Mission Report

on the

Evaluation of the PlayPumps

installed in

Mozambique

Ana Lucia Obiols and Karl Erpf, RWSN,
08 to 29 April 2008

Table of Content

List of Abbreviations

BAT	Sponsor, (British American Tobacco),
CFPAS	Centro de Formação Profissional de Àgua e Saneamento,
Coca Cola	Sponsor (International Beverage Company),
DAR	Direcção De Agua Rural,
DAS	Direcção De Agua e Saniemento,
DNA	Direcção National de Àguas,
DPOPH	Direcção Provincial das Obras Públicas e Habitação,
EPC	Escola Primeira,
GAS	Grupo de Àgua e Saneamento,
GI	Galvanized Iron,
HDPE	High Density Polyethylene,
HQ	Headquarter,
IFC	International Finance Corporation (World Bank),
LEM	Laboratório de Engenharia de Moçambique,
LF	Lemelson Foundation,
Manica	Sponsor (Local Beverage Company),
MDGs	Millenium Development Goals,
MEC	Ministério da Educação e Cultura,
M&E	Monitoring and Evaluation,
MISAU	Ministério da Saúde,
Mono	Pump type (positive displacement pump),
MOPH	Ministério da Obras Públicas e Habitação,
NGO	Non Governmental Organisation,
OFS	Outdoor Fabrication and Steelworks,
O&M	Operation & Maintenance,
pH Meter	a possibility to measure acidity in water,
PMA	Programa Mundial de Alimentação,
PPI	PlayPumps International Africa,
PSI	Sponsor,
PUR	Poly Urethane Rubber,
PVC	Poly-vinyl Chloride,
ROA	Roundabout Outdoors (Pty) Ltd,
RPM	Rotation per Minute,
RSA	Republic of South Africa,
RWSN	Rural Water Supply Network,
RWSS	Rural Water and Sanitation Strategy,
SC	Safe the Children's Fund,
SKAT	Swiss Resource Centre and Consultancies for Development,
SMS	Short Message Service,
SWAT	Evaluation of Strengths, Weaknesses, Opportunities and Threats,
TNT	Sponsor (International Logistic Specialist),
Unilever	Sponsor (International Company),
UNICEF	United Nations Children's Fund,
USD	United States Dollar,
VLOM	Village Level Operation and Maintenance,

W&S	Water & Sanitation,
WFP	World Food Program,
WHO	World Health Organization,
WSP	Water and Sanitation Program (World Bank),
ZAR	South African Rand,

1. Acknowledgements

SKAT would like to express sincerely thanks to the team members of CFPAS and LEM for their hard work during the whole time of the mission and also to the delegates of DAR for facilitating all meetings and organizing the various field trips.

Thanks for the assistance of the colleagues in UNICEF, DAR, WFP, Safe the Children and many individuals, who made the implementing of this mission possible.

The time that Roundabout Outdoor and PlayPumps International Africa have spent to clarify many unknown details of the PlayPump was greatly appreciated.

Lastly, special thanks go to the school children, communities and teachers for being patient to answer all our questions.

2. Background of the Mission

UNICEF and later Save the Children USA initiated the introduction of the PlayPump in Mozambique. The pump is designed to be mainly used by school children. The turning wheel is connected to a pumping mechanism, which enables to pump water into an overhead tank.

Till date, about 100 PlayPumps have been installed in various schools and communities in the Maputo and Gaza Province in Mozambique.

Skat was asked to undertake a technical and social evaluation of the PlayPumps together with CFPAS and to provide an independent study on the technology.

The concept of using children's excess energy while playing for pumping water sounds very attractive. The concept appears to be a very appealing technical option for water supplies used in school sanitation.

However, it is not clear whether the energy is actually enough to make sure that the water pump constantly. The children who play with the pump need to maintain a power input for water pumping from the given depth to the overhead tank and in addition initially need to exceed the power input to turn the pump and create the inertia as the pump acts as a flywheel.

