

An Evaluation of the PlayPump® Water System as an Appropriate Technology for Water, Sanitation and Hygiene Programmes



October 2007



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FOREWORD

This report summarizes results from an evaluation of the PlayPump® technology and associated implementation strategy that was conducted in August and September 2007 by the United Nations Children's Fund (UNICEF) with the support of World Vision and other partners. The aim of the study was to gain a better understanding of the use of this relatively new technology in water, sanitation and hygiene (WASH) programmes in developing countries.

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We hope that this report will be useful to organizations wanting to use the PlayPump® water system, and child-driven pumps in general, in their WASH programs.

ACKNOWLEDGEMENT

This PlayPump® technology study benefited from the generous contributions of many individuals and organizations, who believe in the health and well being of children. UNICEF wishes to acknowledge, with appreciation, the support of World Vision and its partners in the implementation of this study. We sincerely thank various colleagues and stakeholders in South Africa, Mozambique, Malawi, Tanzania, Kenya, Uganda, Zambia, India and the United States for their useful inputs. Lastly, we would like to thank PlayPumps International for facilitating the study in South Africa and the community members, including children, who were interviewed.

Clarissa Brocklehurst
(Chief, WES, UNICEF Headquarters)

Peter Harvey
(Chief, WES, UNICEF Zambia)

United Nations Children's Fund
3 UN Plaza, NY,
NY 10017 USA.

1.0 BACKGROUND

Since Roundabout Outdoor (the South African outdoor advertising company that developed the PlayPump® water system) won the World Bank Development Marketplace Award in 2000, the PlayPump® has been promoted increasingly as an appropriate technology for water supply programmes in sub-Saharan Africa. This has led to growing interest in the technology among donors. On September 20, 2006, First Lady Laura Bush announced a US\$16.4 million investment over three years by the U.S. Agency for International Development, U.S. Office of the Global AIDS Coordinator, the Case Foundation, and the MCJ Foundation to expand the installation of PlayPump® water systems¹.

As a result of this investment, and the further interest created by the associated publicity, there is an increased drive to install PlayPumps® in countries in Southern and Eastern Africa. Indeed, by 2010 PlayPumps International aims to bring the benefits of clean drinking water to up to 10 million people through the installation of 4,000 PlayPump® water systems in schools and communities in 10 countries in Sub-Saharan Africa¹. Currently, more than 900 PlayPump® systems have been installed, with over 90% of these in South Africa and far smaller numbers in Mozambique, Swaziland and Zambia. Planned expansion over the next few years aims to bring PlayPump® systems to Ethiopia, Kenya, Lesotho, Malawi, Tanzania, and Uganda.

In order to make this possible, PlayPumps International is in the process of seeking partnerships with Governments and aid organizations operating in the target countries. Many international aid organizations working in the water and sanitation sector are now aware of the system, but wish to find out more about the technology and associated services before committing to programmes that promote the PlayPump® water system.

Given this context, UNICEF decided to embark on a study to evaluate the PlayPump® water system as an appropriate technology for water, sanitation and hygiene programmes. This report summarizes the findings of this study, which took place in August and September 2007.

2.0 OBJECTIVES

2.1 KEY OBJECTIVE

To gain a good understanding of the PlayPump® water system and associated implementation strategy and evaluate these in order to facilitate agency decision-making regarding its adoption in country programmes for water, sanitation and hygiene.

¹ Playpumps International website www.playpumps.org

2.2 SPECIFIC OBJECTIVES

- i) To understand the technical design and operation of the PlayPump® water system.
- ii) To understand the strategy of PlayPumps International and Roundabout Outdoor for implementing and sustaining PlayPump® water systems.
- iii) To assess the actual implementation of the technology in South Africa, Mozambique and Zambia.
- iv) To understand Government views on the introduction of the PlayPump® technology in their respective countries.
- v) To acquire views of sector professionals on the PlayPump® technology.

