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TRANSFORMATION TOWARDS SUSTAINABLE
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# The impact of procurement and siting procedures on handpump functionality in Uganda

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*Recent findings from Owor et al. (2017) indicate that a high percentage of rural handpump-boreholes (HPBs) in Uganda are in a state of failure. This research seeks to understand the high rate of failure by examining the siting and drilling/installation process in Uganda, and more specifically, aims to identify any factors within this process that may be adversely affecting the quality of the siting and drilling/installation work, and the subsequent functionality of rural Ugandan HPBs. Qualitative data from eighty semi-structured interviews highlighted a key concern within this process to be the use of turnkey contracts, paid via lump sum, no water, no pay payment terms. The following paper explores Ugandan turnkey contracts in more detail, outlining their dominance, why they are being used, their associated quality of siting and drilling/installation work concerns, and finally, the steps that need to be taken if these contracts are to be abandoned going forward.*

## Introduction

Access to an improved water source has steadily increased in rural Uganda over the past decade, from 63% in June 2007 to 70% in June 2017 according to the Ugandan Ministry of Water and Environment (MWE, 2007; MWE, 2017). A number of sector actors have raised concerns, however, over the extent to which these sources are providing safe and adequate quantities of water post-construction. Owor *et al.* (2017), for example, found only 55%[1] of handpump-boreholes (HPBs hereon) to be working on the day of testing. Furthermore, only 34% of these HPBs were able to sustain a yield of ≥ 10 l/min; and only 24% of the HPBs provided sufficient yield and quality (according to WHO 1993 guidelines for drinking water).

A number of factors could be causing the HPB functionality problems noted by Owor *et al.* (2017). Previous HPB functionality studies across sub-Saharan Africa (SSA)[2] have found the reasons for HPB failure to stem from either: a) the quality of work conducted during siting and drilling/installation or b) the extent, quality, and oversight of operations and maintenance post-construction. Focusing on the former, this research seeks to understand the siting and drilling/installation process in Uganda, and more specifically, to identify any factors within this process that may be adversely affecting the quality of the siting and drilling/installation work, and the subsequent functionality of rural Ugandan HPBs.

In addressing this aim, eighty semi-structured interviews were conducted in Uganda in 2017. These included interviews with twenty district water offices (DWOs), sixteen district procurement offices, eleven civil society organisation (CSO) project managers[3], fourteen drilling contractors (DCs), nine groundwater consultants, nine Ministry of Water and Environment (MWE) employees, and one employee from the Ugandan Drilling Contractors Association (UDCA).

Several key concerns were raised during these interviews, one of which was the use of turnkey contracts, paid via no water, no pay payment terms a single DC is responsible for both the siting and the drilling/installation work. Under these contracts, the contract's lump sum price is based on a Bill of Quantities (BoQ) that is prepared by the DC during the tender process. If the borehole is unsuccessful[4], the DC is not paid. If the borehole is successful, however, the DC is paid the full lump sum price, regardless of the costs incurred once on-site (although in a number of cases, DCs in Uganda are not being paid this full lump sum for successful boreholes, as explained further on in this paper). Turnkey contracts violate MWE

guidelines which advise that implementing agencies need to procure: a) a licensed consultant for the siting work, b) a licensed DC for the drilling/installation, and c) a licensed consultant for drilling/installation supervision.

The following paper explores the issue of Ugandan turnkey contracts in more detail, outlining their dominance, why they are being used, their associated quality of siting and drilling/installation work concerns, and finally, the steps that need to be taken if these contracts are to be abandoned going forward.

## Turnkey contract prevalence in Uganda

Turnkey contracts are very common in Uganda: 100% of the CSOs and 63% of the DWOs interviewed use these when procuring the private sector for HPB projects. This high rate of use was confirmed by DCs, with all fourteen of the DCs interviewed stating that turnkey contracts account for the majority of their work. When working under a turnkey contract, every DC (bar one) uses their own staff for siting.

## Why are turnkey contracts so dominant?

Turnkey contracts came to prominence in Uganda in the mid-2000s as DWOs and CSOs became increasingly frustrated with the number of unsuccessful boreholes that were being drilled when consultants were conducting the siting work. Because the consultant told the DC where to drill, if the borehole was unsuccessful, the implementing agency had to pay the DC for the work done/materials used (Sloots, 2010).

