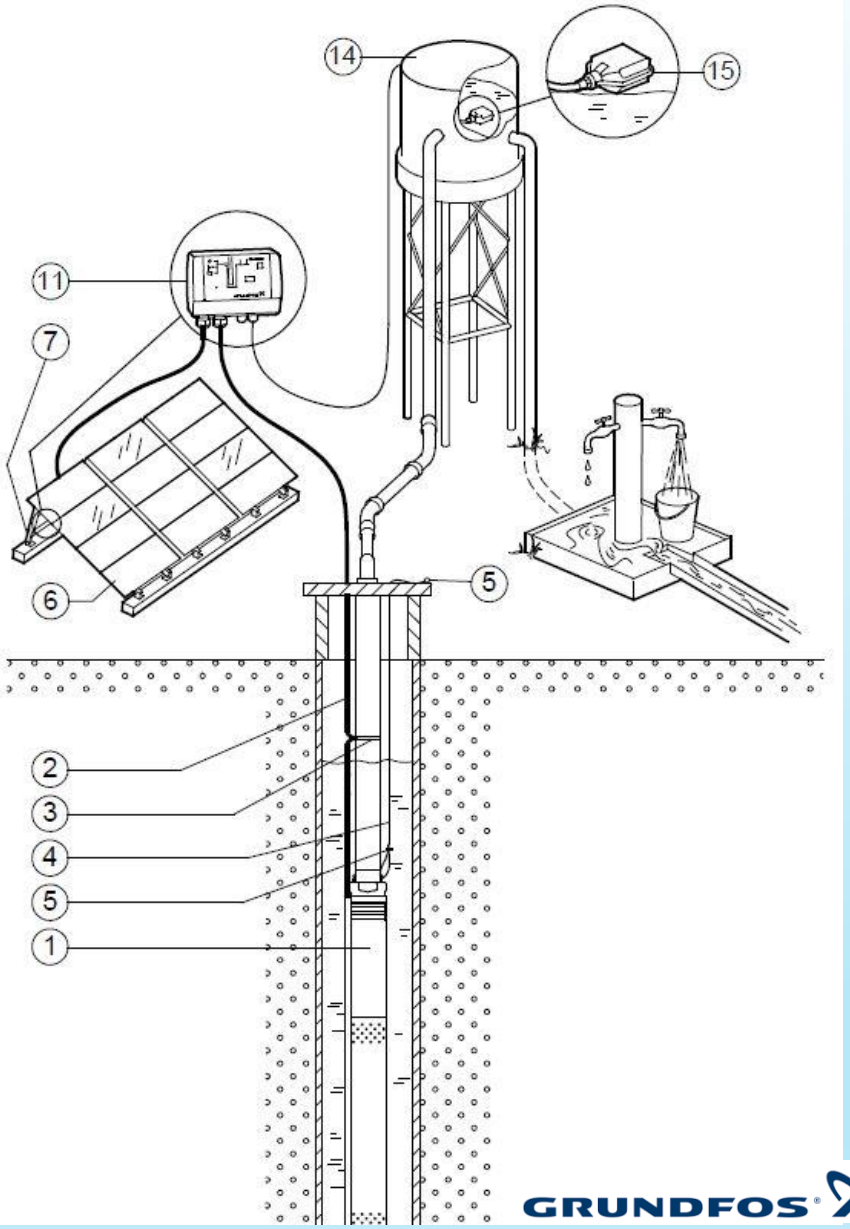
Option 1 Hand Pump - Costs

Borehole Drilling	-	7,000	(30y)
India Mk II	-	800	(10y)
Sub Total	-	*7,800*	
X 7 wells			
Total Construction	**- $ 54,600**		
Cost per capita	**- $ 27**		