3.0 METHODOLOGY

The study adopted the following methodology:

- i) A literature and Internet search for secondary information about PlayPump® water systems.
- ii) Visits and interviews with the PlayPump® programme manager (PlayPumps International), the manufacturer (Outdoor Fabrication and Steelworks (OFS)), and the maintenance and advertising company (Roundabout Outdoor) in Johannesburg, South Africa.
- iii) Visits and interviews with communities and institutions already using PlayPump® water systems in South Africa, Mozambique and Zambia.
- iv) Physical assessments of installed PlayPump® water systems in the above countries.
- v) Visits and interviews with key stakeholders (Government, NGOs, USAID etc.) already involved with the implementation of PlayPump® water systems in the above countries, with further consultations with partners in Tanzania, Uganda and Kenya and Malawi.

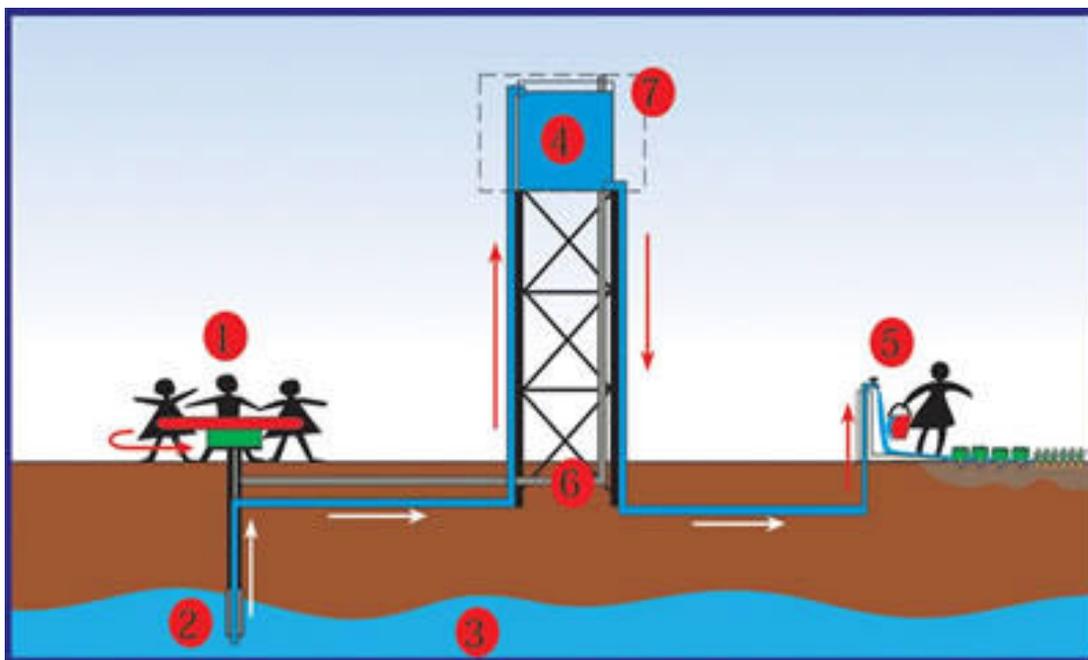
Structured assessment tools were designed and used to gather first hand information from focus groups and key informant interviews (Government, NGOs, private institutions, school teachers, students etc.). The findings are presented below under the following headings:

- Technology issues
- Social issues
- Operation and maintenance issues
- Administrative and financial issues

4.0 FINDINGS

4.1 TECHNOLOGY ISSUES

The PlayPumps International website (www.playpumps.org) explains how the PlayPump® water system works as follows:



'While children have fun spinning on the PlayPump merry-go-round (1), clean water is pumped (2) from underground (3) into a 2,500-liter tank (4), standing seven meters above the ground. A simple tap (5) makes it easy for adults and children to draw water. Excess water is diverted from the storage tank back down into the borehole (6).

The water storage tank (7) provides a rare opportunity to advertise in outlying communities. All four sides of the tank are leased as billboards, with two sides for consumer advertising and the other two sides for health and educational messages. The revenue generated by this unique model pays for pump maintenance.

