UN-WATER SUMMIT ON GROUNDWATER 2022

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STOP THE ROT:
TAKING ACTION TO ENSURE BOREHOLE AND HANDPUMP QUALITY

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Side Event on Groundwater for Rural Water Supply
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BASEflow

Ask for Water

RWSN Rural Water Supply Network

thewaterloofoundation

skat foundation

BASEFLOW'S BOREHOLE FORENSICS FINDINGS

What is Borehole Forensics

- Detailed diagnosis of borehole & handpump performance
  - Identify problems with infrastructure
  - Use mWater Customised Surveys

Key Findings (Malawi)

- Unsuitable well designs and poor construction e.g.
  - Manually cut casings,
  - Inadequate borehole verticality (straightness)
  - Inadequate borehole depth
  - Yielding insufficient
  - Poor sitting (lack of hydrogeological understanding

- Corrosion of Afridev Pump galvanized iron components in areas with high Electrical Conductivity (i.e. high salinity)

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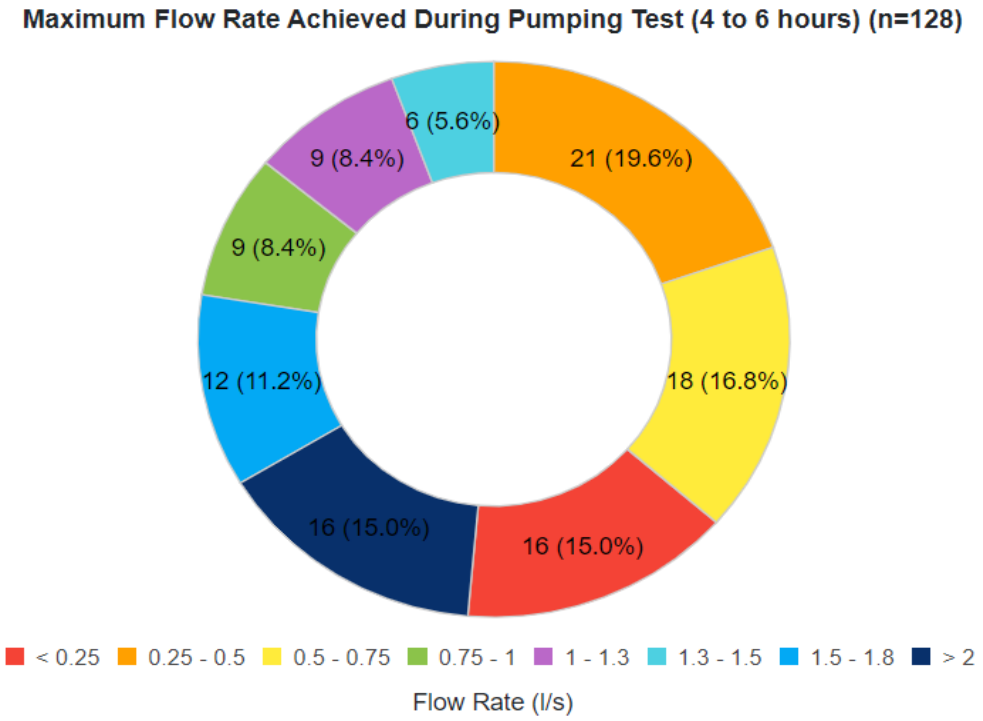
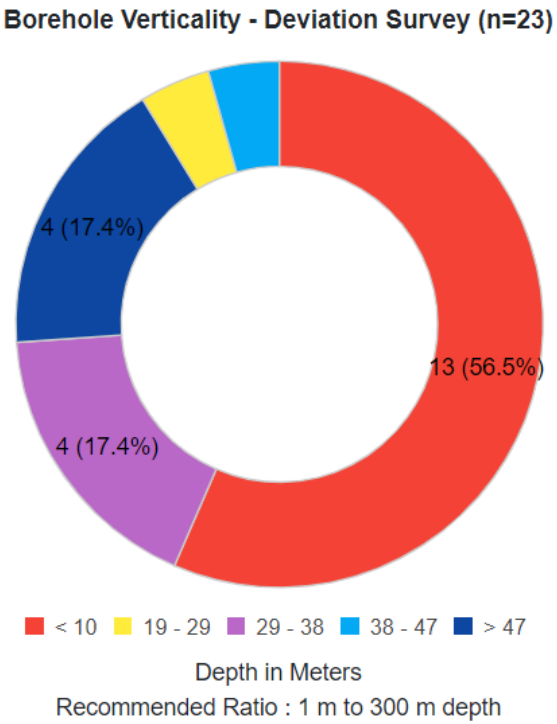
BOREHOLE FORENSICS - MORE DETAILS





