



# MANUAL DRILLING LEARNING SERIES

## Learning Note 5: Private Sector and NGO Experiences of Introducing and Developing Markets for Manual Drilling - Malawi, Zambia & Sierra Leone (11 March 2014)

The last of the 2014 series of five webinars on manual drilling explored experiences from the private sector and NGOs as they introduced and tried to develop markets for manual drilling. Experiences were shared from Malawi, Sierra Leone and Zambia, with considerable discussion among the participants.

### Case Study

#### Case Study 1: Malawi

It is estimated that about 66% of rural households use a protected well or borehole, while 15% use an open well as their main source of drinking water (NSO 2011). In Malawi, the government is trying to tap groundwater for domestic use as well to boost irrigation. Although it has been estimated that up to 1,000 manually drilled wells exist in Malawi, documentation is scant. Neither manual drilling nor self-supply is explicitly mentioned in Malawi's National Water Policy (Malawi Government 2005). There are no national standards for either machine, or manual drilling for the country.



Figure 1 : SHIPO Drilling, Malawi

Although government support of self supply in Malawi is limited, the private sector is responding to demands by households that can afford to improve their own water supplies. Promotional activities such as through the SMART centre are considered key for building government interest.

Mzuzu University Centre of Excellence in Water and Sanitation SMART Centre in Northern Malawi opened in 2012. Since then, it has trained local entrepreneurs to make money through providing services and products that improve access to water at household level. Businesses are being trained in both the technical and business aspects of manual drilling. Nine small drilling companies have been established and by March 2014, about 100 manually drilled wells had been constructed. Training will continue in the future, and there are also plans to certify the drillers after 20 wells have been completed. Manual drilling is believed to have potential in many parts of Malawi, but suitable areas have not been specifically documented or mapped out.

#### Manual Drilling in Malawi: Key information

<b>Type of manual drilling:</b>	SHIPO drill method, based on the Baptist Technology – see SHIPO (2014), augering, jetting, sludging and percussion.
<b>Scale</b>	~100 wells drilled
<b>Regulation</b>	None as yet
<b>Types of pumps</b>	Afridev, Malda, Mark V, Elephant and Canzee Pump
<b>Drilling costs</b>	Technology introduction still too early to fully estimate costs.

## Case Study 2: Zambia

Most of Zambia's Western Province is suitable for manual drilling. This area has one of the lowest water coverage rates in the country due to the sandy terrain is prone to flooding. This makes travel to the hinterland where people are settled problematic. Jetting equipment is particularly well-suited to reaching these areas as it is lightweight and can even be transported on an ox-driven cart.

In Zambia, rapid jetting and installation with the Blair Pump dates back to the 1980s. However due to the unavailability of pumps and spares from Zimbabwe jetting stopped for many years. Manual drilling was picked up again in 2010 by Village Water Zambia, who jetted over 60 water points, and installed them with the India Mark II pump. Hand dug wells have also been upgraded and rehabilitated through "in-drilling" into the well followed by equipping them with handpumps.

Village Water Zambia has trained enterprises in rapid jetting, as well as augering and the rota sludge technique. It also uses the "Village Drill" which combines rotation and jetting techniques. Essentially, the same techniques that are used for conventional drilling well development are used. The formations in the Western Province of Zambia comprise fine sands. They are stabilised with polymers, including those which are used in the mines in Zambia. In some areas, when drilling in the rainy season, wells are particularly prone to collapse.

By early 2014, about 150 manually drilled wells had been constructed in Zambia's Western Province, the majority by private enterprises. While most have been financed externally, more than ten wells have been paid for by citizens themselves. As awareness of the manual drilling technologies increases, interest is growing, particularly in farming areas as well as on the outskirts of towns.

There is currently no stand-alone policy for manual drilling in Zambia, but a process to develop technical specifications, certify manual drillers, train quality controllers and develop simplified tender documents has started. There is Government commitment to mainstream the technology as well as support from UNICEF and Practica Foundation to develop it. In the future, Village Water Zambia envisions that manual drilling enterprises are certified, and can run as profitable businesses without reliance on the NGOs that have trained them. It is hoped that these enterprises will be contracted by national government, local authorities and NGOs. Further, Village Water Zambia envisions that there will be increased demand for manual drilling work from private companies and individuals. Currently manual drilling in Zambia is at an early stage. Time will tell whether the on-going efforts can enable it to significantly contribute towards rural water supplies in the future.



