

# SOLAR DESALINATION IN LODWAR, TURKANA, KENYA



COLIN PRITCHARD, DIMITRI MIGNARD, LAURENCE BLAIR

UNIVERSITY OF EDINBURGH,

WITH MARTYN WELLS, ROYAL OBSERVATORY



THE UNIVERSITY  
of EDINBURGH

# LOCATION: LODWAR, TURKANA COUNTY, KENYA



THE UNIVERSITY  
of EDINBURGH

Lodwar



# A “RESOURCE-RICH, COMMUNICATIONS-POOR” REGION

- GROUNDWATER SURVEY IN 2013 IDENTIFIED  $\frac{1}{4}$  **TRILLION** CUBIC METRES – SUFFICIENT FOR THE WHOLE OF KENYA FOR 70 YEARS! RECHARGE IS  $\sim 2$  BN CU M/YR (2 CUBIC KILOMETRES).
- HOWEVER MUCH OF THIS IS DEEP AND MANY NEAR-SURFACE AQUIFERS ARE SALINE; SOME HAVE HIGH FLUORIDE LEVELS (6X WHO RECOMMENDED LIMIT).
- SOLAR ENERGY IS ABUNDANT! 12 HR/DAY WITH LITTLE CLOUD.
- WIND ENERGY IS ALSO ABUNDANT “ACROSS THE LAKE” IN MARSARBIT (ONE OF THE BEST WINDPOWER SITES IN THE WORLD, CONSISTENTLY 11 M/S FROM ESE).
- *PROSOPIS JULIFLORA* IS ABUNDANT: CAN BE USED FOR CHARCOAL PRODUCTION, OR BURNED DIRECTLY.
- OIL RESERVES HAVE BEEN DISCOVERED BY TULLOW OIL.
- AND THE ONE ROAD INTO THE COUNTY IS ILL-MAINTAINED.