2 **Cost Effective**

Option 2: Solar Pumping Solution

2 Cost Effective



Solar Pump Capacity

78 lpm

Avg Flow for 6.5 hrs

30,000 l/day

Total Flow

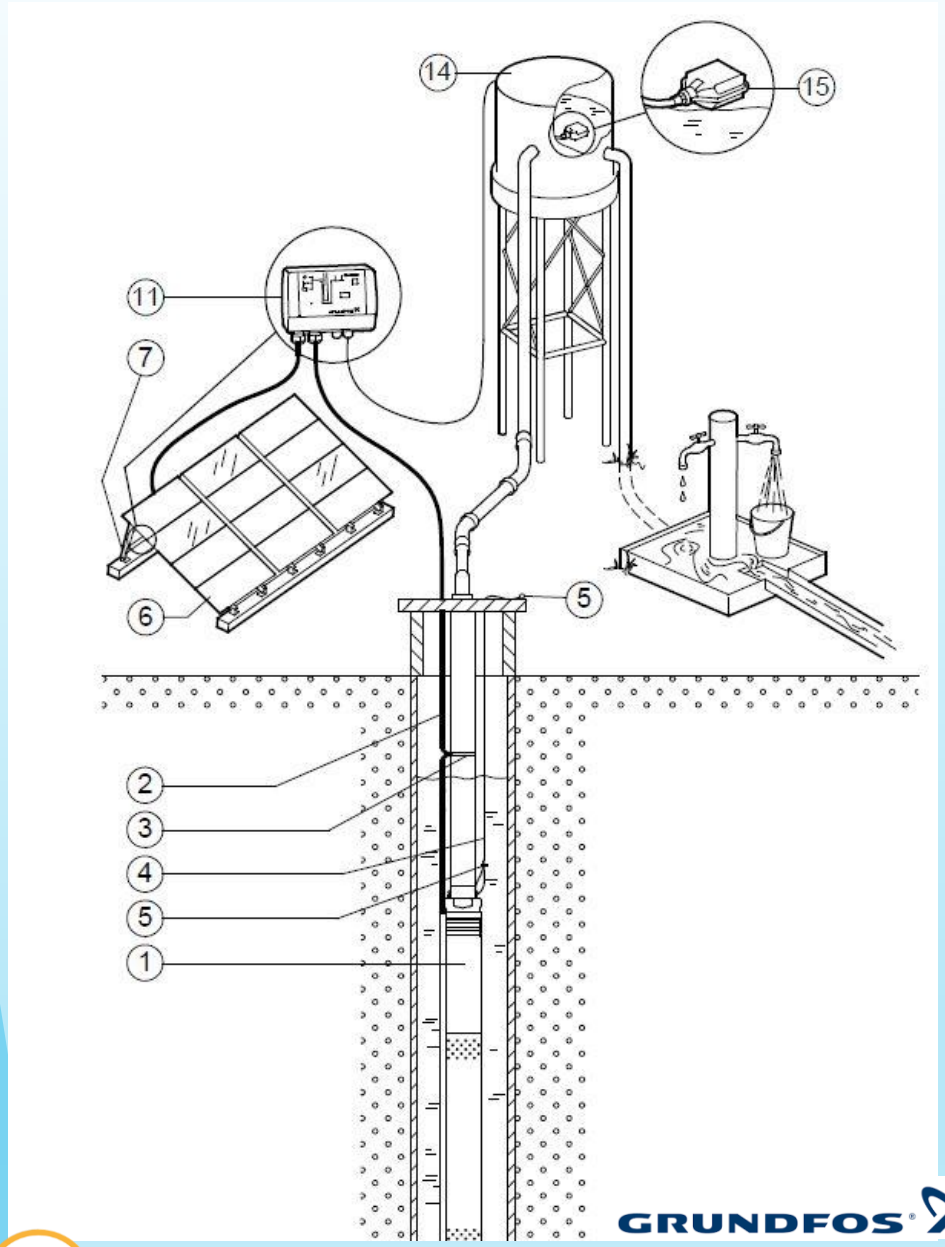
25 SQF-6 DC Pump

Pump required for 80 lpm flow @ 27m (90ft)