Figure 2 Collecting Soil Samples  
& Transportation of Manual Drilling  
Equipment in Zambia

#### Manual Drilling in Zambia: Key information

<b>Type of manual drilling:</b>	Augering, rota jetting, rapid jetting and Rota Sludge
<b>Scale</b>	~ 150
<b>Regulation</b>	Early stages: technical specifications being developed, plans to certify manual driller and train quality controllers, and simplify tender documents
<b>Types of pumps</b>	India Mark II (Blair Pump was installed in the 1980s)
<b>Drilling costs</b>	Around \$3,000

### Case Study 3: Sierra Leone

In Sierra Leone, it is believed that there is high potential for manual drilling in the unconsolidated sediments along the coast (the Bullom Series) and in the inland valley swamps that overly the crystalline basement (Figure 4). Concerns have been raised about possible salinity in some parts of the coastal aquifers though. Manual drilling is very new in Sierra Leone. To date, two organisations, Willamette International and Welt Hunger Hilfe have undertaken manual drilling in Sierra Leone, each with quite different experiences. Drilling techniques, well designs, costs pumps installed and who is paying for the water supply differ considerably, as set out in the table below. The time taken for the two techniques also varies. Simple comparisons should be avoided, as the construction duration depends on the geology, as well as the well design, completion techniques used and overheads.

Both organisations are facing challenges. Drilling in crystalline rock is very difficult, if not impossible. Not everywhere in Sierra Leone is drillable and water tables can fluctuate leading to failed boreholes. Reliable data on groundwater resources in the country is hard to find. Although manual drilling may seem simple, it is actually a technical and skilled job. Manual drilling is labour intensive, particularly in areas with coarse sand and gravel. Willamette recommends site supervision to ensure that all steps are followed and that the borehole is completed to correct specifications.

The Government is pleased to have these NGOs working on manual drilling but needs to understand more about the strengths, weaknesses and suitability of the different methods and approaches. This would help to determine for which parts of the country manual drilling is most suitable and how it can contribute to improved water supplies in rural areas.



Fig 3: Transporting Drilling Equipment by Canoe (Willamette International)

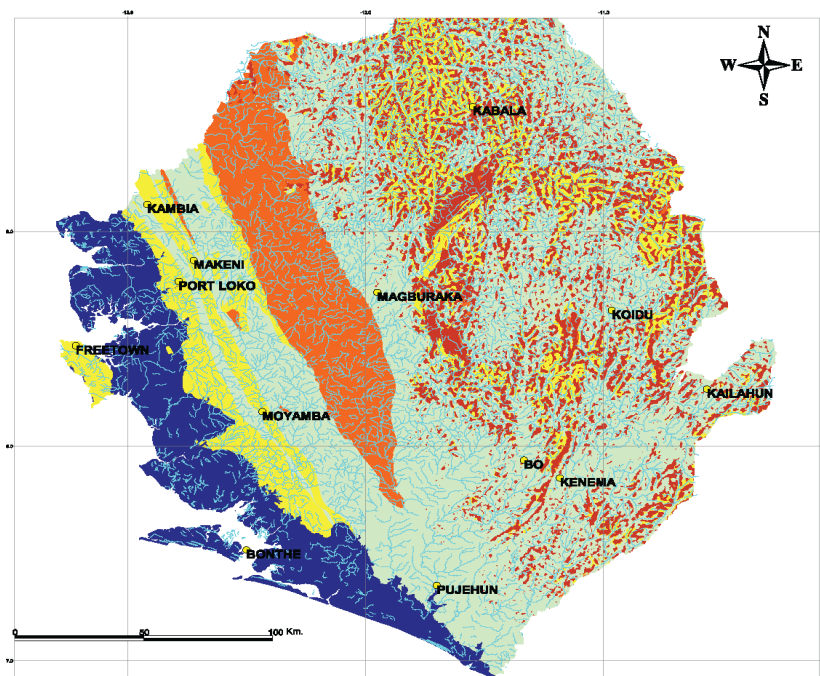


Figure 4 Geological Suitability for Manual Drilling in Sierra Leone (Ministry of Energy and Water Resources)