THE UNIVERSITY  
of EDINBURGH



# LOCAL AREA AND ENTERTAINMENT



THE UNIVERSITY  
of EDINBURGH



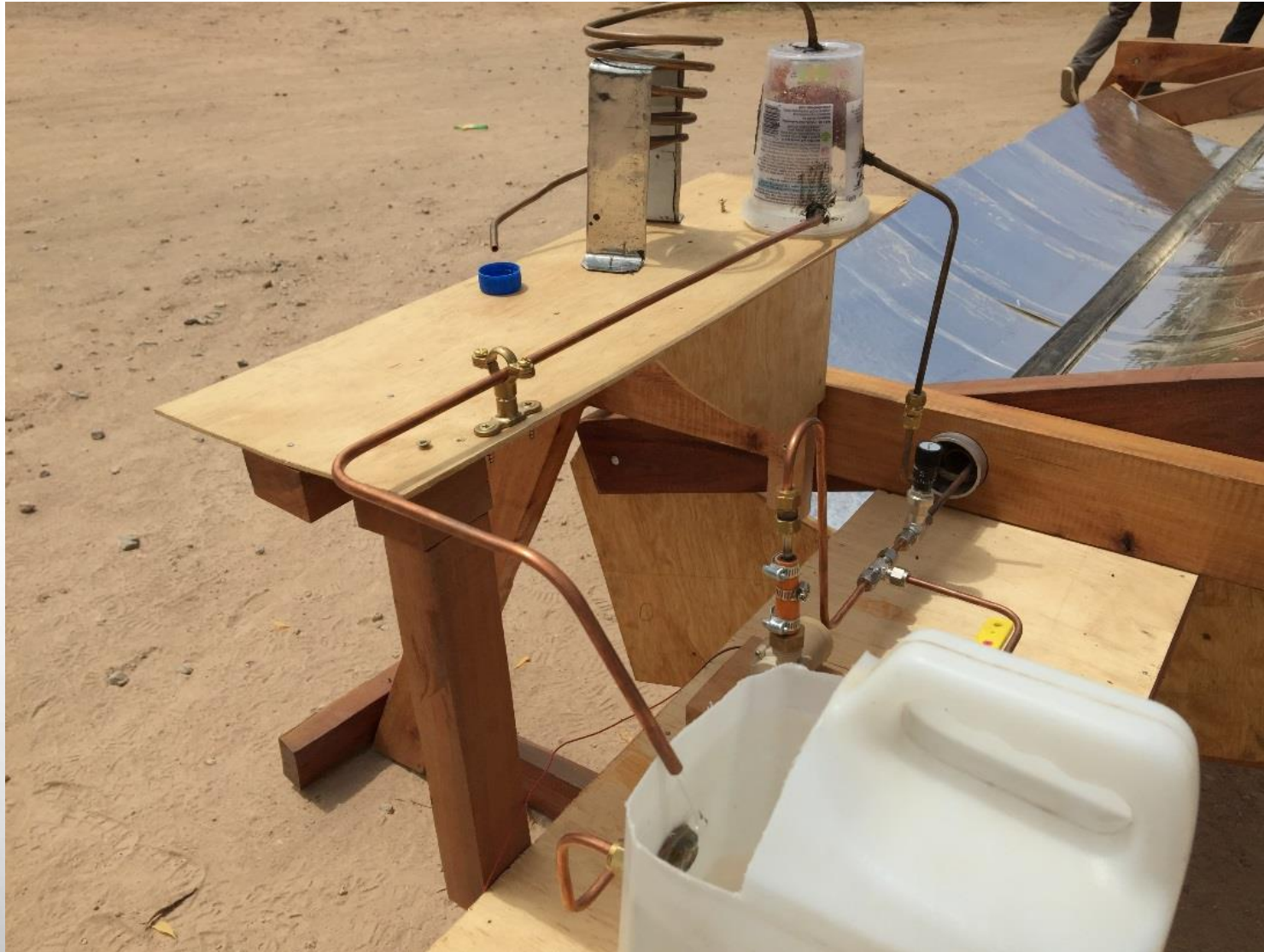
# FINDING AN ARTISAN



THE UNIVERSITY  
of EDINBURGH



# INITIAL SYSTEM TESTED



THE UNIVERSITY  
of EDINBURGH

# WATER QUALITY TESTED BY HELEN ROBINSON (GLASGOW U.)



THE UNIVERSITY  
of EDINBURGH

- MUNICIPAL WATER
  - CONDUCTIVITY – 227.5
  - TOTAL DISSOLVED SOLIDS – 142.3
  - OXYGEN - 94
  - PH – 7.65
- 'DESALINATED' WATER
  - CONDUCTIVITY – 47.8
  - TOTAL DISSOLVED SOLIDS – 29.3
  - OXYGEN - 193
  - PH – 6.52