The design of the PlayPump water system makes it highly effective, easy to operate and very economical, keeping costs and maintenance to an absolute minimum. Capable of producing up to 1,400 liters of water per hour at 16 rpm from a depth of 40 meters, it is effective up to a depth of 100 meters.'

Advantages

- i) The PlayPump® technology is a positive innovation in that:
 - a) it offers a play facility for children, especially in the rural areas, where such facilities are rarely found;
 - b) it converts play energy into the good community service of water pumping; and

- c) it provides an opportunity to disseminate important information to communities through public information messages.
- ii) The PlayPump® has a low breakdown record due to its robustness, compared to commonly used handpumps in rural communities (Afridev, India Mark II etc.).
- iii) The pump has very low chances of water-point contamination since the borehole and the standpost are far apart.
- iv) The pump is relatively easy to operate once rotating, hence children find it fairly easy to play, although this varies with both the age of the children and the depth to the dynamic water level.
- v) PlayPumps International reported that OFS holds the patent for the PlayPump® water system in South Africa, Lesotho and Botswana. It was reported that this covers the entire system (roundabout pump, tank and standpost). It is not clear as to what unique functions are patented, however, since even the pumping principle is the same as a conventional reciprocating handpump.

Disadvantages

- i) The PlayPump® “merry-go-round” design does not protect children from falling off, especially when the rotation is very fast, and the fact that the base is concrete presents a hazard to users. Some users reported that children had fallen off and been injured with bruises and cuts, and in one case a child fractured their arm.
- ii) Most countries understand that the PlayPumps International requirement is to install PlayPumps® only on existing boreholes where there is no pump, the existing pump is broken, or the pump is not in good working condition. In many cases, retrieving borehole-construction information for these boreholes is very difficult.
- iii) The PlayPump® has a relatively low discharge rate due to the short pumping stroke. In Mozambique some stakeholders reported that it takes approximately 4 hours of continuous pumping to fill the 2,500 liter reservoir tank.
- iv) Some primary school children complained of becoming tired very quickly after pushing the pump, particularly as additional torque is required with each rotation to commence the upstroke of the piston.
- v) The installation of PlayPumps® is carried out by local installation teams contracted by Roundabout Outdoor from South Africa. Given the physical distance between the contractor and Roundabout Outdoor (especially for pumps outside South Africa) there is no onsite supervision, and where the quality of workmanship is of a poor standard there is a significant time lag before this is identified. A number of poor quality installations were observed in Zambia, including pumps with concrete aprons that were heavily eroded only months after installation and pumps with leaking pipes. Roundabout Outdoor reported that the

contractor responsible for these installations was no longer under contract with them and yet no remedial action had been taken to rectify the defective results of the poor quality workmanship.

- vi) All user communities visited reported that the reservoir tank is never completely full and 75% of communities in Zambia and Mozambique reported that they only operate the Playpump® to directly fill water containers, i.e. the tank never stores any excess quantity of water. This means excessive work is needed to raise the water to the elevated tank with no additional benefit accrued.
- vii) Since it takes a long time to fill the reservoir tank, there is often insufficient quantity of water to carry out other activities such as gardening and sanitation. Some schools actually stopped or drastically reduced their small-scale irrigation efforts as a result of this.

4.2 SOCIAL ISSUES

Given the widespread acceptance within the sector that water, sanitation and hygiene programmes should be demand responsive and community-based, there is a strong need to assess the PlayPump® water system and associated implementation strategy with respect to social issues.