900 W (1440 W)

1.6 SF for Power

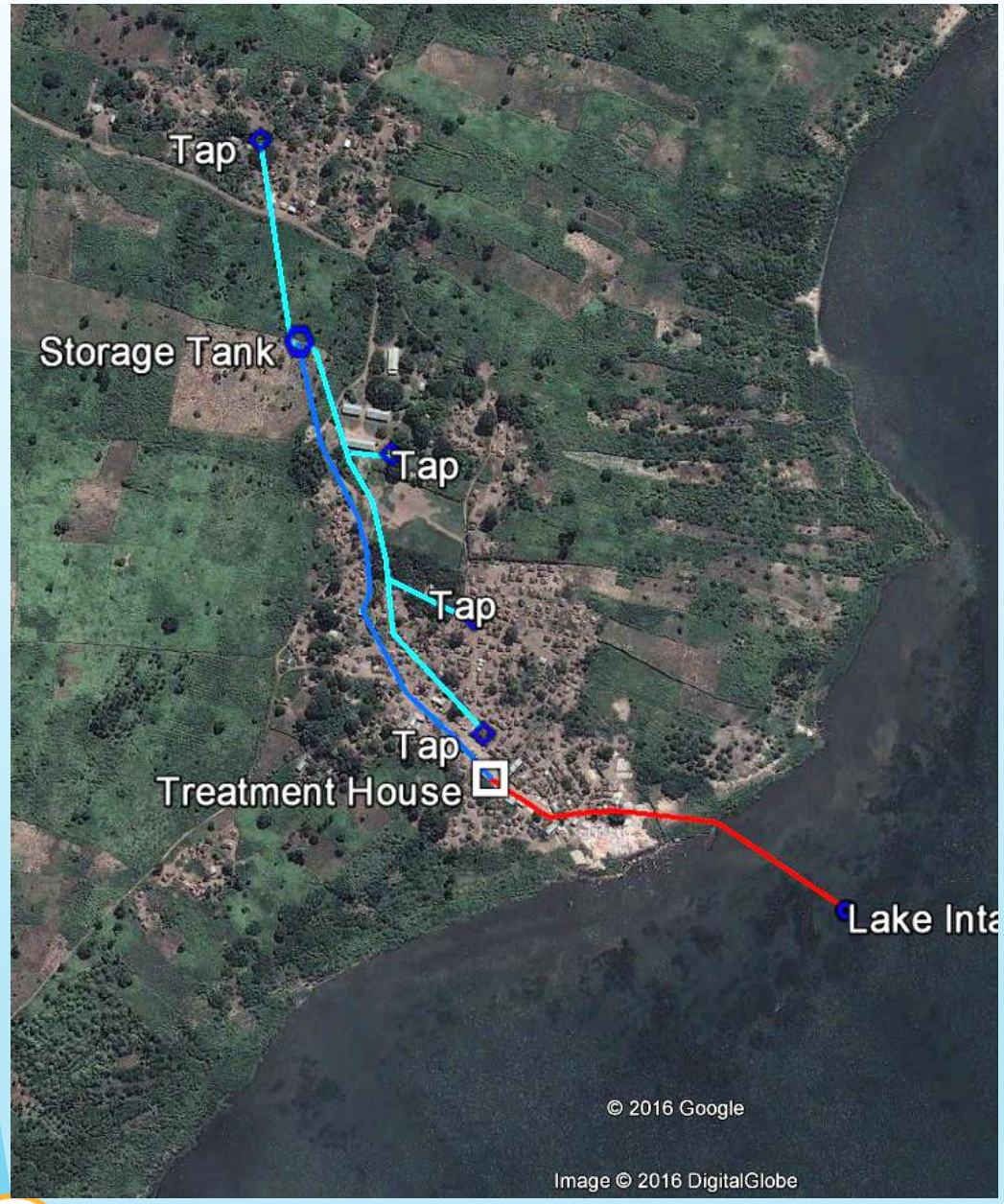
2 **Cost Effective**



Solar Pumping Equipment Costs

Borehole Drilling	- 7,000	(30y)
Solar Pump	- 1,900	(15y)
Solar Rack	- 900	(30y)
1.5 kW Solar	- 1,800	(20y)
Solar Controller	- 500	(10y)
Float Switch	- 50	(10y)
Grounding Kit	- 150	(10y)
Misc Wire	- 500	(10y)
Misc Pipe	- 1,000	(30y)
Steel Tower	- 5,000	(30y)
Storage Tank	- 1,200	(30y)
Tap Stand	- 200	(15y)