# ERIC THE ARTISAN



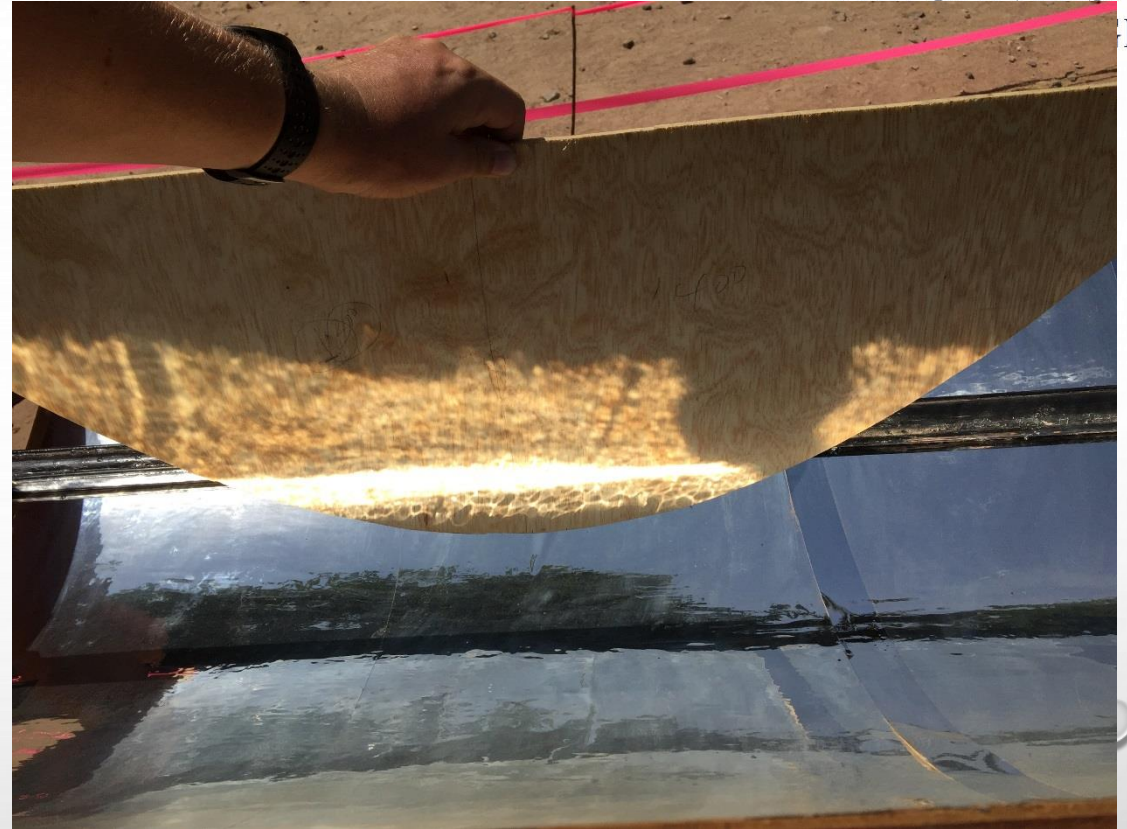
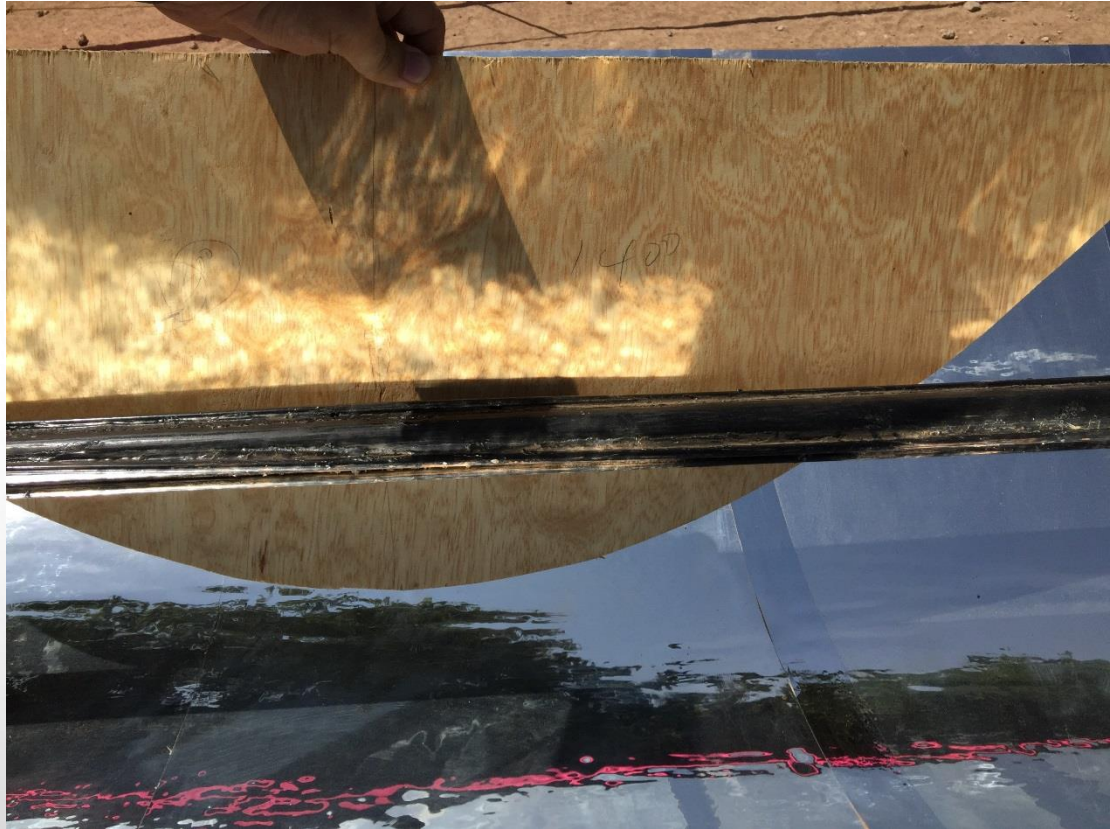
THE UNIVERSITY  
of EDINBURGH



