

MAXIMIZING THE BENEFITS FROM WATER AND ENVIRONMENTAL SANITATION

## Evaluation of handpump water supply in selected rural and semi-urban areas of Zambia

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*Handpumps are widely used for water supply in rural and semi-urban areas of Zambia. This could be an attractive technology to provide safe water supply to additional number of unserved people. However, as the handpumps used in Zambia are imported from outside and financed mainly by donors, the sustainability of this water supply system is questionable. This study reviewed different factors affecting sustainability of handpump water supply in Zambia through a field study conducted in selected rural and semi-urban areas of Zambia. The study revealed that despite the low level of support from government and donors during the O&M phase, most of the handpumps are in relatively good condition. Access to spare parts and financing of O&M costs are the main problems in many rural areas of Zambia. Local manufacture of handpumps, continued support from the government agencies and donors in O&M phase and water quality testing is recommended for long-term sustainability of handpump water supply systems in Zambia.*

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### Introduction

Handpumps have been extensively used for the water supply in rural and semi-urban areas worldwide. They are the preferred choice when groundwater is the only available water source and centralised piped water supply is not feasible. Furthermore, very often handpumps are believed to be low cost; affordable; easy to maintain, an appropriate technology; readily available; easy to install; user friendly and efficient (Wood, 1994).

### Water supply in Zambia

Access to safe water in Zambia is estimated to be 89% in urban areas and 37% in rural and semi-urban areas. Nearly 40% of rural population in Zambia have boreholes equipped with handpumps (CSO, 1998). Many of these boreholes were sunk either by government departments or by international development agencies through different implementing partnerships. Handpumps systems and spares in Zambia are mainly imported from India. The India Mark II and Afridev are the sole handpump systems standardised in Zambia

Handpump delivery to the communities by implementing agencies has included borehole drilling and supply and installation of the facility. Operation and maintenance (O&M) has then remained the responsibility of the user communities. Very often the donors are ready to finance the implementation but not the O&M. A typical problem has been that of maintenance of the handpump water supply systems after installation. Although handpumps are in every rural district in Zambia, often the establishments of spare parts distribution networks and repair services needed to maintain the equipment have not accompanied the introduction of this imported technology. Very often repairs are delayed and

incomplete, and many handpumps have been abandoned shortly after installation and users return to their original contaminated source of water. There was an urgent need to investigate the inherent factors that affect sustainability of handpump water supply systems in Zambia and to come-up with recommendations that can aid planners and decision makers to plan and implement handpump water supply projects better. Therefore, the main objective of study was to evaluate handpump water supply systems in Zambia and to investigate the factors affecting their sustainability.

The main research questions for this study were:

- To what extent are the main stakeholders contributing to the sustainability of handpumps water supplies in Zambia?
- What are the most critical factors undermining sustainability of handpump water supplies in Zambia?

### Methodology

The evaluation of handpump water supply in selected rural and semi-urban areas of Zambia is based on desk study of relevant literature and field assessment of performance of handpump water supply systems in the country and factors affecting sustainability.

### Evaluation criteria and questionnaire development

Based on the literature review, handpump water supply systems performance and sustainability evaluation factors and criteria were developed. The evaluation of performance and sustainability were based on five main factors namely:

- (i) Financial sustainability

- (ii) Technical sustainability
- (iii) Institutional sustainability
- (iv) Social sustainability
- (v) Environmental sustainability

The factors affecting sustainability and their evaluation criteria are presented in Table 1. During the evaluation each criteria was assessed with a set of questions.

**Table 1. Evaluation factors and criteria** (Adapted from Parry Jones et al. 2001)

Factor	Evaluation Criteria
Financial	Capital contribution
	Maintenance funds
	Community training
	R&D financing
Technical	Technical skills
	Availability of equipment & spares
	Preventive maintenance
	Major repairs
	Reliability of spares supply
	Community training
	R&D support
	Standardization
Institutional	Ownership
	Pump management system
	Project monitoring
	Private sector participation
Social	Hygiene awareness
	Community participation
	Access/Exclusion
	User satisfaction
	Impact
Environmental	Source reliability
	Water quality
	Competition from alternative sources
	Water use

The stakeholders in the handpump water supply program and the relevant informants for this study were:

1. National policy level agencies (government stakeholder ministries and departments)
2. Implementing agencies (District councils, department of water affairs, External support agencies and NGOs)
3. Community (Users, CBO, caretaker, Area pump menders)
4. Private sector (Handpump/spares manufacturers, suppliers, traders and artisans)

Based on the evaluation factors and criteria, separate sets of questionnaires were developed for each category of stakeholders in order to aid the field data collection. Additionally, handpump data collection form was prepared to obtain information on the general condition of the handpumps and their surroundings (Numwa, 2005).

