

Costs of rural water point sources in Mozambique

Unit Costs Analysis of Contracts January up to June 2011

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The objective of this document is to present construction, rehabilitation and supervision costs of rural point water sources through analysis of contracts signed by the government up to June 2011. The document also shows the costs average per Province and the costs variation since 2009.

Main Findings

68 borehole construction, rehabilitation and supervision contracts for were signed in 2011. The following average costs were determined (rounded off):

- Construction of a borehole: 362,000 mt
- Rehabilitation of a borehole: 60,000 mt
- Supervision of a borehole: 50,000 mt

The costs fluctuate depending on specific aspects.

The average construction cost in the Gaza Province is 39% above the national average while Niassa is 66% of the national average (figure 1).

There was a change in average costs from 2010 to June 2011:

- Construction: 275,000 mt in 2010 to 362,000 mt corresponding to a rise of 32%;
- Rehabilitation: 44,000 mt in 2010 to 60,000 mt which corresponds to a rise of 37%,
- Supervision: 33,000 mt in 2010 to 50,000 mt which corresponds to a rise of 53%;

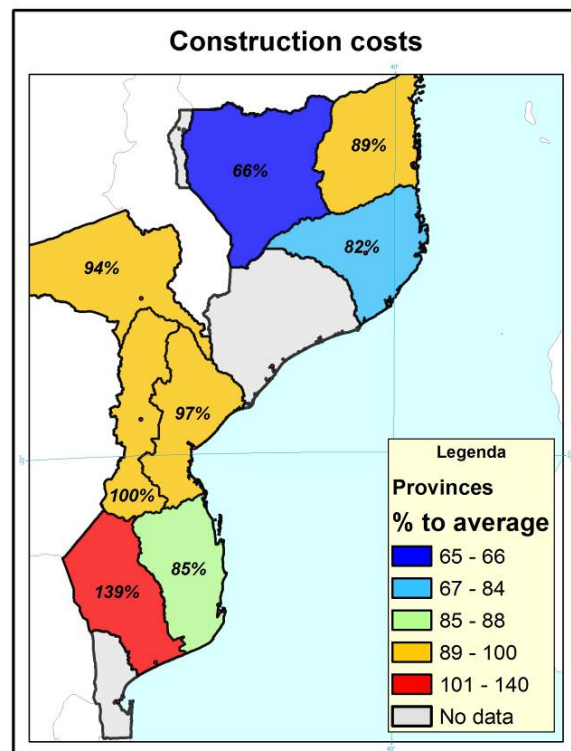


Figure 1 Provincial costs in relation to national average cost

The reasons for these changes can be related to overestimation of the Bill of Quantity in the contracts and the high inflation index (14.8%). The cost per person to build and inspect a new borehole varies between 824 meticaís (USD \$27) and 1,374 meticaís (USD \$46).

Introduction

WASHCost, in collaboration with SINAS, has been collecting information on contracts signed by the sector for construction, rehabilitation and supervision of rural point water sources areas. The objective is to have a tool (database) which permits an analysis and monitoring of costs in the course of time. One of the most important aspects of this analysis is to use it as base for planning and budgeting of point water sources in the following years. The results of 2009 and 2010 have already been published¹. This document is the continuation of this exercise and covers the contracts signed in the first 6 months of 2011.

Methodology

As part of the collaboration between SINAS and WASHCost, data on the construction, rehabilitation and supervision contracts for point water sources were requested from DPOPHs. For 2011 (until June), 68 complete data sets were received (Table 1). Most of the contracts were for supervision (44%) and for boreholes construction (43%). The rehabilitation contracts correspond to only 13% of the total.

Table 1 Collected and analysed data

Activity	Nº contracts	Nº Boreholes	Total amount	Average
Construction	29	750	271,834,265	362,446
Rehabilitation	9	41	2,447,056	59,684
Supervision	30	915	45,677,545	49,921
Grand Total	68	1706	319,958,865	

The number of boreholes to be built (750) up to June 2011 represents 42.5% of the constructions (1,766)² planned for 2011 and water sources to rehabilitate (41) in the first semester of 2011 corresponding to 5% of the rehabilitations (842) planned for 2011.

Boreholes cost analysis

The average cost of the new boreholes (total amount divided by the number of boreholes) is **362,446** Meticaís. This cost is average and it is important to understand the variations found. As is illustrated in the circle of Figure 2, the majority of contracts have a cost between 240,000 and 450,000 meticaís (Annex I). The construction contracts were signed in all Provinces except Zambézia, Maputo Province and Maputo city.

Some of these contracts need to be analyzed in more detail (see figure 2):

- 1) Manica Province, district of Machaze: This district is well known for problems related to great depths and low success rates.
- 2) Contract in Gaza for the districts of Chòkwé and Mandlakazi.
- 3) 40 Boreholes in Mabalane and Chicualacuala, an area with road access problems and boreholes with deep depths.
- 4) Niassa Province, district of Cuamba, where the depths are on average less than 30 meters.

