

# Report on boreholes and sand dams

[Environment](#), [Water](#)



**Abstract:**

Lack of fresh water for agricultural, domestic, and industrial use is a great hindrance to development in many parts of the world. Water shortages are more prominent in the arid and semi-arid areas. In addition to that, the inadequate fresh water resources found in these regions are endangered when it comes to quality due to the numerous man-induced changes. Moreover, the limited water available is limited to groundwater. In there is any surface water, it is mainly flash floods that results from high intensity rainfall that falls for a very short time. Therefore, these floods have very little potential to be a viable source of water. Where presence of renewable fresh water is less than 1000 m<sup>3</sup> per capita per year, extreme water scarcity is observed.

**Introduction:**

In addition to challenges associated with water quantity, aggravation of the water quality of the few water resources available in arid and semi-arid regions causes great distress. Groundwater is very sensitive to climatic changes and agricultural exploitation. Over the past few years, groundwater extraction for purposes of irrigation has resulted in disruption of natural balance and aquifer overdraft in these regions. Groundwater reproduction is imperative to establish apposite management policies since the hydrology of arid and semi-arid regions is quite different from that of more humid regions. This report comes up with several possible methods of providing water in arid areas, and also gives a few recommendations on how to tackle water

scarcity in these regions. The specific area that I am going to tackle is Garrisa District, found in the North-Eastern Province of Kenya.

### **Background:**

In Garrisa, insufficient water for household, crop, and livestock use has been a major development hindrance. This area receives very little rainfall, but extremely high rates of evaporation. The seasonal rivers that supply water in that region can only do so during the rainy season, and even then, the water is too little to help out much. In these areas, women walk 10-20 kilometres every day in search of water. Children also end up missing school because they have to go look for water. Nevertheless, the amount of water they get is too insufficient to sustain a whole family, thus the water consumption per person is usually between 2-4 litres a day; and this water is supposed to cater for all purposes, namely drinking, cooking, and washing.

### **Reasons for retaining water:**

There are only two rainy seasons every year. The long rains fall between March and April, whereas the Short rains fall between October and November. Therefore, no rain is received outside of these seasons, and that is between May and October. In addition to that, there are no permanent rivers or lakes in Garrisa. Since the communities inhabiting this region do not have the funds to fund any water projects, they have to rely on the Government and well-wishers to assist them.

### **Possible solutions:**

Much of Garrisa's problem can be solved by improvement in the methods of capturing and retaining rain water. There are several low-technology, low-

cost methods that can be employed to harvest and retain precipitation.

These options include:

- a) Collection of run-offs from the roofs: This option requires the presence of a tank.
- b) Hand-dug wells: These are between 20-35 metres deep.
- c) Rock catchments: These can take run-offs from stony outcrops.
- d) Earth dams: The problem with these is that the water can easily evaporate.
- e) Sand dams: These store water on seasonal river beds.
- f) Boreholes: These are used to extract groundwater.

In this report, I am going to divulge into the options of sand dams and boreholes, and recommend the better option of the two.

### **A) Boreholes:**

A borehole is an extended, narrow well drilled to reach underground water. However, not any place can be suitable for the drilling of a borehole. In order to understand how to access and manage groundwater, it is important to include hydro-geologists, who use the equipment they have to test for the presence of groundwater. They also rely on water-level dimensions, the quality of aquifer rocks, and other relevant data before making their conclusions. Therefore, it is quite expensive to time-consuming to conduct hydro-geological studies, especially in highly remote areas such as Garrisa, where there is diminutive knowledge about ground-water.

Therefore, a test borehole must first be drilled to guarantee the presence of water. Water-levels must be measured, and several samples sent to special

laboratories for examination. In case the results are inconclusive and the tests have to be repeated, a lot of resources end up being wasted.

Nonetheless, once drilled, the borehole is reinforced with a special sleeve that prevents the hole from collapsing. It is then covered with a hand pump, which serves to prevent contamination, while easing access to the water. Proper maintenance and care can make a borehole last up to 20 years.