Advantages

- i) All children consulted during the study claimed that they enjoyed playing on the PlayPump® and in most locations it was the only purpose-built play apparatus available to children.
- ii) Where the PlayPump® is used heavily (e.g. at a primary school) and the pump's reservoir tank is kept at least partially full, many people within the school and surrounding communities are able collect water within a short time period.
- iii) The PlayPump® is proving successful in primary schools with many children (design figure of 350 or more) where children take turns to play, hence not getting tired or dizzy.
- iv) In South Africa and Mozambique, most adults (women) reported that they found the pump relatively easy to operate if children were not there, since they did not want to force the children to play when they were tired or unavailable at the time when the water is needed. It should be noted, however, that the ease of operation varied from pump to pump, and may be influenced by the depth to the dynamic water level and installation details. For instance, in Zambia many users reported that their pumps were hard to operate.
- viii) In some cases the PlayPump® has become a social gathering point for women and has even increased the time mothers stay close to their children, hence providing opportunities for continued awareness-raising in hygiene and water use.

- ix) The tank sides provide an excellent opportunity to carry public service messages regarding important social issues such as HIV, hygiene, and education.
- x) Water is provided to schools and communities free-of-charge which ensures the basic human right of access to safe water.

Disadvantages

- i) No children reported that they had been forced to 'play' but several complained of getting dizzy or hurting themselves when falling off. There were also several reports of both children and women vomiting after spinning on the pump carousel.
- ii) When children are not available, adults (especially women) have no choice but to operate the playpump. While some women in South Africa and Mozambique reported that they did not mind rotating the "merry-go-round", in Mozambique they also reported that they got embarrassed where the people watching them did not know the linkage between the "merry-go-round" and the water pumping (e.g. where the pump is near a public road).
- iii) All women interviewed in Zambia reported that they did not like operating the pump and at one installation site in a community adults actually paid children to 'play' on the pump.
- iv) Installation of PlayPumps® on boreholes which previously had a different type of pumping system (e.g. India Mark II or Afridev handpump) brings a lot of controversy to communities, since some users prefer the previous system. Users at 63% of PlayPump® sites visited in Zambia indicated that they were not adequately consulted, were presented with no technology choice, and preferred the previous handpump that had been removed to make way for the PlayPump®.
- v) Public service messages were observed on approximately half of installed PlayPumps® only.
- vi) In a small number of communities where a handpump had been replaced with a PlayPump®, community members continued to pay the village water committee user fees for the operation and maintenance of the pump, even though this was not necessary. This demonstrated that there had been inadequate community consultation and sensitization.
- vii) The fact that water is provided free-of-charge means that the value of water is lessened. This may create conflict between users, especially where neighbouring communities are required to pay for water, and may create excessive pressure on the PlayPump®. (This is less of an issue in South Africa where there is the Free Basic Water Policy, but is certainly an issue in all other countries.)

4.3 OPERATION AND MAINTENANCE ISSUES

The PlayPump® water system technology is currently tied to fixed arrangements for operation and maintenance (O&M) as dictated by Roundabout Outdoor in South Africa. The operating principle is that the revenue raised from advertising carried on the tank sides is used to support O&M teams contracted by Roundabout Outdoor, who are responsible for the maintenance and repair of all PlayPumps® within a designated geographical area. Typically, each team is responsible for 100 installed pumps. Should any problem occur with the pump, users have been advised to contact these teams indirectly by calling a South Africa toll-free telephone number. This system is currently being replaced with an SMS service, whereby users send the pump reference number by SMS text message to a cellphone number displayed on the PlayPump® reservoir tower. Roundabout Outdoor in South Africa then contacts the relevant maintenance team, which is then expected to attend to the pump, typically within a few days. Each installed PlayPump® water system carries a ten year guarantee, during which period the maintenance team will ensure the effective O&M of the system.

Advantages

- i) Roundabout Outdoor has individual contractors at country level, trained to maintain PlayPumps®, who can be contacted by users through toll-free telephone numbers or by cellphone SMS (through Roundabout Outdoor in South Africa).
- ii) About 60% of the communities visited in Mozambique indicated that the country level maintenance individuals trained by Roundabout Outdoor did visit their pumps and respond promptly to their calls for technical support.
- iii) Funds raised from advertising are pooled together for maintaining all installed PlayPumps®, even those which do not carry adverts, in and across countries. This means that PlayPumps® carrying adverts in high profile locations (e.g. nearby a major road) effectively cross-subsidize those in more remote areas (most of which have no adverts).
- iv) Communities do not spend time and resources in maintaining the PlayPump®.