Source: Malawi Government mWater Data base

A number of low yielding boreholes below the National Standard that were commissioned for use.

A good number of boreholes whose well holes that are not straight cause frequent and fast wearing out of pump parts

EXAMPLES OF PREMATURE FAILURE OF WATER POINTS WITHIN 1 TO 2 YEARS

- 15% to 30% of water points failed in the first one to two years in Liberia, Sierra Leone, Malawi and Tanzania (Tincani *et al,* 2015).
- 15-30% of water points* in Nigeria were likely to fail in the first year (Andres *et al* (2018b).

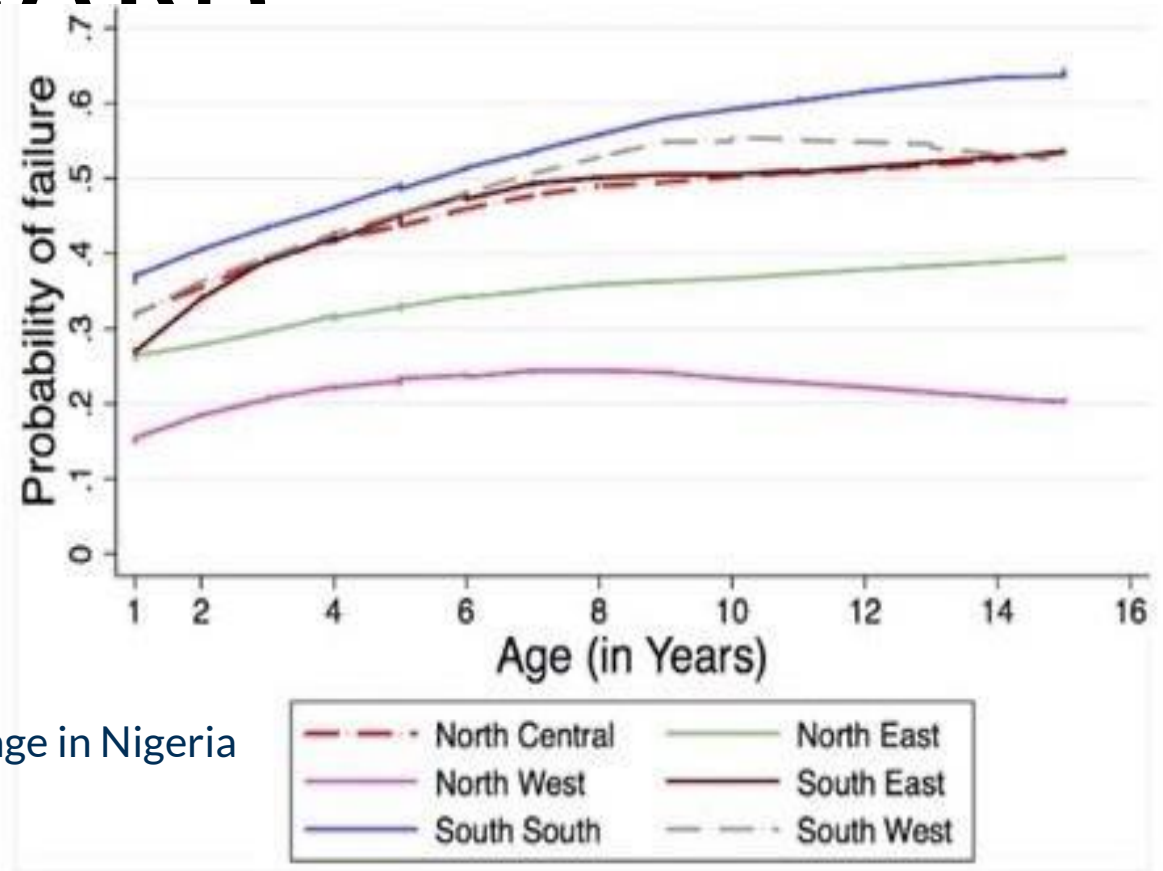


Figure: Probability of water point failure by age in Nigeria (Source: Andres et al, 2018b)

HANDPUMP PERFORMANCE

- If wells and boreholes are properly designed & constructed (including well development) their lifetime should exceed 25 years (Driscoll, 1986).
- India Mark II & Afridev handpumps are designed so that wearing parts can be replaced, and, over a ten year period, every part should be replaced (Arlosoroff *et al*, 1987).
- But pumps stop working earlier…and can also perform poorly

- A handpump breaks down for a very specific technical reason (such as the breakage of the chain, riser pipe or an O-ring failing).
- Its repair (or rehabilitation) depends on the ability of the community (or government) to raise funds, organise a mechanic and source spare parts and more….

RAPID CORROSION OF HANDPUMPS

- In the **1980s/early 1990s** it was concluded that:
  i. total iron concentration in natural groundwater is **rarely greater than 1 mg/l**
  ii. the red water (iron) problem in handpump-equipped wells is usually caused by corrosion
  iii. galvanisation does not protect rising mains and pump rods from corrosion if pH < 6.5 (or if salinity is high)

CORROSION HAS BEEN KNOWN ABOUT FOR OVER 30 YEARS AND

YET SIMPLE MISTAKES ARE REPEATED AGAIN AND AGAIN

Figure: Removal of corroding riser pipe in Hoima, Uganda in 2012 (Source: Larry Bentley).
Note: In 2018 the Government of Uganda issued a directive to prevent further use of Galvanised Iron riser pipes throughout the country