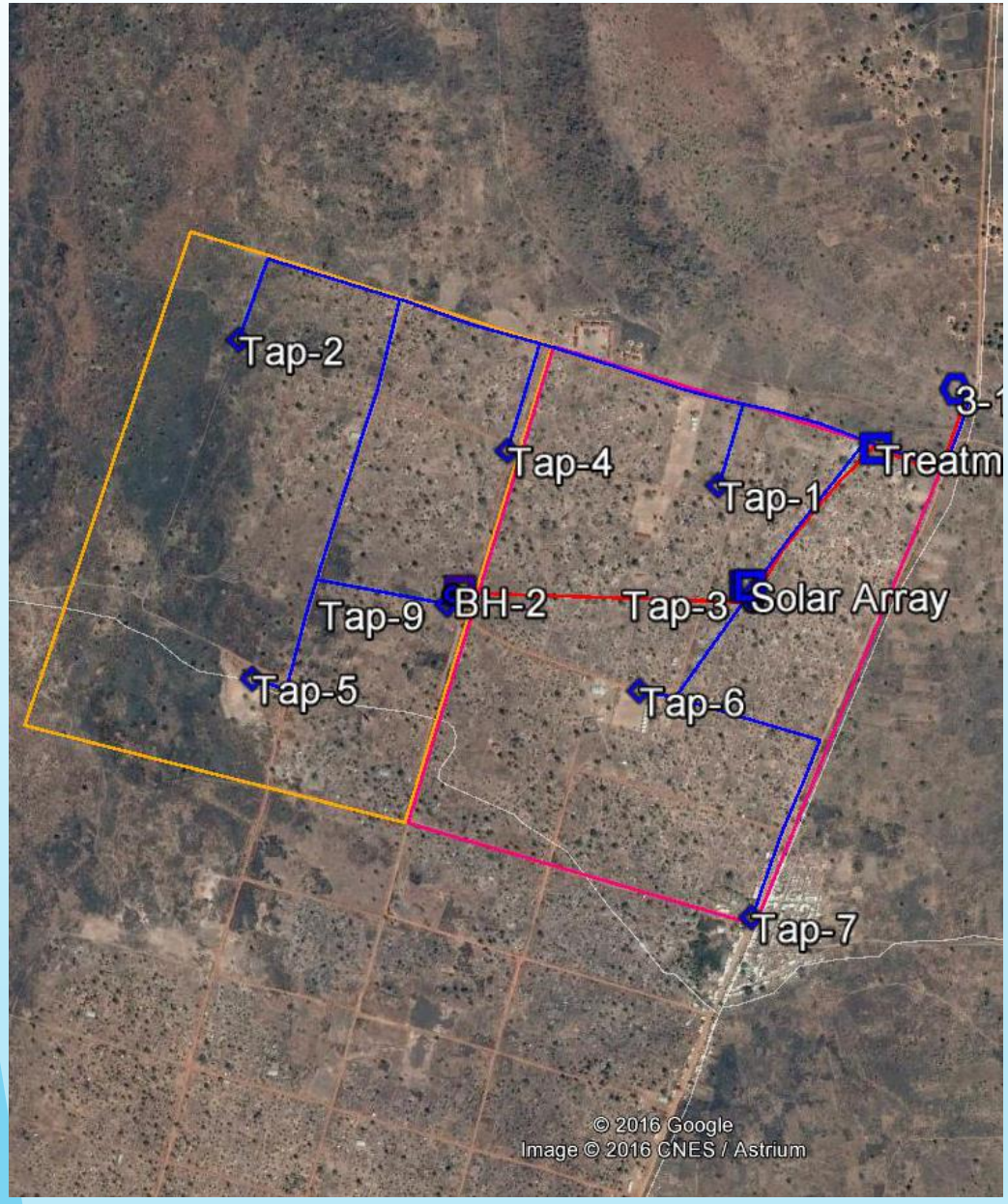
2 **Cost Effective**



Option 2 Solar Pumping (Kayonga - Lake)

Water Source Development	$1,000
Structures	$11,000
Electrical	$4,000
Pumping Equipment	$2,000
Water Storage Tanks	$3,000
Water Distribution Taps	$2,000
Water Treatment	$10,000
Piping	$4,000
Sanitation	$-
Other	$2,000
Total Construction	**$39,000**
Cost per Capita (3,200)	**$12**

2 **Cost Effective**



Option 3 Solar Pumping (Borehole)