Unsuccessful boreholes were blamed on the quality of the consultants siting work, with 'briefcase consultants' (those with no formal geology or hydrogeology training) having flooded the market in the recent years (Tindimugaya, 2016; Sloots, 2010). These 'consultants' would present fake documents when tendering and, because of the low prices they would offer (and the common desire among implementing agencies to cut costs), they were gaining the siting contracts. Implementing agencies had no way of verifying the documents submitted by different consultants; identifying fakes was difficult.

Paying for unsuccessful boreholes because of incompetent consultants became problematic and challenging given the tight budgets DWOs and CSOs must work to. Number of new water source targets were suffering and project managers were being made to look inept. Moreover, politicians failed to understand that unsuccessful boreholes were a common part of drilling, hence, if a DC was paid for an unsuccessful borehole, politicians saw this as corrupt. Some district water officers were threatened with jail as a result.

## Quality of siting and drilling/installation work issues associated with turnkey contracts

While many implementing agencies believe that turnkey contracts coupled with lump sum, no water, no pay payment terms are best given the problems with unsuccessful boreholes, several concerns were raised among those interviewed as to the quality of siting and drilling/installation work that is being conducted under these contracts. These are explained briefly below.

### Siting based on 'ease of finding water'

Under turnkey contracts, a great deal of pressure is placed on DCs to find water. If they do not, they will not be paid. As a result, it was widely reported that DCs are siting HPBs in easy to find water areas, for example, in valley areas, near swamps, near wetlands, and near riverbanks. Not only are DCs extremely likely to encounter water in these areas, hence be paid, but they are also extremely likely to find water at much shallower depths than their lump sum was based on. Greater profits can therefore be made in these areas. Such sites, however, are extremely vulnerable to pollution. While a HPB may pass water quality tests at the time of drilling, the water may become unsafe for human consumption in the rainy months as surface pollutant transport and leaching rates increase or in *x* years' time as pollutants accumulate in these areas. Furthermore, community access may be limited, especially in the rainy months as these areas are vulnerable to flooding.

### Limited hydrogeological training among DC staff who are conducting the siting work

As explained earlier, when working under a turnkey contract, the majority of the DCs interviewed use their own staff for siting. While these DCs all stated that they have hydrogeologists on staff for this work, this fact was highly disputed when talking with other stakeholders, with many stating that the 'hydrogeologists' the DCs claim to have are not indeed qualified hydrogeologists. MWE is well aware of this issue and to combat this, from July 2017 onwards, for a DC to have their drilling license renewed they must have a MWE licensed hydrogeologist on staff.

### Short cuts on-site

The no water, no pay payment terms of turnkey contracts result in an on-going need for DCs to save money wherever possible so they can cover the costs of unsuccessful boreholes. In order to save, it was reported that certain DCs are known for:

- Using low quality and/or hydrogeologically inappropriate materials, for example, galvanised iron (GI) rising mains rather than stainless steel in aggressive groundwaters. GI rising mains are 4-5 times cheaper than stainless steel. A 3 metre length of GI costs UGX 45,000 – UGX 70,000[5], while the equivalent in stainless steel costs UGX 150,000 – UGX 210,000[6,7]. When GI rising mains are used in aggressive groundwaters, red/brown coloured water post-construction is extremely likely (Casey *et al.,* 2016; Bonsor *et al.,* 2015).
- Using fewer materials than needed for the given hydrogeological conditions. One option here is to use fewer lengths of casing than needed, however this of great concern, especially in unconsolidated areas, with the likelihood of siltation post-construction increasing in these cases. The quantity of water available and the water's appearance may then suffer (Adekile, 2014; Anscombe, 2011).
- Stopping drilling at the first water strike. A great deal of money can be saved in these instances; in Ethiopia, for example, drilling a borehole to 50 metres instead of 60 metres cuts the drilling cost by 13% (Calow *et al.,* 2012). If the borehole does not penetrate the main aquifer, however, the quantity of water available post-construction may be problematic, even if the borehole passed test pumping at the time of drilling (Danert *et al.,* 2010).
- Faking the pump test data or cutting the pump test time short in an attempt to mask low-yielding, unsuccessful sites. When these HPBs are commissioned, however, they will inevitably be low-yielding post-construction, or in the worst case, be dry.

