EDUCATING THE PUBLIC ABOUT PLANNING FOR INSTALLING OF A HOUSEHOLD WATER BOREHOLE: EXPERIENCE FROM SOUTHERN AFRICA

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Abstract - This paper is designed to educate and the public about the basic aspects that they need to be aware of when they need a household water borehole while appreciating the risk the associated with the processes based on experience in Southern Africa. This is important because installation of borehole is a cost intensive processes, thus ordinary citizens need to make informed planning and decisions. Basic definitions of terms associated with the main professionals and processes involved when installing a borehole are given using non-technical language which speaks to ordinary citizens. The paper discus some of the main reasons that generally contributes and influences ordinary citizens to end up having the need for a household borehole. There are a number of important aspects for ordinary citizens to consider during planning prior to the installation of a house borehole. Ordinary citizens must understand that the process to locate a suitable drilling spot is a relative process influenced many natural factors and due to that there is always a risk failure to get water. Ordinary citizens should therefore also be prepared for that risk of failure after incurring expenses. It is hoped that this non-technical information can help ordinary citizens to plan and decide cost effectively effectively about installation of a household borehole.

Keywords - Borehole; Groundwater; Drilling and SADC

I. INTRODUCTION

In recent years there has been an increase in the number of boreholes (wells) in Southern Africa in an effort to utilize the groundwater to meet the rising demand for fresh water. The general increase can be attributed to a wider range of natural, economic and social factors. The frequent droughts as attributed to the influence of climate variability have affected the traditionally reliable surface water resources and thus conjunctive use of surface and groundwater is being promoted.

The UN (2015) Sustainable Development Goal (SDG) target 6.1 aims to "achieve universal and equitable access to safe and affordable drinking water for all by 2030". It's estimated that at least 70% of the 250 million people living in Southern African countries rely on groundwater as their primary source of water for drinking and domestic use, and supporting of livelihood activities (World bank 2017). Groundwater as one of the important sources of freshwater have a crucial role to play as part of efforts to achieve this SDG in the Southern African Development Community (SADC) region and is therefore a factor contributing to increase in the number of boreholes.

Although at different levels, the SADC member states are integrating groundwater into their water policies, strategies, development of institutional frameworks and capacity to manage the water resources. Most of the SADC countries have some form guidelines and protocols for borehole drilling, but these are mainly for technical purposes and groundwater practitioners. While the guidelines are quite useful especially when a project that requires the installation of boreholes is being conducted by a groundwater practitioner, they are still not adequately enforced. In most cases they applicable to those are typically big projects, where a number of boreholes are required.

The approach is different when just an ordinary citizen (Not a groundwater expert) is requires a household borehole within their yard/plot or farm. In most of cases, it is the drilling contractor who does all the job from finding the suitable drilling position, drilling, constructing of the borehole development and testing for yield. From a cost point of view, it is justified for the ordinary citizen to deal with only the drilling contractor because the consulting fees for professional groundwater practitioners are quite high. At the same time, the drilling contractor have very limited knowledge about the groundwater science and this leaves a big loophole because such work is then not conducted under the professional supervision of groundwater practitioner. This leaves ordinary citizens exposed to a number unscrupulous deals but also sometimes having unrealistic expectations. This paper is therefore designed to educate and the ordinary citizens about basic aspects that they need to be aware of when they need a household and for them to be able to understand the risks associated. This is important also because installation of borehole is a cost intensive processes and also the processes during installation have strong bearing on performance and long-term life of the borehole. The information presented in this educationary article can help ordinary citizens need make informed planning and decisions. The article is therefore meant to be non-technical and focused on conveying message to speak ordinary citizens.

II. DEFINITION OF IMPORTANT TERMS

It is important to give a general definition of terms that are typically used in the groundwater industry that are useful in this educationary discussion.

Borehole is a long narrow hole drilled to access under groundwater for utilization.

Borehole installation – A process that comprises of the following main work phases; locate a suitable place to drill the borehole, find the drilling contractor, and supervise the drilling process, construction, development and completion of the borehole.

Groundwater Practitioner – Is a professional working in the field of groundwater. The professional must be qualified and registered with a respective professional body. Depending of their professional body, in general for one to be registered as a practicing professional implies that they have acquired appropriate qualifications and experience. With respect to borehole installations, a *groundwater practitioner* should be able to use scientific methods to locate the suitable place to drill the borehole, supervise the drilling, construction, development and completion of the borehole.

Household borehole – It is a borehole that is installed in one's yard for the use by that particular house/family use. This is a borehole not used for commercial activities.