Disadvantages

- i) The management of advertising contracts and funds at a regional level in South Africa is contrary to the development ideology of local empowerment and capacity building. Partners in countries outside South Africa have negligible say in the advertising carried (it has been agreed only that alcohol, tobacco and firearm advertisements will not be carried) and there appears to be little attempt to conform to Government policies. It also raises questions regarding the ownership of the PlayPump® water system since the user community/institution has no control over the advertising that its system displays and receives no direct benefit from the revenue generated.

- ii) Lack of information regarding how much revenue was raised from adverts on PlayPumps®, and how it was used, is bringing some discomfort to stakeholders, including aid agencies, Governments and communities.
- iii) Lack of involvement of the user communities in the management and/or maintenance of their PlayPumps® is contravening many country policies and regulations.
- iv) The guarantee by Roundabout Outdoor to maintain the playpumps for 10 years only is a concern for some users, who believe that this will be the time when serious breakdown may start with the aging of the pump, and hence they will need the Roundabout Outdoor services more than now.
- v) PlayPumps® installed at some institutions had adverts and messages on the tanks, while those at other institutions carried none without clear reason. In Zambia, 38% of PlayPump® water systems visited had tanks which were completely blank, and 75% carried no advertisements.
- vi) Country-level water authorities and implementing partners have problems in contacting the individuals who were trained by Roundabout Outdoor since the phone numbers displayed on the PlayPumps® are for Roundabout Outdoor in South Africa (to whom they report) or are set up for SMS service only. There is no local registration of O&M teams within the country of operation (outside South Africa) and no local accountability for the services they provide.
- vii) One school in Zambia had the cellphone number of one of the installation team and called the individual to repair a broken tap but had not received a visit from the O&M team after waiting for five months.
- viii) Of all the PlayPumps® visited in Zambia, 75% carried no contact details for the O&M teams and 63% of the respective schools and communities did not know who to contact in case of breakdown; 25% of pumps were in need of some form of repair.

4.4 ADMINISTRATIVE AND FINANCIAL ISSUES

PlayPumps International is a non-profit organization that enables individuals, Governments, foundations and companies to donate PlayPump® water systems to rural African communities and schools. PlayPumps International is registered both as a United States 501(c)3 organization and as an independent South African NGO, and maintains offices in both countries. PlayPumps International was formerly known as Roundabout PlayPumps. Roundabout Outdoor is a rapidly growing South African company with a social mission. Outdoor Fabrication and Steelworks (OFS) manufactures the pump and Roundabout Outdoor installs and maintains PlayPump® water systems.

PlayPumps International offers a package whereby a donor contributes to a 'bundle' which includes the actual PlayPump® water system, water testing, installation and

transportation costs. For economies of scale the implementation strategy is based on a minimum of 100 pumps in a given geographical area within a country; this is designed to provide full-time employment for one O&M team. PlayPumps International seeks out partners (such as NGOs working in the water sector) in countries of operation to provide community mobilization and hygiene promotion activities, which they collectively term as 'wrap around activities'. They also seek partners to carry out water testing of boreholes as this reduces their costs and frees up donor funds for additional PlayPumps®.

Advantages

- i) PlayPumps International is an NGO, which has a strong private partnership with Roundabout Outdoor and Outdoor Fabrication Services, private companies that handle the technical part of the PlayPump® (including manufacturing, installation and maintenance).
- ii) PlayPumps International has a small, highly experienced and very well networked team at high political levels internationally and with excellent resource mobilization skills.
- iii) PlayPumps International has expressed a willingness to review its operational systems, hence accepting experiences from stakeholders for improving their operations.
- iv) The resources for procuring the PlayPump® water systems are already donated to PlayPumps International by various donors, including organizations and individuals.