During the field study questionnaire-guided interviews and discussions were held with 6 National Policy Agencies, 8 External Support Agencies, 9 District implementing agencies, 3 private handpump dealers and 1 technology research institution. Furthermore, 36 handpump sites (12 semi-urban and 24 rural) were visited and conditions of the handpumps were examined.

### Study area

Three provinces namely Lusaka, Central and Southern were selected for this study, where handpump water supply are widely used. In each province, three districts were selected and four handpump water points were visited in each district. While selecting the sites for field visits, care was taken to select the sites of different implementing agencies and sites of different operating conditions.

### Data analysis

For the purpose of quantifying the qualitative field data, three situational statements were developed around each question. The statements were assigned numerical values to represent a relative scale of performance, ranging from a score of one (1) as the least favourable case to a score of three (3) as the most favourable scenario (Table 2). The score for a sustainability factor was calculated as the average of scores of all questions related to that factor. The overall

**Table 2. Stakeholder score criteria**

Score	Condition	Explanation
3	Favourable	All sustainability requirements are met
2	Moderately favourable	Some or most sustainability requirements are met
1	Least favourable	Few or no sustainability requirements are met

sustainability score was calculated as the average of scores of five sustainability factors.

**Main results**

**National policies**

Interviews with the national policy agencies revealed that there is no national policy on rural water supply in Zambia and the financial contribution of the government towards capital costs of handpump water supply is negligible. The average sustainability scores with respect to national policy is shown Figure 1.

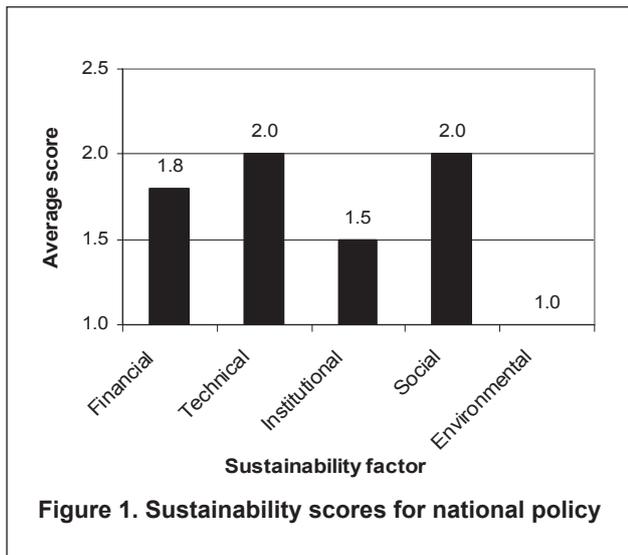
Environmental sustainability score is minimum as there is no policy regarding groundwater exploitation and water quality monitoring. Technical and social sustainability scores are relatively higher due to standardization of handpumps and adoption of Water Sanitation and Hygiene Education (WASHE) concept.

**Implementing agencies**

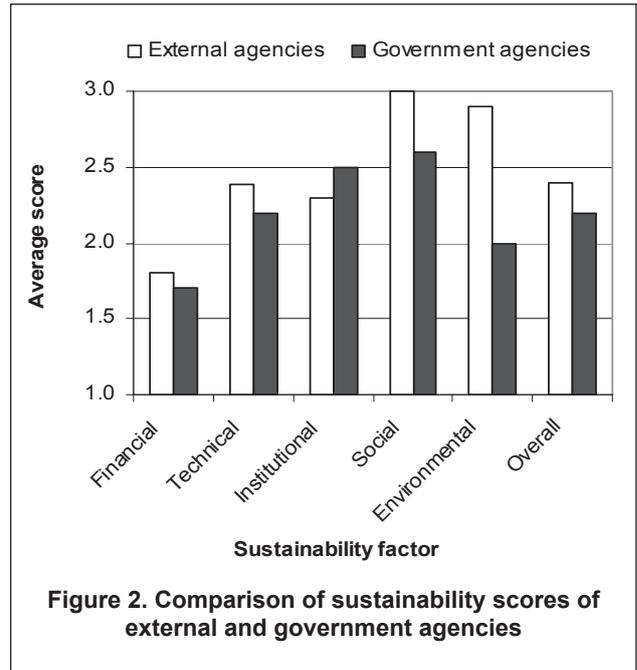
In general there are two types of handpump projects in Zambia with respect to implementation arrangements: (a). Projects funded and implemented by External Agency and supported by District Government Agency (district councils) and (b) Projects funded by External Agency and implemented by District Government Agency.

