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FOR ALL IN A FAST CHANGING WORLD

Assessment of the functionality of hand-pump boreholes drilled through the Basic Services Fund, South Sudan

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BRIEFING PAPER 1936

After decades of civil war, the Basic Services Fund (BSF), with DFID as lead donor, was a major contributor to the reconstruction efforts of the Government of South Sudan to develop its basic services. Between 2006 and 2012, 29 NGOs received grants for WASH projects mostly for drilling or rehabilitating hand-pump boreholes. Over 6 years, 578 new hand-pump boreholes were drilled. Borehole functionality is however a major challenge in South Sudan: The National Water Policy states that only 30-50 % of the boreholes are functional at any time. To quantify the real outcomes of the BSF and assess the impact of the sustainability-focused monitoring of the BSF Secretariat, a status review was conducted on all drilling activities carried out since 2006, one of the components being to execute a functionality assessment of all BSF boreholes. This article describes the conceptual framework, the methodology as well as the main results of the assessment.

Introduction

The Basic Services Fund

After decades of civil war, the Comprehensive Peace Agreement (CPA) was signed in January 2005. This was a turning point in South Sudan's history. Since the CPA, the Government of the Republic of South Sudan (GoSS), with support of international donors, has been actively engaging in activities to improve its citizens' access to basic services. This is the context in which the Basic Services Fund (BSF) was established, with the Department for International Development (DFID) as main donor, and contributions from the Governments of Canada, The Netherlands, Norway, Sweden and the European Union. Its overall goal was to expand access to education, health and water and sanitation to communities recovering from conflict. Between 2006 and 2012, four phases of grants were provided to NGOs. About 97,000,000 GBP was allocated over 6 years amongst which about 20,000,000 GBP for Water, Sanitation and Hygiene (WASH) projects. BMB Mott MacDonald[3] was assigned as the Secretariat for the BSF, being therefore responsible for the technical and financial monitoring of the implementing agencies.

Achievements in the rural water supply sector through the BSF

In South Sudan, many NGOs are involved in the rural water supply sector. Over the four phases of the BSF, 29 NGOs received grants for drilling and repair/rehabilitation of boreholes. To guide NGOs towards a more consistent, efficient and sustainable way to implement drilling activities and to engage in capacity building activities, the BSF Secretariat provided advice to gradually bring the NGO sector in line with the Ministry of Water Resources and Irrigation (MWRI) Sector Guidelines and recommendations. A total of 578 new hand-pump boreholes were drilled, providing access to safe water to 144,500 people (based on 250 beneficiaries per borehole[4]), assuming all water points are still functional. In addition, 535 boreholes were repaired or rehabilitated.

Sustainability of handpump boreholes seems to be a real challenge in South Sudan: The National Water Policy (2007) echoed by the WASH Sector Strategic Framework (2011) indicates that 30-50% of the water points are non-operational at any time in the different States. Based on this information and in order to assess the real impact of the fund in terms of outputs and sustainability, DFID requested to carry out status review of the drilling activities carried out with the BSF. The Status review had two main components:

- Component 1: To inform on the actual number of functional boreholes at the end of the project, through the execution of a detailed assessment of the operational status of the boreholes;
- Component 2: To assess whether the recommendations and the frequent monitoring provided by the BSF secretariat had a positive impact on the sustainability of boreholes; through collecting and analysing the feedback of NGOs and government at all level as well as field observation.

This article focusses on component 1 and presents the conceptual framework and the methodology used for the assessment of borehole operational status and its results.

Conceptual framework

Figure 1 summarizes the degrees in types of 'operational status' of a borehole.