Therefore an in-depth study of its technical performance and the social acceptability was carried out, as well as a comprehensive financial analysis (initial investment and O&M cost), which is needed to review the financial feasibility of the pump.

3. Objectives of the Mission

The objective of the Evaluation Mission in collaboration with CFPAS is, to provide MEC, MOPH, PMA and UNICEF with the necessary information on the performance of the PlayPump and its acceptance by the users to enable the DNA management to issue guidelines for the application and purchase of this technology.

Besides the technical aspects of the facilities (hardware) also managerial issues (software) will be addressed in order to secure sustainability. Field observations shall be made to check the pump performance, to clarify the viability of the whole set-up, to check whether the PlayPump is safe for children to play, to hear the comments of the water users and the playing children. The desk study will be used to estimate the cost of the complete infrastructure, including installation and social mobilisation.

4. Background on the PlayPump Stakeholders

There were several organizations involved in the implementation of the PlayPump® water system in Mozambique including the following:

PlayPumps International Africa - a non-governmental organisation based in Johannesburg, South Africa. Since it's founding in 2004, the NGO has donated the PlayPump® water system to schools and communities in South Africa, Swaziland, Lesotho, Mozambique and Zambia.

PlayPumps International (US), a NGO founded in 2006 and based in Washington DC, was a donor to PlayPumps International Africa.

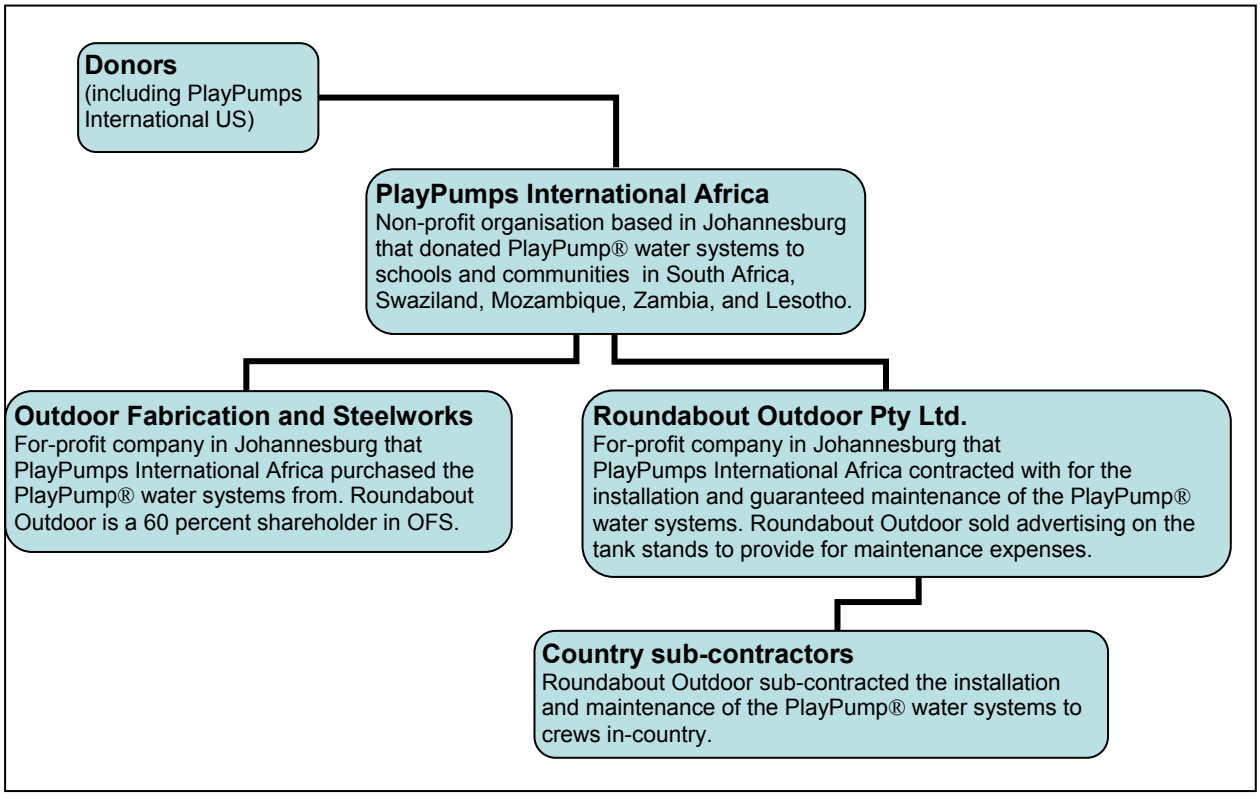
Roundabout Outdoor (Pty.) Ltd. – a for profit company based in Johannesburg, South Africa. Roundabout Outdoor (ROA) holds the trademark and patent on the PlayPump® water system. PlayPumps International Africa contracted Roundabout Outdoor to identify and test boreholes, install PlayPump® systems, and maintain the PlayPump® systems in Mozambique. Roundabout Outdoor sold advertising on the PlayPump® system.