Borehole survey/siting - The process of looking for a suitable place to drill the borehole. This is important because underground surface is not uniform, implying that there are some places with groundwater which can be accessed through a borehole and others which does not have ground groundwater which can result in dry boreholes.

Drilling Contractor – This is the company or individual who does the drilling of the borehole using appropriate equipment. The borehole drilling machine is typically known as the *drilling rig*. The area of specialisation of a *drilling contractor* is drilling the borehole unless; they also have a groundwater practitioner as part of their company set up. In principle their activities are supposed to be regulated by a certifying professional body but this is far from being adequately implemented/enforced in most of the developing countries.

III. WHY INSTALLING A HOUSEHOLD BOREHOLE ?

There are a number of reasons why an ordinary citizen could decide to install a household borehole. The information presented here is based on the experience the author through speaking with ordinary people during some of the groundwater related projects. These views they do not necessarily the represent the opinion of the author as a groundwater practitioner. In the SADC region, household boreholes are generally found in both urban and rural area mainly depending on the affordability of the family or individual. This is also subject to national regulations which vary from one state to the other. In addition to affordability, here is a summary of the main reasons which generally motivate installation of household boreholes:

- In some areas, the municipal water supplies are not reliable and sometimes perceived unsafe,
- Groundwater being the only source of water in the area, common in rural areas,
- Sense of ownership of the water source,
- Perception that there could be shortages/problems with piped water system in future as demand increase due to population growth,
- Additional need for water to support household family livelihood activities such as gardening and livestock, and
- Inspiration from seeing a neighbour or friend installing a borehole.

IV. IMPORTANT ASPECTS CONSIDER FOR INSTALLATION OF A BOREHOLE

Once the need to install a household borehole has been established, there are a number of important aspects to consider before installation of a borehole. This section discusses some of the main steps and aspects and highlight potential challenges that an ordinary person seeking the services of an expert or drilling contractor for the installation of a borehole must be aware of.

Table **1** shows a summary of the important aspects to help ordinary citizens to plan for installation of household boreholes.

Table 1 A summary of the important aspects to help ordinary citizens to plan for installation of household boreholes

Appoint	Scope of work	Benefits	Challenges
Groundwater Practitioner (A)	Handle and facilitate everything as a complete project up when you have a successful borehole, this generally involves: - Siting/survey,	- You leave the whole project job to the professional expert, quality work is expected. - You can also	- Can be costly because of the total cost includes consulting fees of the expert and the drilling cost

	- Find the drilling contractor, - Supervise the drilling contractor to ensure work achieved according to best of an expert's knowledge.	verify/trace their registration credentials from their professional body, - Groundwater practitioner uses scientific methods to locate the drilling spot and produces a report and that becomes basis of decision	- The practitioner can use experience to save cost.
Groundwater Practitioner (B)	Handle and facilitate only siting/survey to find a suitable drilling position	- You leave the most difficult part to locate a good drilling spot to the expert, higher chances of success, - Groundwater practitioner uses scientific methods to locate the drilling spot and produces a report and that becomes basis of decision.	- Can be costly because of the consulting fees of the practitioner and the drilling cost - The borehole owner need to supervise the driller themselves to ensure work is done appropriately but it's not their area of expertise or one just need to trust the driller will act in good professional way
Drilling contractor	Install a borehole in at a suitable place in my yard. The drilling contractor must - Site/survey, - Install the borehole according to their knowledge and experience	- Could be cheaper than when a practitioner is also involved,	- Unless the drilling contractor has a groundwater practitioner in their team, they only use traditional water divining methods to find a suitable drilling spot. These methods are not scientifically proven and no report is produced. - The borehole owner need to supervise the whole process themselves to ensure work is done appropriately but it's not their area of expertise or they just need to trust the driller will act in good professional way, risk of failure is high.

It is important to mention that when the borehole has been completed, the next steps are to test the quality of the water and estimate sustainable yield with will lead to equipping of the borehole. These are fairly specialised aspects of groundwater science which would need to get advice from relevant government department or the groundwater practitioners. While most of the drillers might claim that they are capable of doing these activities, it not something that they are trained by qualification and practice to do.

CONCLUSIONS

Ordinary citizens must understand that the process to locate a suitable drilling spot is a relative process influenced many and there is always a risk failure. The use of a groundwater practitioner for improves confidence and changes of success and the decision is made based on some of form scientific measurements. Naturally there are also places under the groundwater where there is no groundwater implying that some boreholes can be dry and that can be in someone's yard. Ordinary citizens must therefore also be prepared for that risk of failure after incurring expenses. It is hoped that this information can help ordinary citizens to plan and decide effectively about installation of a household borehole. This could help to reduce the risk of failure and also save cost where possible.

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