A further short cut reported by a number of key informants is the use of 5 inch casing on top of 6-6.5 inch open holes, due to the fact that 5 inch casing is cheaper than 6 inch. To prevent the 5 inch casing from falling into the 6-6.5 inch open hole, DCs are heating the base of the PVC casing and stretch this to fit on top of the open consolidated rock. 42% of the DCs interviewed admitted to this practice. While some see the stretching of 5 inch stretching as a clever trick, others are concerned around the impact this will be having on these HPBs over time, with these HPBs then being vulnerable to siltation due to gaps between the casing and the consolidated rock and/or cracks that form in the thinly stretched areas of the casing. As explained by two DCs (who are not partaking in this practice):

> *"The casing needs to be of uniform thickness. When you stretch it you have no way at all of ensuring this, there is not way it will be uniform by the end and this will only increase wear and tear of this part and ultimately lead to siltation issues. This will only fail over and over again" (DC 8).*
>
> *"They will end up with silting. When you are warming it, [you will] not get the exact circumference, you will end up with gaps. They get a fire and then they put the casing over the top of this to warm it up and then they get the hammer bit that they drilled with and push the casing onto this to the point where it's stretching and can go over the hammer. But it is not perfect, this is plastic, it will end up with cracks, it won't be as good as the original, and it will end up being thin because you have stretched it" (DC 12).*

When looking at the use of 5 inch casing in more detail, however, it was found that this is not entirely due to DCs wanting to take short cuts. Instead, this was blamed on a misalignment between the bidding document technical specifications, which typically specify a 4.5 inch hole with 5 inch casing (as per MWE design guidelines), and what DCs are willing to drill, with most stating the narrowest open hole they will drill is 6 inch as this is faster, hence less costly for them. Furthermore, many do not own smaller drilling bits. Given that the bidding document technical specifications specified 5 inch casing, however, the DCs' lump sums are typically based on the use of 5 inch casing. If they use 6 inch casing, they need to cover this cost themselves.

### Limited supervision

Full-time supervision by consultants was found to be greatly lacking when turnkey contracts are used: only 16% of those implementing agencies using turnkey contracts procure a consultant for full-time supervision (compared to 100% among the implementing agencies that are not using turnkey contracts for siting and drilling/installation). As under turnkey contracts, implementing agencies do not have to pay for unsuccessful boreholes, guaranteeing the quality of work is not so urgent; if the borehole is unsuccessful, they will not suffer. Where a consultant is not procured for the supervision work, implementing agencies typically use DWO staff, CSO staff, handpump mechanics, and water use committees for this instead. Concerns were

raised among MWE staff and consultants, however, as to the quality of the supervision work in these situations due to: a) the limited hydrogeological knowledge among these people and b) the limited time these people spend on-site when supervising. When a competent supervisor is not on-site full-time, the above quality of work issues are ever more likely (Danert and Gesti Canuto, 2016).

## Making matters worse: the incorrect use of the lump sum, no water, no pay payment terms

A further issue noted while in Uganda with the use of turnkey contracts was the fact that a number of implementing agencies are breaking the norm when it comes to paying for successful boreholes; instead of paying the full lump sum as they should do in these cases, they are only paying for the actual work done/materials used (known traditionally as BoQ payment or admeasurement payment). This was found to be the case for 67% of the DWOs that are using lump sum payment terms. The whole premise behind a lump sum, no water, no pay payment terms, however, is that while DCs will lose money when the borehole is unsuccessful, the fact that they will be paid the full lump sum for successful boreholes means that they will be able to recover these costs in due course. When the full lump sum is not paid for successful boreholes, DCs lose this ability to recover their losses.

These DWO payment issues have led to 36% of the DCs interviewed no longer being willing to work for DWOs. The majority of these firms are those with the greatest experience in Uganda, with most having been in business for the last fifteen-twenty years. Given that DWO projects accounted for 68% of the deep boreholes drilled in the financial year 2016/17 (MWE, 2017), this is of great concern as these DCs are arguably the most experienced in the country.