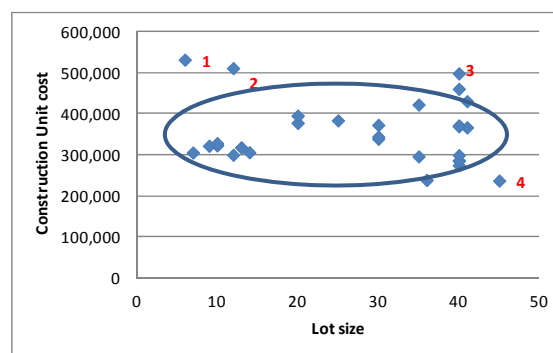


Figure 2 Construction costs of boreholes versus the size of the contract. The circle indicates the interval with costs around the average

All the contracts signed in 2011 are of the type of “only positive boreholes”; which indicates that the risk of a negative borehole is with the contractor. This risk aspect, combined with the depths (which depend on the geological specifications of each site), seem to be the main cost driver.

Analysis of rehabilitation cost

Boreholes that are not working for a longer period are rehabilitated³. The 41 rehabilitations are in Sofala, Nampula and Niassa Province. The average cost is **59,684** meticaís.

There is a specific case of two contracts managed by an NGO in Inhambane with very high costs (point 1, 2 in Figure3), caused by the deep depths of Inhambane and additional contract specifications. For that reason these contracts *are not considered in the calculation of the average cost in the country*.

In Figure 3 (and annex II) shows a large variation between costs, with the majority between 60,000

¹ Documents C-01 e C-02, WASHCost Moçambique

² Report of the semester balance of PES 2011.

³ In the financial technical language, this is called CapManEx, which include major replacements and substitution.

to 80,000 meticaais (Annex II). This variation is related probably to the nature of work: rehabilitation works are not the same for all boreholes, each one has a specific intervention to be made.

Point 3, with the lowest cost, is in Cuamba district, Niassa Province, and represents a contract of 15 borehole rehabilitations.

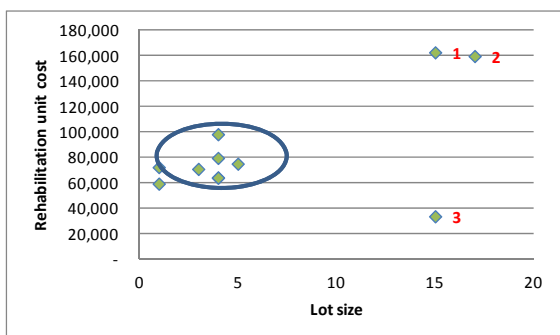


Figure 3 Cost of rehabilitations related to the size of the contract. The circle indicates the interval with normal costs

Analysis of Supervision Cost

Supervision is to inspect the works of a contractor during the construction phase. The average cost of 915 supervisions carried out in the Provinces of Gaza, Inhambane, Manica, Sofala, Tete, Zambézia, Cabo-Delgado and Niassa is **49,921** meticaais.

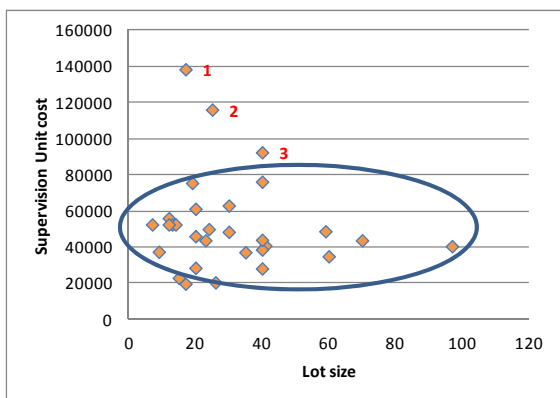


Figure 4 Supervision costs related versus lot size the contract. The circle indicates the interval with the normal costs.

Figure 4 illustrates that costs vary from 20,000 to 80,000 meticaais (annex III). However, there are some outliers:

1. District of Nhamatanda in the Province of Sofala, contract for supervision of 17 boreholes.

2. Districts of Dondo and Muanza in the Province of Sofala. Contract of supervision of 25 boreholes.
3. District of Gorongosa in the Province of Sofala, contract of supervision of 40 boreholes.

Average Costs of boreholes per Province

Table 2 Average costs borehole construction per Province up to June 2011

Province	Quantity	Average Cost	% to Average
Gaza	80	505,221	139%
Manica	176	364,053	100%
Sofala	311	351,595	97%
Tete	90	338,967	94%
Cabo Delgado	30	322,306	89%
Inhambane	20	306,388	85%
Nampula	25	296,455	82%
Niassa	18	237,874	66%
Total	750	362,446	100%

Although there are national average costs for borehole construction, supervision and rehabilitation, there are variations between Provinces (Table 2) (no data was present for Maputo and Zambézia Province).

Until June 2011, the average construction cost was highest in Gaza (39% above the national cost) and lowest in Niassa (34% below the national cost), though based on less boreholes. The main driver is linked to depth. The largest amount of boreholes is planned for Sofala Province.