Outdoor Fabrication and Steelworks – a for profit company based in Johannesburg, South Africa that manufactures the PlayPump® water system. Roundabout Outdoor is a 60 percent shareholder in this company.

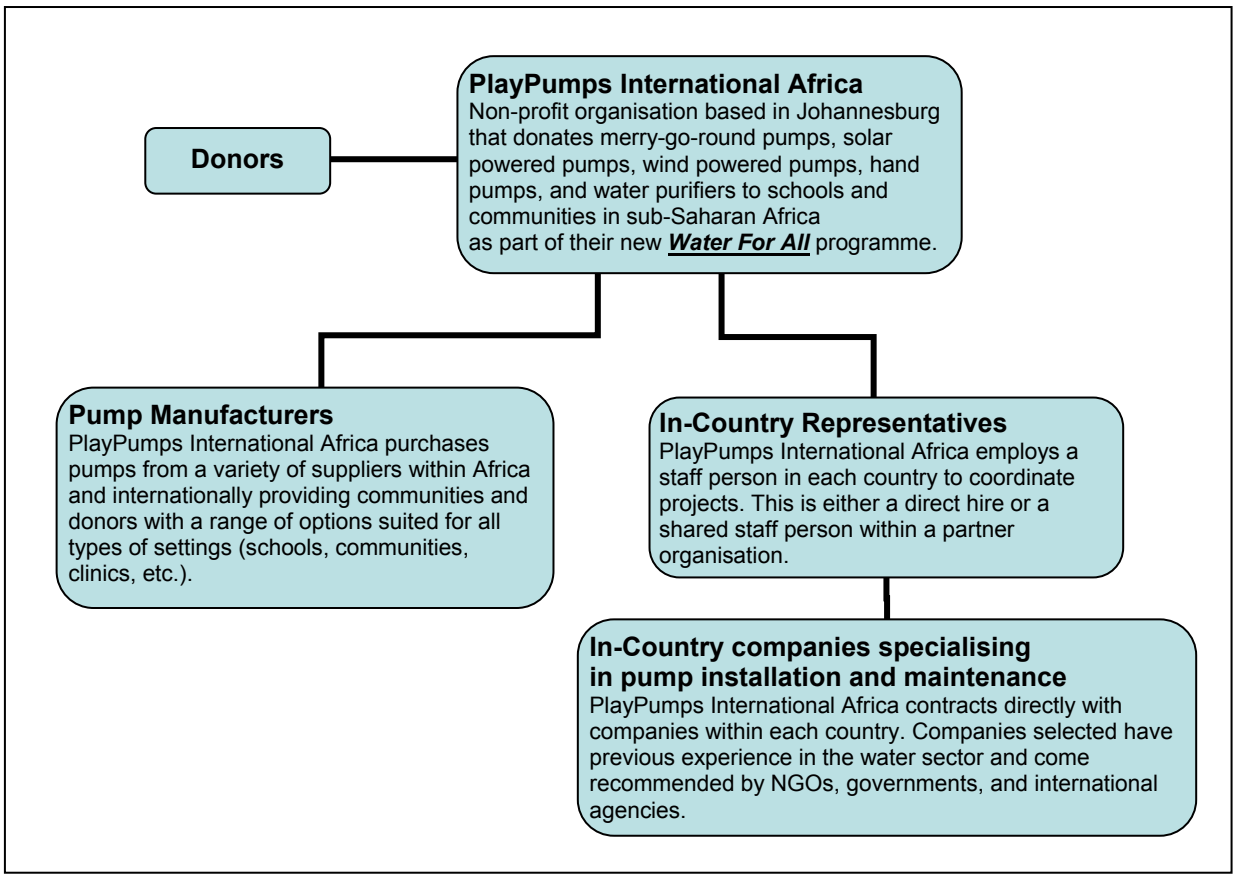
Just before the evaluation, there were some changes to the stakeholder relationships. On March 31, 2008, PlayPumps International Africa terminated it's relationship with Roundabout Outdoor and Outdoor Fabrication and Steelworks. This change will likely affect the ongoing negotiations for the potential future expansion of the initiative in Mozambique.