Water Source Development	$7,000
Structures	$44,000
Electrical	$36,000
Pumping Equipment	$15,000
Water Storage Tanks	$9,000
Water Distribution Taps	$5,000
Water Treatment	$2,000
Piping	$53,000
Sanitation	$3,000
Other	$25,000
Total Construction	**$199,000**
Cost per Capita (7,000)	**$28**

2 **Cost Effective**

Implementation

3 **Technically and financially viable**

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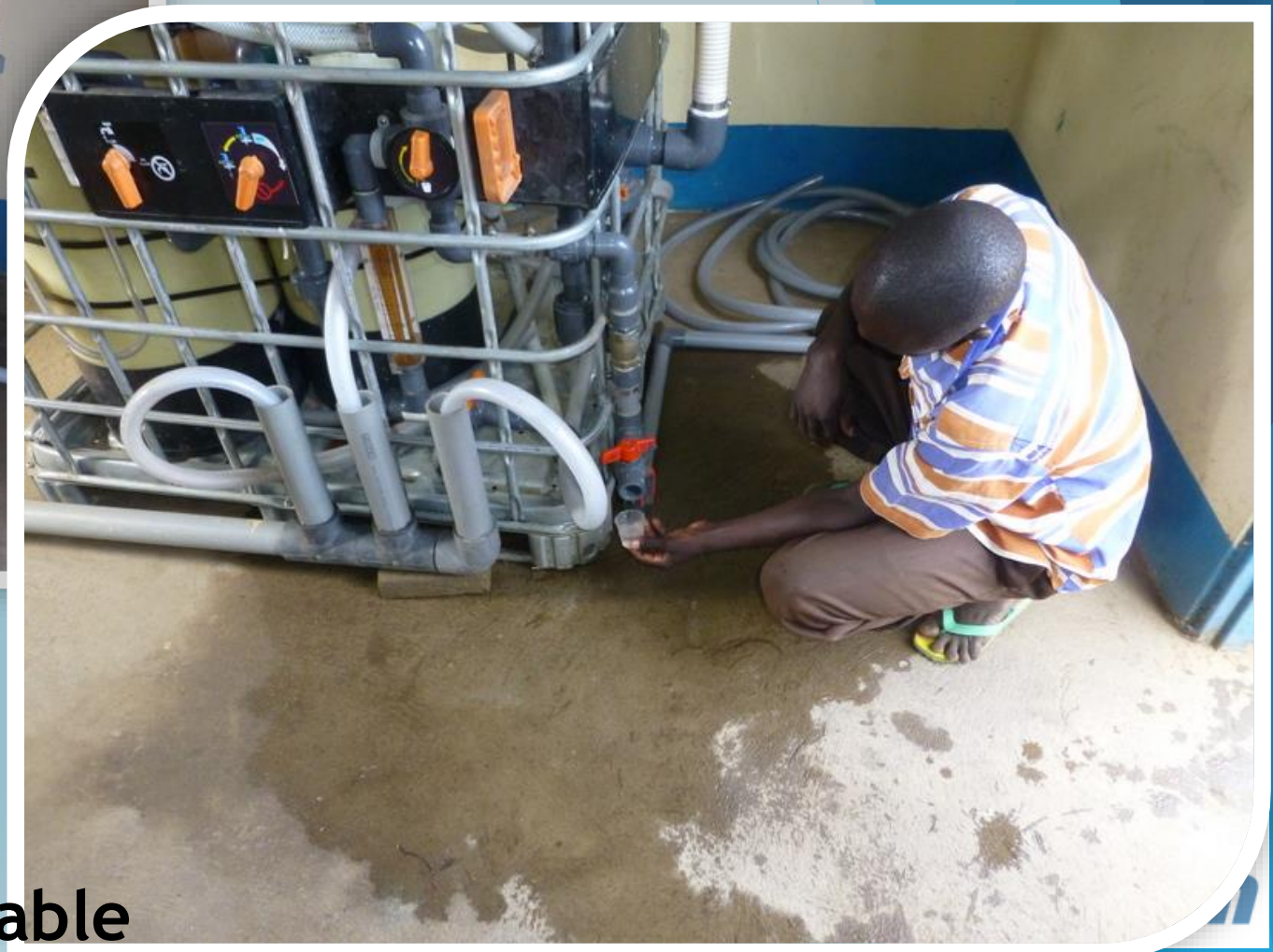