Figure 2 compares the sustainability scores for external and government agencies. The average scores for external agencies varied from 2.1 to 2.8 whereas that of district councils ranged from 1.7 to 2.3. In general scores were higher for external agencies compared to government agencies expect for institutional sustainability. It was found that external agencies always test the water quality before installation of handpumps whereas in the case of district councils this is not the case due to lack of funds.

There is lack of comprehensive approach to handpump water supply projects on the part of implementing agencies.



**Figure 1. Sustainability scores for national policy**



**Figure 2. Comparison of sustainability scores of external and government agencies**

The donor approach of “install handpump and leave” is undermining the sustainability of handpump water systems. Communities need uninterrupted motivation and support from implementing agencies including External Agencies and District Councils during O&M phase as well.

**Users**

Table 3 presents sustainability scores of the handpump sites visited in 9 different districts in Zambia. The overall sustainability scores for three provinces namely Lusaka, Central and Southern were 2.3, 2.4 and 2.5 respectively.

**Table 3. Sustainability scores for different districts**

District	Sustainability factors				
	Finan.	Tech.	Institu.	Social	Env.
Chongwe	1.9	1.9	2.4	2.3	2.4
Luangwa	2.1	2.0	2.5	2.3	2.0
Kafue	2.4	2.4	2.8	2.6	2.7
Kabwe	2.3	2.3	2.4	2.6	2.0
Chibombo	2.0	2.7	2.7	2.4	2.5
Mumbwa	2.5	2.4	2.7	2.3	2.6
Sinazongwe	2.0	2.1	2.8	2.7	1.9
Choma	2.9	2.8	2.6	2.7	2.4
Monze	2.6	2.2	2.7	2.6	2.5

It was also observed that despite the difficulty in access to spare parts, handpump O&M was relatively much more organized in rural areas than in semi-urban areas. It is likely because in semi-urban areas some alternative water sources were available whereas in rural areas handpumps were the only source of safe water.

### Private sector

Private sector in Zambia is involved in drilling and installation of handpumps, supply of spare parts and repair works. Companies visited reported that the cost of a handpump water system including drilling and handpump installation is about US\$ 6,000 for an average 60 m deep fully cased and screened hole. The cost of the pump itself ranges between US\$ 300 and US\$ 1000 depending on specifications. This is rather high and could be a major constraint to promote handpump water supply systems in unserved areas.

Spare parts are available in all urban centers. Distribution of spare parts by the small private retailers still remains a problem because of low profits. Other than drilling and installation of handpumps and selling spare parts, the private sector in these areas are generally traders with little or no capacity to engage in local fabrication of handpumps and spares. Initiatives for local manufacturing of handpumps should be taken by big industries with support from the government.

### Handpump data evaluation

Handpump evaluation included collection of the data on working conditions of the handpump, discharge measurement, state of platform and drainage, presence of caretaker, state of different parts including handle, spout and bearings. A numerical evaluation scale ranging from 3 (very good) down to 0 (poor) was also developed to gauge handpump condition and general pump site order. Of 36 handpumps visited 33 were India Mark II and 3 were Afridev.

34 out of 36 handpumps were in working condition with the average scores ranging from 2.5 to 3. Communities demonstrated high levels of commitment to sustain handpump water supply, nearly in all districts visited. Other than handpumps which are owned by institutions such as schools, clinics and the councils where caretakers are salaried employees of such institutions, community caretakers are purely undertaking a voluntary responsibility. This shows that handpump water supply is an attractive and feasible technology for rural water supply in Zambia. Most communities though are managing to maintain the operations of the handpumps with maximum down times of ten days. However, preventive maintenance is still to be the part of the community culture.

### Conclusions

- The perpetual dependence of Government on donor

financing for handpump water supply is putting all the sustainability factors of handpump systems at risk.

- The environmental sustainability of handpump water supply systems is the most affected due lack of environmental policy and strategies to guide groundwater exploitation and water quality monitoring.
- Institutional sustainability is also weak due to insufficient government participation in monitoring and evaluation of handpump water supply systems.
- The standardisation of handpump technology is a positive step towards technical sustainability of handpump water supply systems in Zambia, although technical guidelines with respect to quality of handpumps supplies need to be put in place.
- The “project” approach in which many implementing agencies install handpump systems, train the communities in financial management, technical skills and community mobilisation and leave is undermining the sustainability.
- High drilling cost of borehole is one of the major constraints in expanding water supply coverage in rural and semi-urban areas.
- Spares parts for handpumps are available in many outlets in urban areas, however transport cost to access to spare parts still remains considerable disadvantage for the rural communities.
- Communities have demonstrated high levels of commitment to sustain handpump water supply, which has manifested in the high levels institutional and social sustainability, nearly in all districts visited.

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