### **Benefits of using boreholes:**

- i) Water obtained from boreholes is usually free of harmful micro-organisms, especially if the source is natural, pure, and protected. This water mainly results from rain water that has been deposited over several years, and has been filtered by the various rock layers. The water is also very rich in minerals such as magnesium and calcium. Chlorine is also found in abundance.
- ii) Boreholes are a sufficient and reliable means of providing water. No water bill requires to be paid at any time, and unexpected water shortages are also absent. They are also quite economical, as one borehole can supply several households with water.
- iii) Boreholes provide easy access to water, and women do not have to walk for hours in search of water. Moreover, children do not have to miss school.
- iv) The time saved can be utilized in performing various activities that could provide earnings to the women, which could bring about socio-economic developments.
- v) Accidents that may result from using wells are also prevented, as well as the time restriction of fetching water only during the day. Children can also

fetch the water unaccompanied.

vi) A borehole can be drilled and start functioning within a period of one week, and can thus be applied to counter emergency water needs.

### **Disadvantages of using boreholes:**

a) Boreholes require regular servicing, which may not be possible in case the users are unable to maintain them.

b) The initial cost incurred while drilling a borehole is quite high.

### **B) Sand dams:**

A sand dam is a toughened concrete wall constructed across a seasonal river bed. It can go up to 4 metres high, and up to 90 metres wide. A pipe is usually built inside the dam, and it can go up to 20m upstream. During the rainy seasons, the dam fills up with water and sand. The water then filters through the in-built pipe. The water can either be collected from the pipe on the lower end of the dam, or from holes dug behind the dam in the sand. Sand dams can hold as much as 15 million litres of water, and can therefore supply about 1200 people, vegetable gardens, tree nurseries, and livestock.

To locate the best site for a sand dam, a survey has to be conducted first. This includes the analysis of the physical and geological features of the area, especially the soil properties and the underlying rock structure. After the best site has been located, a timber frame is erected, which forms the base for the dam. The frame is then filled with stones and cement so as to set up the structure and then barbed wire is added for strengthening. The cement is mixed using shovels on the ground, and is then passed along a line of people

so as to reach the dam. The process goes on until the dam becomes full of cement.

During the construction of a sand dam, the local community can easily take part. This can be in the form of collection of the stones, water, and sand essential for the construction. This can reduce the total costs by half.

Furthermore, with proper maintenance, dams can last up to 30 years.

### **Benefits of sand dams:**

- a) Sand dams deliver a year-round supply of water, and thus women do not have to countless hours searching for water. Children also get to go attend classes more often.
- b) The time saved also means that the people can engage in more productive activities such as the growing of crops that can sustain households.
- c) The water acquired is quite clean, as it goes through filtration processes as it passes the layers of sand.
- d) Cleaner water means fewer incidences of diarrhoea and typhoid.
- e) The self-fulfilment that the community experiences from taking part in an initiative meant to help them is priceless.
- f) A sand dam can easily transform the environment, in that it can raise the water table on both the upstream and downstream end of the dam. This can then increase the survival rates of plants that would have never survived in the dry land.
- g) Sand dams help in the control of soil erosion, and also increase infiltration of moisture into the ground water.

h) Maintenance of sand dams is quite simple, as only the lower riverbanks require protection from soil erosion.

### **Disadvantages of sand dams:**

I) Construction of a sand dam is quite labour intensive, and thus requires massive co-operation with the local community.

II) Capital required to purchase materials necessary for the construction is quite high.

### **Discussion:**

Evidently, both boreholes and sand dams are excellent choices when it comes to water provision in Garrisa District. Although both have disadvantages, the advantages outweigh them in both cases. Even though boreholes supply enough water for consumption, sand dams provide more water, which can also be used for extensive farming. Both methods may require a lot of starting capital, but the costs incurred after they have started working are negligible.

### **Conclusion:**

Following the above comparisons, it is clear that both boreholes and sand dams are possible water provision methods in Garrisa, as either can be successful.

### **Recommendations:**

1) Sand dams may be the better option in this particular region, as they require less operational costs, and their maintenance is quite low.



2) Sand dams also last longer than most boreholes, and therefore they are the safer bet.

## **References**

B. D. R. Misstear, D. B. (2006). Water wells and boreholes. New Jersey: John Wiley and Sons.

Mwakikagile, G. (2007). Kenya: identity of a nation. Dodoma: Godfrey Mwakikagile.

Norton, M. (2007). 365 ways to change the world: how to make a difference one day at a time. New York: Simon and Schuster.

Robert A. Obudho, J. B. (2000). Issues in resource management and development in Kenya: essays in memory of Professor Simeon H. Ominde. Nairobi: East African Publishers.

Rushton, K. R. (2003). Groundwater hydrology: conceptual and computational models. New Jersey: John Wiley and Sons.