Below are diagrams representing the operating models:

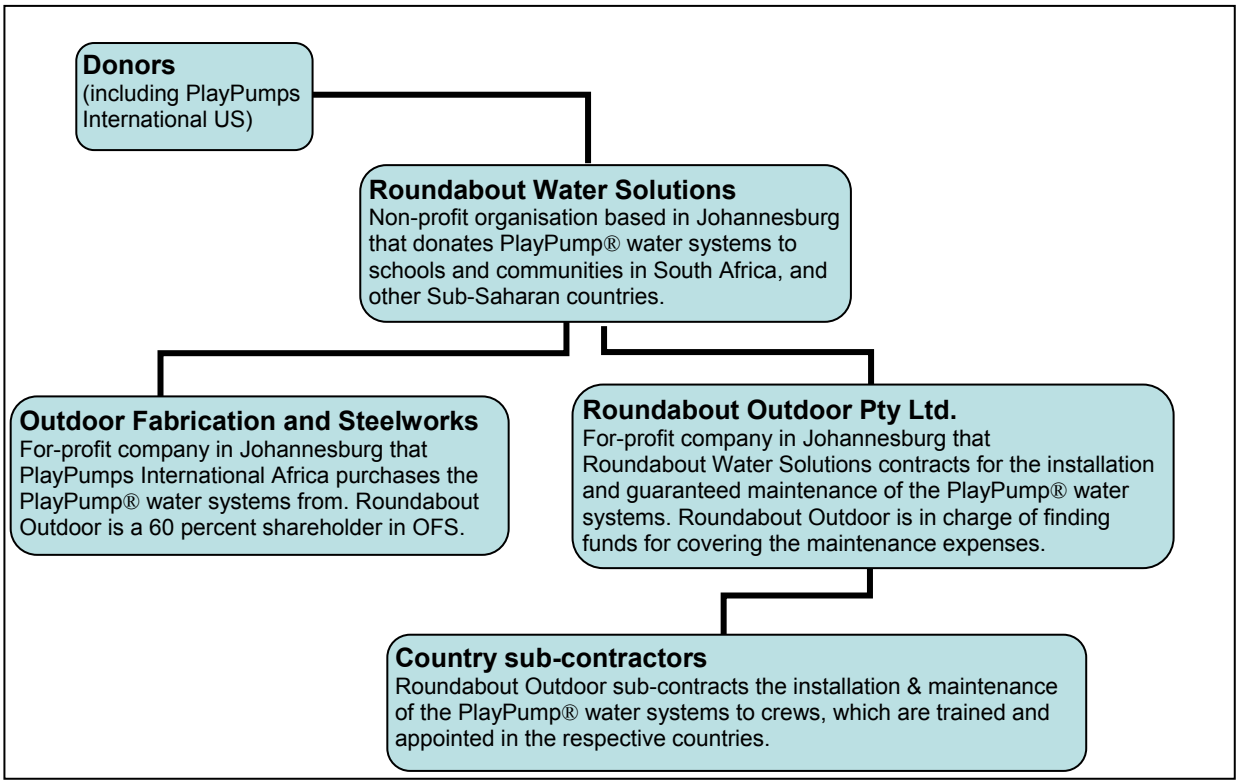
The Operation Model of PlayPumps International Africa and Roundabout Outdoor (before 31 March 2008)



