Technology Fact Sheet for Adaptation

A. Boreholes/tube wells for domestic water supply during drought [i]

A.1 Introduction

Water shortage for domestic or production due to droughts, prolonged dry spells or extreme heat is one of the most recognisable effects of climate change. Fortunately, Zambia still has a lot of water stored in its underground aquifers to mitigate this impact but many communities have little means to access this water. Increasing access to groundwater for both potable and non-potable water is a key strategy for ensuring domestic water supply in the light of climate change. Boreholes/tubewells where they are promoted could help meet this need.

A.2 Technology characteristics

Tubewells consist of a narrow, screened tube or casing driven into a water bearing zone of the subsurface. Boreholes are tubewells that penetrate bedrock, with casing not extending below the interface between unconsolidated soil and bedrock. Tubewells can often be installed by hand-auguring while boreholes require a drilling method with an external power source. A hand-powered or automated pump is used to draw water to the surface or if the casing has penetrated a confined aquifer, pressure may bring water to the surface. A tubewell consists of a plastic or metal casing; usually 100-150 diameter, in unconsolidated soils, a “screened” portion of casing below the water table that is perforated, a “sanitary seal” consisting of grout and clay to prevent water seeping around the casing and a pump to extract the water.

To further enhance productivity, it is proposed that the boreholes/tubewells have a *Solar powered pump for water supply photovoltaic system (PVP)*. In this system, the women and children will not spend time operating the hand pump. The time would then be used in other productive activities. The water pump is powered by solar and might involve pumping the water into an overhead tank which later flows down using gravity. The PVP equipment mainly comprises:

PV generator which generally constitutes one or more polycrystalline photovoltaic solar module;
Inverter which converts direct current (DC) into alternating current (AC). This is not applicable when the pump is for DC;
Pumping system, this could be DC or AC; and,
Overhead tank for water storage.

A.3 Country specific applicability and potential

There is no national standard borehole specification for Zambia. The handbook entitled “*Borehole Standard Construction and Details 2002*” indicates that finished diameters should be 4 inch for hand pumps and 6 inch for motorized units. In practice, most specifications are 4 inch diameter casing in a 6.5 inch (165 mm) diameter hole but Danida and German Government funded projects both currently specify 8 inch (312 mm) diameter drilled boreholes and the current JICA-funded programme formation, specifies drilled diameters of 7.8 inch (200mm) to 9.75 inch (250mm)[1].In Zambia, the boreholes are usually fully cased to the bottom irrespective of the natural rock lining. Since this design is to supply the water even during the drought, the depth would be 100m.

1

A.4 Status of technology in country

Many organizations have been promoting boreholes to improve rural water supply for more than two decades now. Between 2000 and 2009, there were at least 10 projects related to rural water and sanitation with funding from Germany, Ireland, African Development Bank, Japan, UNICEF and Denmark most of which included the sinking of boreholes. NGOs have also participated actively in ensuring access to underground water in rural areas. The Danish Government through Danida and UNICEF intends to construct 3,650 water points each by 2015. It is a target of the National Rural Water Supply and Sanitation Programme, (NRWSSP) in Zambia to construct 10,000 new water points by 2015.

As a result of these interventions, the rural population with access to improved water sources (mostly boreholes and protected wells) rose from 22% in 1990 to 45% in 2010, i.e. over a period of 20 years (WHO/UNICEF, March 2012). Despite this significant improvement, the need for access to ground water remains high as 55% of the rural population is still without safe water. A large proportion of the rural population still depends on open rivers/streams and unprotected wells for their water supply.

A.5 Benefits to economic / social and environmental development

This technology addresses the problem of water shortage during droughts and dry spells in the rain season. Due to climatic changes such as prolonged drought, ground water resources are negatively affected. This results in inadequate recharging, lowering of water tables and drying of boreholes. Discontinuity of water supply during this period can halt economic development and hinder human health and well being. Those mostly affected by the drought are the rural communities in Zambia who have to travel long distances in order to have access to clean water.

Drawbacks include high installation costs and that the technology is not usually applicable to deep boreholes and high water consumption rates. Diesel pumps are best applied in such cases.

A.6 Climate change adaptation benefits

Drilling of boreholes and tubewells will improve access to groundwater by rural populations. It will prevent reliance on poor quality alternative supplies and reduce man hours spent on travelling to far distance reliable water points. Some of the benefits of the technology include better access to water for irrigation and other uses such as watering livestock. It also increases the productivity of women as they now access water near their homes.

A.7 Financial Requirements and Costs

Interviews with some private suppliers indicate that a 40 to 60 meters solar powered borehole would cost between K40 and K60 million including a 2,000 litres tank and pipes.[2] The cost depends on geographical location, soil type-sandy or rocky and distance to site.

---

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment for Climate Change Adaptation – Zambia. You can access the complete report from the TNA project website http://tech-action.org/**

---

[2] Interview with Mr. Albert Chongo, Water engineer, Water Board, March 2012, SARO Agriculture Engineering Limited and Mr. Chibesakunda, Commercial Manager, SunPower Africa.