Bullom Group

Inland valley swamps


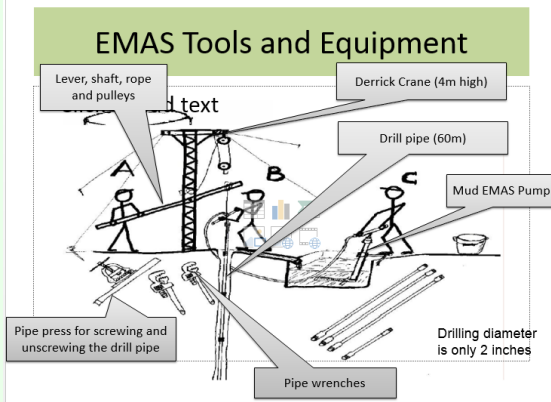
Weathered crystalline rocks

Rokel River Group

Basement complex



## Manual Drilling in Sierra Leone: Key information

ORGANISATION	WILLAMETTE INTERNATIONAL	WELT HUNGER HILFE
Tools and Equipment	<p><b>Willamette Drilling Tools</b></p>  <ul style="list-style-type: none"> <li>• 7" drilled hole finished with a 4" PVC casing</li> <li>• Use of temporary 6" casing in collapsing soil</li> </ul>	<p><b>EMAS Tools and Equipment</b></p> 
Subsidy	Facilities are fully subsidized.	All wells paid for by individuals in a self supply project.
Type of manual drilling	Hand auguring used in soft soils such as sand and clay; manual percussion drilling used in hard soils and rock .	The EMAS technique from Bolivia - suction and washing (Buchner and MacCarthy 2014).
Scale	71 boreholes drilled to date.	Introductory training including support of local businesses and five test wells drilled.
Regulation	None as yet	
Types of pumps	In communities, schools and churches - India Mark II; large schools, clinics or hospitals - Solar Pumps	Canzee pump.
Suitable soil	Sandstone, Laterite (Red stone) and other soft materials can be penetrated	The equipment is adapted when thick sand, small stones or pebbles are encountered
Average time on site	10 days	Drilling of 30 metres can be done in two days (6 drillers)
Average borehole depth	23 metres	30 metres
Average Yield	Average yield: 1,800 litres/hour	Average yield: 3,600 litres/hour
Drilling costs	Around \$3,000	Less than \$1,000

## Discussions

The **rope pump** received considerable attention, with questions raised about its durability as well as the maximum depths of installation in Malawi. In particular, concerns were raised about abandoned rope pumps and low strength ropes in Burkina Faso and depth limits to 20m in Senegal. Efforts are currently underway in Malawi to find locally-made ropes of sufficient strength. Ibrahim Mamadou pointed out that the 20m depth limit was introduced to make the rope pump comfortable and efficient to use. It was noted that these pumps can be installed at household or community level. Patrice Beaujault pointed out his good experience with rope pump introduction at household level, where the household pays the full price. Nederstigt and Van der Wal (2011) have published a technical training handbook for the rope pump.

A question was raised about associations of manual drillers, to which respondents in Togo, Cameroon, Malawi and Zambia replied do not exist.

### Did you miss the webinar?

You can watch the webinar on <http://vimeo.com/88864336>.

A summary as well of all presentations and scripts (English and French) is available on: <http://www.rural-water-supply.net/en/resources/details/565>

### Additional Resources

BUCHNER W and MACCARTHY M (2014) *Experiences from Bolivia – EMAS Manually Drilled Wells/ Expériences de la Bolivie – les Forages Manuels EMAS*, Presentation at the 2<sup>nd</sup> UNICEF -RWSN Webinar on Manual Drilling, 18<sup>th</sup> Feb 2014, Available on: <http://www.rural-water-supply.net/en/resources/details/565>

MALAWI GOVERNMENT (2005) *National Water Policy*, Malawi Government, Available on <http://www.moafsmw.org>

MEWR (no date) *Feasibility Study for Manual Drilling - Mapping of Favourable Zones*, Ministry of Energy and Water Resources, Sierra Leone

MOIJUE M and GOBA S (2014) *Private Sector and NGO Experiences of Introducing and Developing Markets for Manual Drilling in Sierra Leone Expériences du secteur privé et des ONG pour l'introduction et le développement de marchés pour le forage manuel en Sierra Leone*, Presentation at the 5th UNICEF-RWSN Webinar on Manual Drilling, 11th March 2014, Available on: <http://www.rural-water-supply.net/en/resources/details/565>

MUBIANA MUYANGWA (Village Water) (2014) *Case Study of Western Province in Zambia/Etude de Cas de la Province de l'Ouest en Zambie*, Presentation at the 5th UNICEF-RWSN Webinar on Manual Drilling, 11th March 2014, Available on: <http://www.rural-water-supply.net/en/resources/details/565>

NEDERSTIGT, J and VAN DER WAL, A (2011) *ROPE PUMP: Low Cost Pump Series - Technical Training Handbook on Rope Pump Production, Installation and Maintenance*, Practica Foundation, Available on: <http://www.practica.org/wp-content/uploads/services/publications/Rope%20pump%20manuels/ropepump%20manual%20EN%20full.pdf>

NSO (2011) *Third Integrated Household Survey (IHS3) 2010/2011*, National Statistics Office, Malawi, Available on <http://www.nsomalawi.mw>

SHIPO (2014) *Manual Bore hole Drilling*, Southern Highlands Participatory Organisation (SHIPO), Available on <http://www.shipo-tz.org/services/training-centre>

TAUZIE, B (2014) *Manual Drilling in Malawi/Forage Manuel au Malawi*, Presentation at the 5<sup>th</sup> UNICEF-RWSN Webinar on Manual Drilling, 11<sup>th</sup> March 2014, Available on: <http://www.rural-water-supply.net/en/resources/details/565>