PlayPumps International Africa new operating model (from April 1, 2008)



Roundabout Outdoors new operating model (from April 1, 2008)



5. Descriptions

5.1 Visions, Targets and Strategies

5.1.1 Water Policy and Sector Guidelines

- **National Policy**

  There are several principles in the recently approved Water Policy and Sector Guidelines that need to be considered by ROA and PPI for the adaptation of their core business activities, as follows:

  a) To respond to the demand in which communities are paying a small percentage of the capital costs and collecting maintenance/repair fees and therefore want to become the owner of the water point equipment.
  b) The government supervises and regulates the sector activities, and is responsible for attributing responsibility for use and management of water supply infrastructure to community groups or to a contracted operator.
  c) The private sector provides services for construction, quality control, social works and maintenance.
  d) The State is the legal owner of the water supply infrastructure.

  Domestic Water Supply Minimum Service Level

  The basic level of service for domestic water supply in rural areas shall be a protected, year-round supply of 20 liters of potable water per capita per day through water points located within 500 meters from the furthest homestead and serving 500 persons per outlet.

  There is also the need to ensure that the new process complies with:

  - An integrated water, hygiene promotion and sanitation approach.
  - Supporting the decentralization process to District Level.
  - The new strategy for meeting the MDGs in which there is a strong focus on finding ways to ensure water point sustainability.

  The rural water and sanitation strategy prioritizes three main strategic directions to reach the Millennium Development Goals, these are:

  1. Increasing coverage by attracting funds for investment, and setting up management mechanisms leading to greater sustainability.
  2. Improving research and innovation on alternative technologies to reduce costs and finding more sustainable management models.
  3. Institutional and human resource development to support decentralization of the water supply sector.

5.1.2 Roundabout Outdoor and PlayPumps International Africa

- **Vision**

  The vision of Roundabout Outdoor together with PlayPumps International Africa and PlayPumps International US is to help improve the lives of children and their families by providing easy access to clean drinking water, enhancing public health, and offering play equipment to millions across Africa.

- **Target**

  The goal is to bring the benefits of clean drinking water to 4,000 schools and communities in 10 countries in sub-Saharan Africa by 2010, serving up to 10’000’000

people (2'500 per PlayPump). Please see also "Description of the PlayPump", information on PlayPumps International US website on Page 20.

- **Strategy**
  The PlayPump water system is the vehicle to provide the targetted numbers of beneficiaries with clean drinking water including ten years of guaranteed maintenance.
- **Communication and Liaisons**
  The communication between all project partners must be open, so that appearing problems during the implementation phase can be solved and questions and requests from user communities can be answered at all times.

5.2 Pilot Project

5.2.1 Partners

- **Roles and Responsibilities of Project Partners**
  For roles and responsibilities of international project partners please see the operation models of PlayPumps International Africa and Roundabout Outdoor on Pages 10/11.

5.2.2 Management Model

During the implementation of the Pilot Phase in Mozambique, the PlayPump Project had three different management models as follows:

Table 1: Implementing Phase

Timeframe	Phase	Management Models	Province covered	No. of pumps installed
1. From 2005 to 2007	The Flourishing Schools Project managed and financed through the World Food Program (WFP) and UNICEF in straight collaboration with government and private sector;	Private-Public Partnership	Maputo, Gaza and Inhambane (lately not covered*)	29 out of 30
2. From 2006 to 2007	The Save the Children Foundation	Private-NGO Partnership	Gaza	48 out of 80
3. From 2007 till today	Maputo Extension, Direct Roundabout Outdoor management with task contract orders with local private enterprises	Private-Private Partnership	Maputo	23 out of 40

* The bidding process was cancelled due to lack of drilling capacity at the provincial level.