Table 3 Average costs in the rehabilitation of the boreholes per Province up to June 2011

Province	Quantity	Average Cost	% to Average
Inhambane	32	161,156	155%
Nampula	4	79,560	76%
Sofala	22	73,855	71%
Niassa	15	33,600	32%
Total	73	104,165	100%
without Inhambane NGO	41	59,684	

For rehabilitation costs (table 3), there are two averages presented (with the Inhambane NGO included and without). Inhambane Province has the highest quantity of rehabilitations and with highest cost (55% above the national cost). The Province with the lowest costs is Niassa (68% below the national cost). These variations are caused because the boreholes in Inhambane are mainly in Funhaloro district, with deep boreholes (>75m). In the case of Niassa Province the boreholes in Cuamba district are less deep and therefore lower costs.

Table 4 Average supervision cost per Province up to June 2011

Province	Quantity	Average Cost	% to Average
Sofala	176	77,874	156%
Cabo Delgado	30	62,953	126%
Niassa	12	56,000	112%
Manica	140	54,246	109%
Tete	232	41,971	84%
Gaza	100	41,084	82%
Zambézia	100	36,362	73%
Inhambane	125	34,678	69%
Total	915	49,921	100%

Concerning supervision contracts up to June 2011, the most expensive Province is Sofala with 56% above the national average. Inhambane Province is the least expensive one with 69% of costs below the average.

In Sofala Province, the information is from districts with deep boreholes (Muanza, Cheringoma, Machanga, Marromeu, Nhamatanda, Machanga, Gorongoza and Maríngue), which explains the higher values. The low cost in Inhambane Province is related to districts of Zavala and Massinga which have, in contrast with the rest of the Province, limited borehole depths.

This data is presented in details in the annex IV.

Boreholes cost analysis, 2010 up to 2011

The costs of 2010 have already been published⁴. The construction, supervision and rehabilitation costs changed from 2010 to June 2011. This change depends on various factors such as the budgets for the different activities in 2011, the areas where these activities were carried out, the geological features of those areas, road access and others. These factors have influence in the costs and changes in time. One of the cost drivers in this period, was the annual average inflation which was about 14.75%⁵.

Table 3 Variation of borehole costs 2010 up to June 2011

Activity	Average cost 2010	Average cost 2011	Change
Construction	274,868	366,645	33%
Rehabilitation	43,695	59,684	37%
Supervision	32,733	49,921	53%

⁴ No Folheto Informativo Moçambique C02

⁵ <http://www.bancomoc.mz/Comunicados.aspx?id=C&ling=pt>: Comunicado de Imprensa N°07/2011 de 08 de Julho de 2011

According to table 5, there was a rise in 32% in the construction of boreholes from 2010 up to June 2011. This is much more than foreseen⁴, as a rise of around 8% (taking into account the inflation indexes) was anticipated. The inflation in this period was much higher than it had been foreseen (14.8%)⁶.

There was a rise of 37% from 2010 to June 2011 for borehole rehabilitation, which also was much higher than the foreseen rise of 8%. The annual inflation might be a partial cause.

Concerning supervision, there was a rise of about 53% from 2010 up to June 2011. Aside from inflation, this rise may have been provoked because some big contracts are also for 2012 (and consequently a contractor also needs to include inflation of 2012).

Discussion

All the costs of 2011 went up considerably in comparison to 2010. This can be explained partially by the inflation in this period. Furthermore, the sector is discussing that there is a difference between the amount of the contract and the amount paid at the end. This could mean that the real unit cost is lower because the quantities were underestimated?

A recent publication stated that there was a trend of costs reduction from 2008 up to 2010 (UNICEF, 2011). The next step for WASHCost in coordination with other partners will be to quantify this difference in order to help planning for more realistic amounts.

Table 4 Variation of lot size

Activity	2008	2009	2010	2011
Construction	26	32	18	26
Rehabilitation	30	13	14	5
Supervision	31	44	29	31
	28	29	19	25

Another development indicates that the lot size for rehabilitation is decreasing over the last years. That is related to the decentralization process of this activity. The allotments of supervision are similar. Curiously in 2010 the drilling lots were relatively small.

⁶ <http://www.bancomoc.mz/Comunicados.aspx?id=C&ling=pt>: Comunicado de Imprensa N°01/2011 de 10 de Janeiro de 2011

Another consideration to look at is that supervision is 14% of construction cost. In general, with Public Works 10% is common. However, supervision of point water sources includes considerable mobilisation and also risks (only payment of positive boreholes) for the supervisor, which could explain a higher percentage.

Rehabilitations (CapManEx) of the sources correspond only to 16% of a new construction. Three rehabilitations in 20 years is equivalent to 48% of a borehole cost. That can justify planning focusing on rehabilitations, instead of new construction.

The last observation is presented on table 7. In this table, the investment per person is calculated. If it is assumed that each source serves 500, the cost per person is 824 meticaís (USD 27) and 300 people per source are assumed, it is 1,374 meticaís (USD 46).

Table 5 Unit Costs per person

Activity	Average Cost 2011	Cost per person (500 per source)	Cost per person (300 per source)
Construction	362,000	724	1,207
Supervision	50,000	100	167
AVERAGE	412,000	824	1,374
USD (exchange rate 30)	\$ 13,733	\$ 27	\$ 46

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