# ALIGNING THE PARABOLA



THE UNIVERSITY  
OF EDINBURGH



# FLOW DIAGRAM



$\frac{1}{4}$  inch copper  
pipe soldered on  
to 1.5 inch  
galvanised steel  
over a parabola



THE UNIVERSITY  
of EDINBURGH

Steam / hot /  
boiling water  
coming out

Ball Valve (Closing decreases  
flow rate over parabola)

Ball Valve (Closing  
increases flow rate  
over parabola)

Tank feed point raised to  
take hotter water from  
tank

# FLOW DIAGRAM



THE UNIVERSITY  
of EDINBURGH



Condensing coil – sometimes  
air is drawn in the other way

Collection of  
condensed water

Outer condensing  
container

De-mister

Collection of  
condensed water

Re-fed brine to  
feed tank

Steam / hot /  
boiling water  
coming out

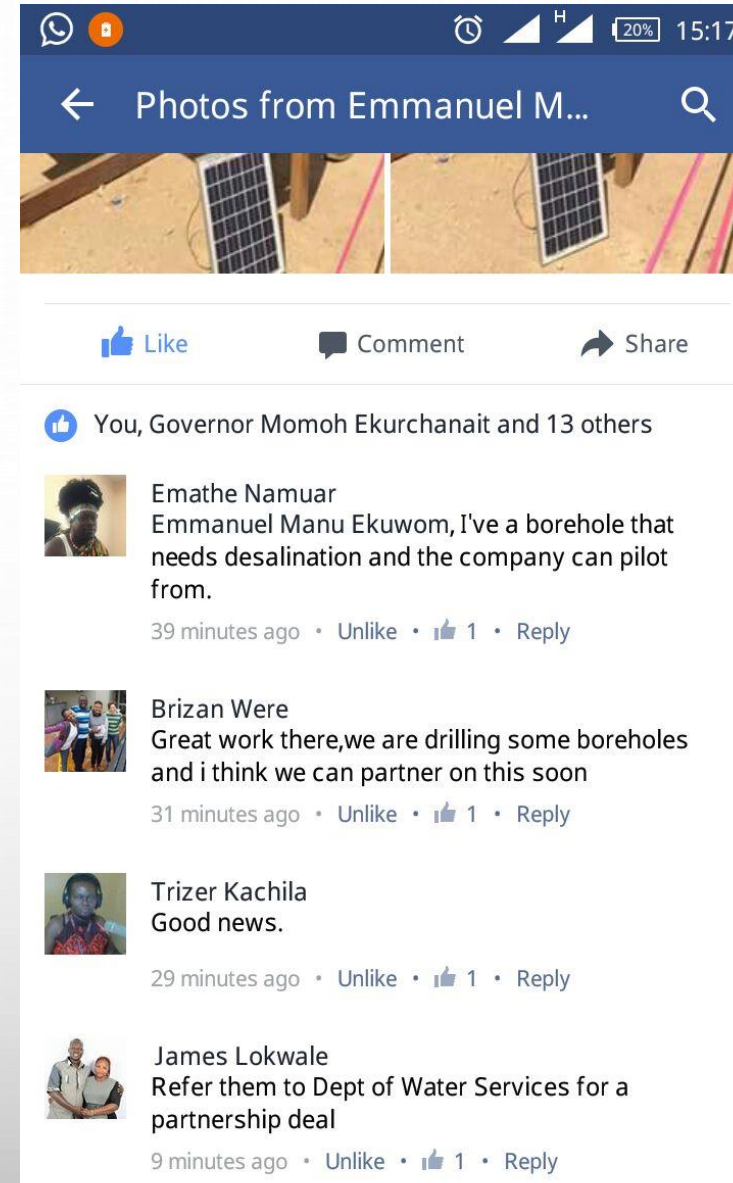
# LOCAL RADIO STAR COMING FOR AN INTERVIEW



THE UNIVERSITY  
of EDINBURGH



And  
correspondence  
within 3 hours!



# ERIC IS NOW LEFT TO TRAIN A COLLEAGUE TO CONTINUE BUILDING THESE MACHINES



THE UNIVERSITY  
of EDINBURGH