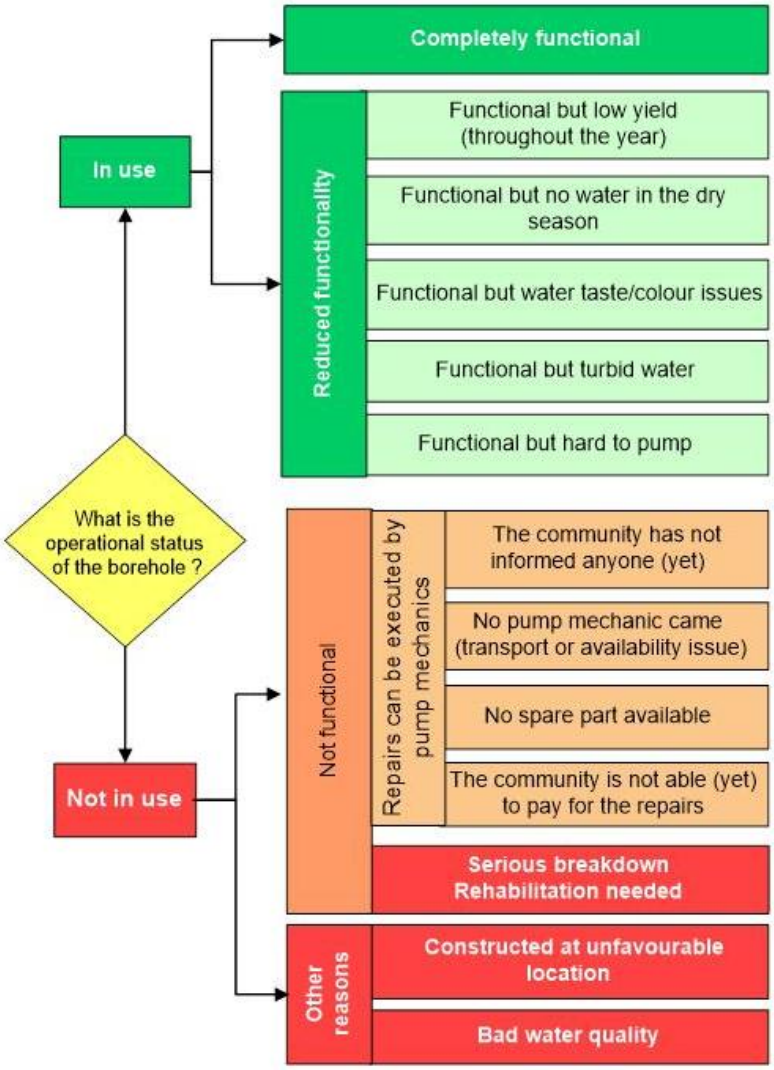

Figure 1. Conceptual framework: classification of operational status of a borehole

Source: Leclert, 2013. Status Review of BSF's borehole drilling component in South Sudan (2006-2012)

The approach followed for the borehole operational status assessment went beyond a standard functionality assessment. It aimed to get substantial information on the current operational status of newly drilled boreholes by:

- Analysing the degree of functionality (fully functional, reduced functionality, or non-functional);
- The problems that led to reduced functionality or non-functionality;
- The reasons why those boreholes have not been repaired;
- The limiting factors that jeopardise their use.

Categories for reduced functionality

As depicted in Figure 1, a borehole can be in use but still having a reduced functionality. The aim was to quantify those different degrees of functionality so as to reach a better understanding of the main factors that have an impact on borehole sustainability (some of which could potentially lead to a break down). The reasons for reduced functionality can be as described in the following paragraphs.

Low yield throughout the year

Low yield means a lesser yield than the yield of a hand-pump borehole (700 litres per hour). A low yield can be an aquifer characteristic; in that case this would have been found out during analysis of the test-pumping results. It can also be due to a borehole completion problem, for instance the borehole has been sited at the wrong location, has not been drilled deep enough, has not been installed properly, or not properly developed. Other (technical) reasons can include well diameters (Larger diameter wells recharge quicker and can sustain higher abstraction rates), clogging of the filter screen or even a screen with too small a filter size, the grain size of the packing material around the well which can create locally lower permeability (This can be caused by the grouting material or sand being forced lower down around the screen).

Seasonal water supply, i.e. the borehole will have a reduced yield in the dry season, or even dry up in the course of the dry season

The most probable reason is that the borehole was not drilled deep enough. This may happen with boreholes in basement rocks that are only tapping water from the overburden which is being depleted over the dry season and not from the fractured bedrock, or with shallow boreholes in sedimentary aquifers, that only penetrate the upper water-bearing layer which is of insufficient extent and also recharged directly from rainwater. The wrong positioning of the screen and the fact of carrying out the groundwater exploration and subsequent pumping tests during or just after the wet season can also lead to lower than expected yield.