COUNTRIES WITH EVIDENCE OF RAPID HANDPUMP CORROSION

(DANERT, 2022B)

Red, iron-rich water being pumped
Photo: WaterAid Uganda

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POOR QUALITY HANDPUMP COMPONENTS

- Specific concerns over quality have been observed and/or measured in many handpump components in several countries* such as:
  - Components too light
  - Non-standard material composition
  - Thin galvanising
  - Non-conformant dimensions
  - Defective materials
  - Non genuine parts
  - Lack of durability (especially seals)

These can lead to premature failure of the handpump.

Figures: Select quality problem (Photos; Larry Bentley, Tony Beers and Richard Carter (Danert, 2022c)

*collated by Danert (2022c)

CALL TO ACTION

1. Build the knowledge & skills of consultants, drillers and managers to site, procure, manage contracts, drill and install, and supervise construction
2. Stop using underground handpump components (pump rods & riser pipes) made from galvanised iron
3. Ensure that all pump and pipe materials meet quality standards
4. Incentivise pump manufacturers and installers to deliver quality and regulate imports of handpump components
5. Map areas with low pH and high salinity
6. Find out the reasons for failure from rehabilitation programmes
7. Properly cost handpump component service life
8. Use suitable technologies in areas with high pH and high salinity
9. Ensure that donor policies and financing conditions consider risk, supervision requirements and post-construction inspection
10. Address challenges in the enabling environment, including corruption

Photo Drilling supervision course in Sierra Leone (Kerstin Danert)

Screen shot of educational film on borehole siting

CAN SERVICE PROVIDERS, DONORS AND IMPLEMENTORS BE HELD ACCOUNTABLE FOR THE DISCOVERED ROT ?

JOIN US TO STOP THE ROT!

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https://tinyurl.com/stoptherot1

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Website – Professional Drilling: https://tinyurl.com/waterdrilling

Website – Handpumps: https://tinyurl.com/handpumps