3 Technically and financially viable

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4 Additional Benefits

Safe Water v/s Improved Water

1200+ Water Sources

Analyzed physical, chemical & micro-biological

(633) – Ground Water

(473) Boreholes (Deep Wells)

79% > 0 CFU TC/100mL

51% > 0 CFU FC/100mL

39% > 10 CFU FC/100mL

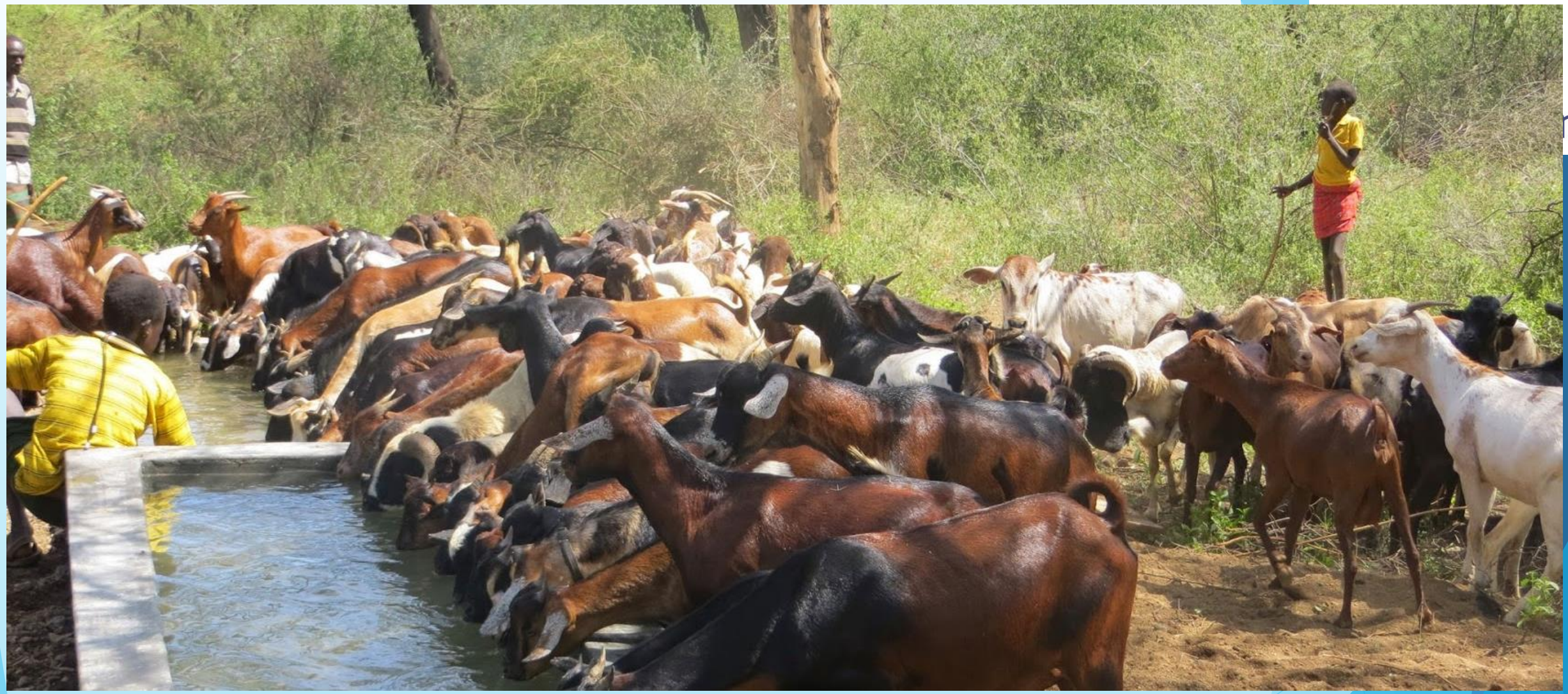
4 Additional Benefits

Surface Water Applications

4 Additional Benefits

Deep Well or High Volume Applications

4 Additional Benefits



Production / Livelihood Applications

4 Additional Benefits

Disaster Response: Nepal

4 Additional Benefits