Disadvantages

- i) The cost of PlayPump® water system is high (approx. \$14,000) and has increased dramatically in the last 2 years from the previous \$6,500 without explanation to clients. Many partners had expected the cost to reduce to about \$4,500 by now.
- ii) Although some donors have already paid for a certain number of PlayPumps®, key stakeholders in the water sector are not comfortable knowing that the \$14,000 paid for each unit would have covered several conventional handpump-equipped boreholes or wells, thereby providing safe drinking water to far more people than one PlayPump® can.
- iii) The cost of PlayPump® water system is high, in part, because of long distance transportation of bulk components (e.g. message boards) from South Africa to countries of use.
- iv) Many partners view the PlayPumps International implementation strategy as over-investing, since it focuses primarily on replacing existing pumps instead of installing on new boreholes in schools that do not already have safe water supplies.

- v) Governments in some countries such as Zambia and Malawi were subjected to considerable pressure from non-traditional water sector donors to sign a Memorandum of Understanding with PlayPumps International.
- vi) In Zambia, PlayPump® water systems have been installed without consultation with local Government authorities, thereby circumventing Government policies and planning frameworks.
- vii) There are few staff in PlayPumps International who have on-the-ground (country level community-based) water sector experience, hence the implementation strategy misses out on compliance with national water policy requirements, such as community ownership issues, which are prevalent in the targeted countries.
- viii) Some countries and organizations are reluctant to pilot as many as 100 PlayPump® water systems since it is a new technology, which has not been proven effective outside South Africa.
- ix) Some countries do not have 100 boreholes which meet the PlayPump® selection criteria in a given geographic area. This creates the danger that some inappropriate sites will be included in order to make up the numbers and that sites may be selected against the wishes of the user community (as has been demonstrated in Zambia).
- x) Selling of both services and equipment in bundles presents a logistical problem to some organizations where costing transparency is required. Some clients (e.g. UNICEF) have previously asked Playpumps International and Roundabout Outdoor to give a breakdown of costs for the implementation bundle but they have so far failed to do so.
- xi) The PlayPump® intervention package does not include sanitation and hygiene, which is a requirement of many Government policies.
- xii) One PlayPump® water system installed in Zambia and partially funded by UNICEF carried signing for British American Tobacco on the reservoir tower despite explicit requests to exclude any reference to tobacco.

5.0 CONCLUSIONS

The PlayPump® water system is an innovative and robust technology, which can be improved with some minor modifications. On the other hand, the implementation strategy adopted by PlayPumps International and its partners requires serious and urgent revision. The current PlayPumps International implementation strategy clearly contravenes several Government policy directives and water sector development principles common to the countries under consideration. These are summarized as follows:

- Standardization – the PlayPump® is not a standardized technology in any of the target countries, some of which have restrictive policies standardizing human-powered pumps.
- Technical and safety issues – the PlayPump® water system has certain technical limitations, especially when installed in a community, and there are significant safety concerns that need to be fully assessed over time.
- Community-based water supplies – the Playpumps International implementation strategy lacks adequate community consultation and empowerment. Communities should be provided with a choice of management options and Roundabout Outdoor and its contractors should be accountable to communities with PlayPump® water systems.
- Demand responsive approaches – the fact that the Playpumps International implementation strategy is technology-led goes against development ideology since communities are not provided with a choice of technology, nor is there provision of adequate information related to the technology.
- Community ownership – the principle that the community or institution is the owner of the PlayPump® water system is undermined by the fact that they have no control over the advertising or messages displayed on the tanks, and they have no negotiating power with the installation and O&M teams.
- Advertising revenue – the fact that Roundabout Outdoor insists on controlling advertising revenue at a regional level is understandable in that they want to ensure that funds are used efficiently (via cross-subsidy) to maintain all PlayPump® water systems. However, this limits local empowerment, and given that the majority of tanks outside South Africa did not carry advertisements there would appear to be flexibility to allow for greater local control of advertising revenue.
- Accountability and legal issues – supervision of contractors outside South Africa is currently insufficient and there is no clear accountability to local Government authorities or user communities. Contractors are not registered within their countries of operation and are contracted directly by Roundabout Outdoor in South Africa.