## Conclusions and recommendations

Considering the widespread quality of work issues that are known to occur under turnkey contracts, we agree with MWEs opinion on this matter: turnkey contracts must not be used going forward. Instead, implementing agencies must revert to procuring an independent consultant for the siting (and supervision) work and a DC for the drilling/installation work (Danert and Gesti Canuto, 2016).

As MWE has found, however, simply issuing a directive that says that turnkey contracts must not be used, as was issued by MWE in January 2017, is not sufficient. While many of the DWO and CSO project managers interviewed were aware of the quality of work issues associated with turnkey contracts, they all stated that, no, they do not plan on reverting to procuring a consultant for siting and a DC for drilling/installation, regardless of the MWE directive. This reluctance comes back to the fact that:

- they and their superiors (for example, the Chief Administrating Officer and politicians for DWO projects, and higher-level staff within CSOs and donors in the case of CSO projects), do not want to have to pay for unsuccessful boreholes (they are trying to install as many new water sources as they possibly can within their budgets),
- they do not trust consultants, and
- turnkey contracts are easier to manage.

We therefore argue that, for project managers to be willing to abandon turnkey contracts, a series of higher-level changes are needed.

Firstly, awareness needs to be raised among all implementing agency actors as to the realities of drilling and the fact that unsuccessful HPBs are *normal*. Success can never be 100% guaranteed when dealing with groundwater, thus DCs deserve to be paid for the work done, regardless of the outcome. We suggest that MWE takes responsibility for these awareness raising efforts. It is crucial that both DWOs and CSOs are included and that any superiors who control the implementing agencies policies or project manager actions are involved. If superiors are not involved, a move away from turnkey contracts is unlikely as project managers will continue to fear their superior's reactions to them paying for unsuccessful boreholes.

Secondly, there needs to be a mind-set shift among all implementing agency actors, including superiors: the mind-set cannot be, 'we must install as many HPBs as we possibly can within our budgets'. Instead, the mind-set needs to be, 'we must install as many *high-quality* HPBs as we possibly can within our budgets'. If BoQ payment is to be used for all HPBs, there will inevitably be some 'lost' costs in the process. However, if this helps to prevent short-cuts from being taken among DCs, it will be worth it in the long-run.

Thirdly, confidence in the consultants' abilities must be raised among implementing agency actors. The recent step taken by MWE to license consultants (Tindimugaya, 2016) is a major step in this direction. (This process began in July 2016, and while uptake was slow to begin with, progress was made in 2017. By July

2017, MWE had issued licenses to 61 individuals and 13 companies.) Implementing agencies now need to be continually encouraged that these consultants are indeed qualified and safe to procure, however, as already alluded to above, a crucial element here is that implementing agency actors also need to be aware of the realities of drilling – they cannot expect these consultants to site successful boreholes 100% of the time.

Finally, all implementing agency actors, including superiors, need to realise, that while procuring both a consultant and a DC (and paying the DC via BoQ payment terms rather than lump sum payment terms) will require more work, it will be worthwhile if this prevents DC short-cuts from occurring. If these short-cuts continue, poor functionality among HPBs in the country will inevitably remain - communities cannot be expected to keep their HPBs functional if they are delivered low-quality HPBs in the first instance.

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## Notes

[1] Including HBP's which have not worked for over 1 year, and therefore, not in use (abandoned).

[2] For example, Klug *et al.* (2018), Cronk and Bartram (2017), Fisher *et al.* (2015), Walters and Javernick-Will (2015), Adank *et al.* (2014), Foster (2013), Harvey (2004), Lockwood *et al.* (2003), Parry-Jones *et al.* (2001), Hazelton (2000), Sara and Katz (1998), Howe and Dixon (1993), and McPherson and McGarry (1987).

[3] Two of the CSOs interviewed were not implementing projects themselves, so any percentages quoted further in this paper are based on the nine CSOs that were.

[4] Does not meet the thresholds specified in the contract for yield and water quality.

[5] US$ 12.43 - US$ 19.34 (based on 1st May 2017 exchange rate)

[6] US$ 41.43 - US$ 58.00 (based on 1st May 2017 exchange rate)

[7] These figures are based on those reported by the DCs interviewed, the range coming as a result of different prices between suppliers.

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