Bad taste of the water, coloured water, or turbid water

Problems of water taste and colour, and turbidity, though both water quality issues, are put in two different categories in Figure 1 as the causes for the water quality issues are different. Taste issues or coloured water issues are mainly related to the characteristics of the aquifer; mostly it is related to iron content (reddish colour and metallic taste), and salinity. Although this water is fit for human consumption, it is excessively hard and salty, and therefore objectionable to the population. However, turbid water /water with suspended particles is usually the result of a construction/design issue, for example insufficient well development or placement of the screens opposite a geological formation that should not have been screened, or inappropriate filter pack. Turbid water is therefore in most cases in fact the result of a technical failure.

Difficulty to pump

Difficulty of pumping can have various causes. The causes can be due to borehole completion issues: for example, the alignment during installation can be improper; either due to poor installation, or due to non-vertical borehole, or even a default in the manufacture, where bearings were not properly aligned and designed. When communities complain about ‘hard to pump’, they might also mean that the water takes long to come, which might be explained by the fact that the pumps can take long to fill up the column, which can be caused by either a leakage in the pipes, or the effect of a deep aquifer. This means that the difficulty in pumping may either have a technical or a geological reason.

Apart from an actual break down, there are other reasons for communities not to use a borehole. An objectionable water quality or an unfavourable location can lead communities to opt for other water sources options, even though these might be more unsafe. Examples of unfavourable locations include proximity of a river, too far from the community settlement or close to an army camp. Inaccessibility of the borehole due to insecurity or floods is another possible reason.

Categories for non-functionality

In case of a break down, two categories have been distinguished:

- A break down that can be repaired by a pump mechanic; and
- A serious breakdown that can only be addressed by rehabilitation;

In the case of repairs that can be handled by a pump mechanic, the assessment aims to understand the reasons why the repair has not happened as yet, which may include the following situations:

- The community has actually informed no one of the breakdown;
- Though the information on the break down was communicated, no pump mechanics came (which might be due to logistical limitations such as no transport or a accessibility problem);
- The fact that no spare parts are available at local level (which can similarly be due to a transport and/or accessibility problem); and
- The community is not (yet) able to pay for the repairs.

Methodology

Materials for data collection

Each of the 29 BSF grant recipients was requested to report on the operational status their boreholes and to send back to the BSF Secretariat a detailed questionnaire with the information contained in Table 1.

Table 1. Information to collect for each borehole for the assessment of borehole operational status

General information	
• Name of borehole, Location (Payam, County), Geographic coordinates • Name of drilling company and drilling date • Location of the borehole : Health facility, school or community • Is the borehole functional? • Information on WUC (including gender aspects)	
If the borehole is functional	**If the borehole is not functional**
Questions so as to understand whether the borehole has some minor issues that could lead to a complete breakdown in the close future	Questions on the reasons why the borehole is not being used. If it is because the borehole has broken down, then the objective of the assessment will be : • To understand what was exactly the issue • Why it has not been repaired yet

No random sampling method was used for the assessment. Getting a representative sample would be difficult as too many variables are involved including, amongst others, type of underlying geology, implementing NGO, age of borehole, type of contract used for the drilling, drilling company, accessibility, availability of spare parts, degree of ownership by the community, etc. For the boreholes who were not (or hardly) accessible during the period of the status review, NGOs could do a quicker assessment, by simply calling a community member or a local pump mechanic to give the information on whether the borehole is functional or not. The BSF Monitor also visited some NGOs and has assessed about 70 boreholes with them. In a few cases, NGOs had withdrawn from the site where they drilled boreholes which made data collection difficult.

Limitations of the status review methodology

Non-controllable factors

The status review was carried out between May and November 2012, which coincides with the rainy season. Some boreholes were thus not accessible and could not be reported on. Some boreholes were drilled by NGOs that were no longer based in that area.

Possible biases

The results of the assessment were based on the assumption that NGOs really went to the site and completed the questionnaire for each borehole. It is also important to keep in mind that the answers given during the borehole assessment highly depend on the person from the community that is interviewed, i.e. whether (s)he is part of the Water User Committee (WUC), the time (s)he could dedicate for the questions, and his/her knowledge of the status of the borehole.