In addition, there are clearly specific concerns in Mozambique and Zambia, arising from the lack of transparency demonstrated by Playpumps International and its private sector partners in South Africa, especially in relation to the cost of equipment and services, as well as the funds raised from advertisements.

6.0 RECOMMENDATIONS

In order for UNICEF and its partners to become, and to continue to be involved, in the promotion and installation of PlayPump® water systems, the following critical recommendations are made:

Critical recommendations

- i) The PlayPumps International implementation strategy must increase involvement of user communities in the management of the PlayPump® water system; this could include some routine maintenance activities (e.g. for fast wearing components such as taps, concrete aprons etc.).
- ii) PlayPumps International and its private sector partners need to improve transparency in relation to the management of funds raised from advertisements carried on the PlayPumps®.
- iii) It is recommended that at least two sides of the reservoir tank are controlled within the country of operation, whether for advertisements or public service messages, both in terms of content and revenue.
- iv) PlayPumps International and partners should provide an overall breakdown of the bundled costs, thereby separating the cost of the pump from the associated services. This will relieve concerns regarding transparency and cost increases, and will enable clients to choose what they want to procure.
- v) The PlayPumps International implementation strategy must incorporate clear components for adequate community consultation, technology choice, sanitation and hygiene (i.e. it should be demand-responsive). This will not be possible if the strategy remains technology-driven, and is likely to involve greater flexibility in how the organization partners with other stakeholders in the sector.
- vi) PlayPump® water systems should be installed only in schools or comparable institutions.
- vii) PlayPump® water systems should be installed only on boreholes which have had no other type of water pumping system before, unless the user community demands otherwise.
- viii) Installation and maintenance teams should be formally registered in the country of operation and should be accountable to communities, implementing partners and local authorities.
- ix) In order to facilitate the installation and testing of fewer than 100 PlayPump® water systems at a time, existing local artisans should be trained to undertake maintenance and repair activities as a supplementary source of income.
- x) PlayPumps International should have formal fulltime physical representation in the countries in which they are working.
- xi) The PlayPump® water system should be handled as just one of many water supply technology options.

- xii) The PlayPump® water system should still be in a pilot phase outside of South Africa, until various country experiences are assessed and concerns are adequately addressed.

Secondary recommendations

In addition to the above critical recommendations the following measures are also strongly recommended:

- i) There should be research to investigate ways to increase the discharge rate of the PlayPump® water system (e.g. by increasing the length of its strokes).
- ii) The potential for accidents could be reduced by reducing the rotational speed by increasing the water column (probably achievable through (i) above), and by considering the use of materials other than concrete for the pump apron.
- iii) Roundabout Outdoor should consider manufacturing bulk PlayPump® components (e.g. tanks, towers and advertisement boards) in the user countries to reduce transport costs.

Recommendations specific to Zambia

In addition to the above recommendations the following critical measures need to be addressed in relation to PlayPump® water systems already installed in Zambia:

- i) All installed PlayPump® water systems should be revisited by the installation and maintenance teams and defects such as poor quality concrete, broken taps and leaking pipes should be repaired.
- ii) All installed PlayPump® water systems should have the contact number of the maintenance team clearly displayed, and thorough community sensitization should occur to ensure that users are aware of the procedure to be followed in case of breakdown.

7.0 WAY FORWARD

- i) PlayPumps International and its private partners should consider urgent inclusion of the recommendations of this report (and those from other stakeholders) in their ongoing revision of their operational strategies and implementation plans. Consequently, relevant changes should be included in any Memorandum of Understanding (MoU) which PlayPumps International signs with interested Governments.
- iv) Following revision, PlayPumps International should share promptly their new operational strategies at relevant global fora (e.g. the Millennium Water Alliance), and should organize workshops at country level, aimed at sharing more detailed information with country level stakeholders.