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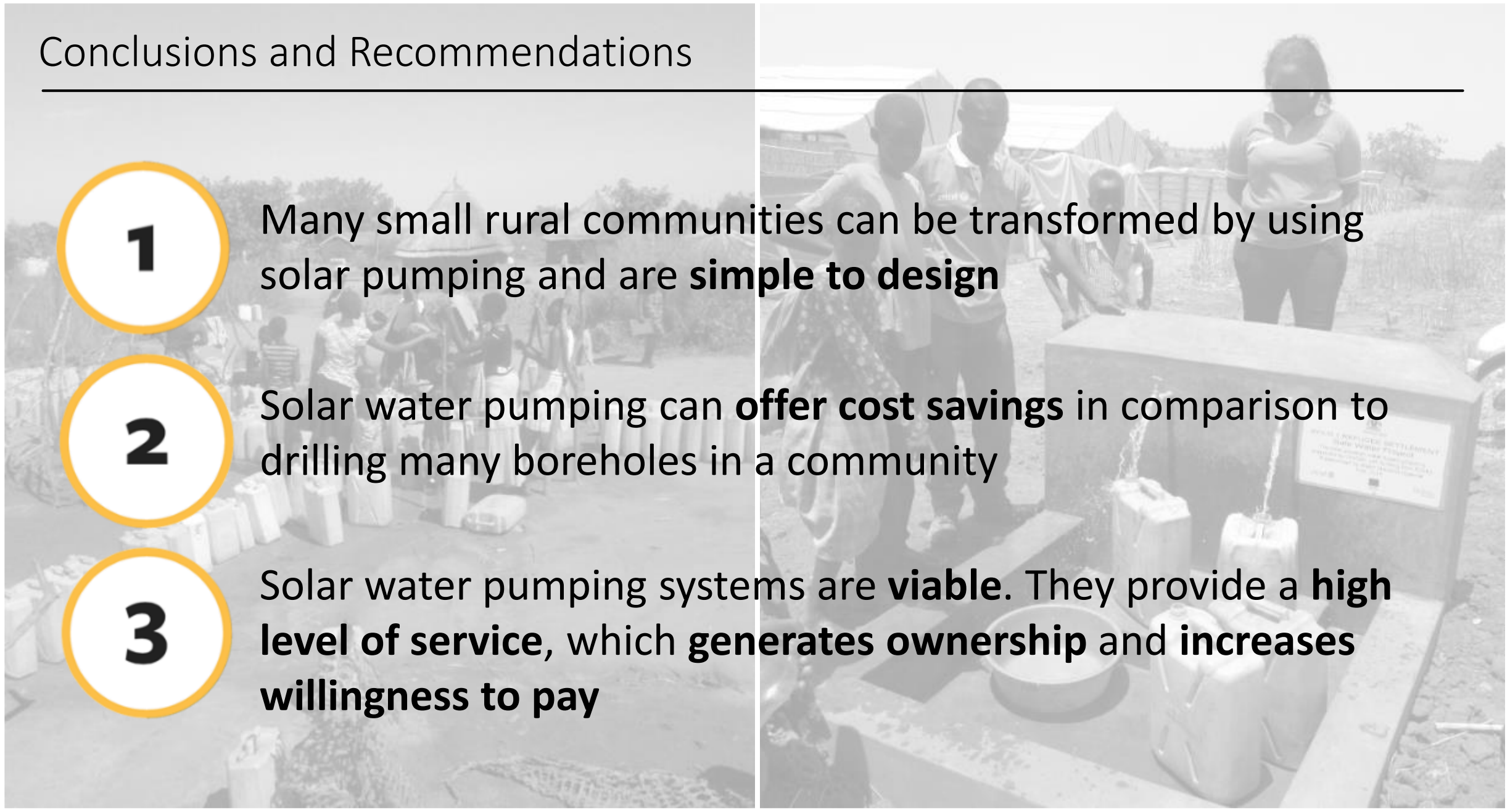
4 Additional Benefits

Conclusions and Recommendations



1. Many small rural communities can be transformed by using solar pumping and are **simple to design**

2. Solar water pumping can **offer cost savings** in comparison to drilling many boreholes in a community

3. Solar water pumping systems are **viable**. They provide a **high level of service**, which **generates ownership** and **increases willingness to pay**

Questions and Discussion

watermission.org

watermission.org/research

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