Summary of the results

In general, NGOs were receptive to the survey. A total of 69% of the boreholes were assessed (400 out of 578), with overall a good coverage per State and per BSF Phase. The rainy season was the main limitation for NGOs visiting and reporting on boreholes: the 31% of the boreholes of which no information was received were mainly the inaccessible boreholes, or the boreholes constructed by NGOs that had withdrawn from the area. These may also have been the boreholes with a higher occurrence of breakdowns or reduced functionality. Indeed, the accessibility challenges and the fact that the implementing agency is not on site to provide follow up support reduce the possibility for communities to inform authorities of a breakdown and/or get the spare parts, and the pump mechanics to repair it.

Concerning the 69% boreholes assessed, the functionality rate was found to be high, reaching 96.5%. The boreholes were relatively new (they were drilled a maximum of six years before), which contributed to the high functionality rate. The assessment of borehole functionality status went one step further by analysing the reasons for breakdown or reduced functionality. Non-functional boreholes were mainly the result of a technical break down. Water quality was also a reason for not using a borehole. Out of the total reported boreholes, 76.8% were fully functional. The main reasons for reduced functionality were difficulties with pumping and an objectionable taste or colour.

The existence of a WUC responsible for the borehole maintenance who informs a pump mechanic or the local authorities (County Water Department) in cases of breakdown proved to have a positive impact on the functionality rate. It was difficult to collect reliable information on the patterns of water user fees collection, therefore comparison between communities not paying fees, paying fees on a need basis or on a regular basis was not possible. Boreholes located in health facilities also had a higher functionality rate compared with community boreholes or boreholes located in school, most probably due to the fact that health workers are more committed to maintain the borehole and will be quicker to inform the County Water Department in case of functionality problems.

Photograph 1. Community borehole in Western Equatoria State

Photograph 2. School borehole in Aweil County, Northern Bar El Gazal State

Conclusion and recommendations

Factors that can influence functionality are numerous and interrelated, ranging from technical aspects (design, quality of construction, hand-pump maintenance, underlying geology, and water quality) to social aspects, such as involvement of the WUC (if any), cultural behaviour, commitment and value given to the water (if no other alternative water supply). Though this assessment attempted to capture this variety of factors, it was difficult to conclude on the impact of one individual factor on the final functionality rate.

Efforts to systematically implement the recommendations from MWRI included in their Sectoral Technical Guidelines should continue to be advocated, as it has shown to have a positive impact on borehole functionality and sustainability (when compared to the national statistics).

Less than one decade ago, water points were constructed without initial participation of the community due to the emergency situation. When handpumps malfunctioned, NGOs would take the responsibility, and communities seem to still expect the same today. Community ownership, behaviour change and capacity building at all levels (from MWRI, State, County and Payam to local pump mechanics and WUC) are long processes that require time and perseverance, and, last but not least, education. One may wonder how this process can adequately be monitored and followed up by implementing agencies in the framework of short-term grants or funding mechanisms.

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Note/s

1. This article is based on following report: Leclert (2013) *Status Review of BSF's borehole drilling component in South Sudan (2006-2012).* For the BSF Secretariat. Government of South Sudan. DFID.
2. Lucie Leclert was the WASH Monitor for the BSF Secretariat in 2012, working for BMB/Euroconsult Mott MacDonald, and was in charge of executing the status review. She is currently working for Caritas Switzerland as WASH Unit Coordinator for the Horn of Africa Region.
3. BMB Mott MacDonald is an international management consultancy based in the Netherlands and part of the Mott MacDonald Group.
4. The number of beneficiaries for one borehole is estimated to 250, as, in the Technical Guidelines for the Construction and the Management of Borehole with Hand-pump (MWRI, 2009), it is indicated that it is 500 beneficiaries in emergency situation and 250 beneficiaries for normal situation. As it is impossible to define 'normal' situation (as it greatly varies per areas in South Sudan) and not to over-estimate, it was decided to count on 250 beneficiaries per borehole, keeping in mind that the realistic number is between 250 and 500.

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