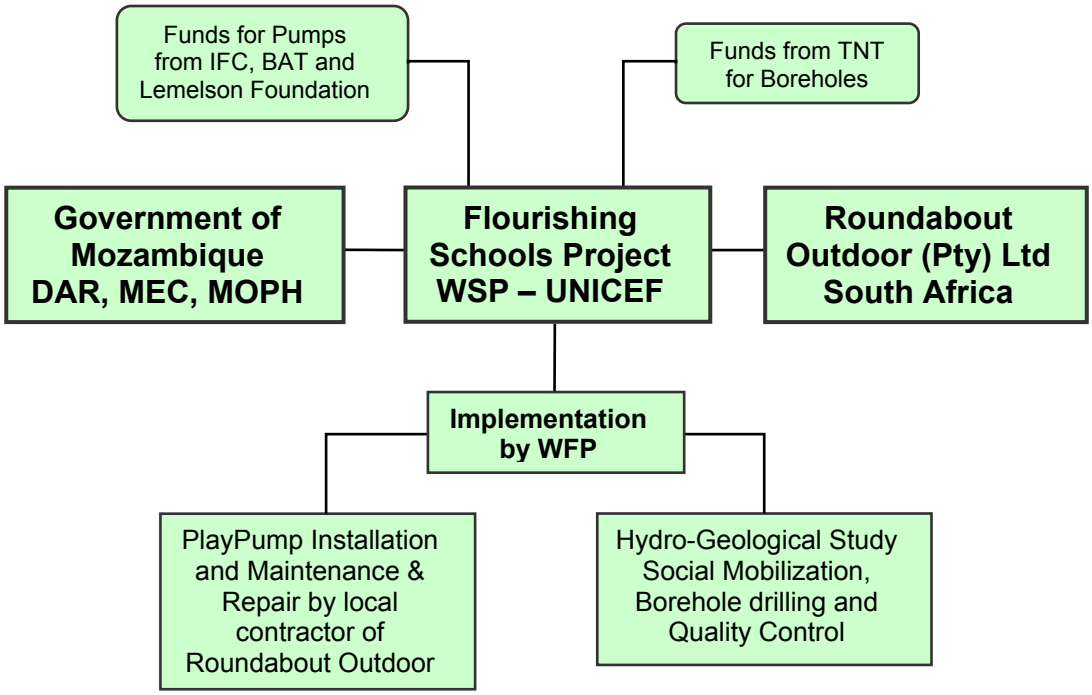
a) 29 pumps installed by the Flourishing Schools Program (WSP-UNICEF),
b) 48 pumps installed by the Save the Children Project,
c) 23 pumps installed by the Expansion in Maputo Province (Samuel Manhiça).

In the WFP-UNICEF schools, all 29 PlayPumps were installed on new boreholes. From the rest of the 71 PlayPumps of Save the Children and Maputo Expansion, the pumps were installed as follows:

a) 28 of PlayPumps installed substituted pumps that were no longer working,
b) 43 PlayPumps installed substituted pumps that were working or had minor problems, easy to repair at community level.

- **The 3 Pilot Projects**

  a) Public-Private Partnership



The WFP- UNICEF project had a clear Memorandum of Understanding between the Government of Mozambique represented by the Ministry of Education and Culture (MEC) and the Ministry of Public Works and Housing (MOPH), WFP and Roundabout Outdoor. The project aimed to install 30 PlayPumps water systems on new boreholes in schools. The implementation was managed by WFP with technical assistance from UNICEF and funds from the International Logistic Specialist TNT. All contracts for hydro geological studies, social mobilization, drilling and quality control were done through the provincial directorates of public works and housing, responsible for the water and sanitation sector. Roundabout Outdoor had the responsibility of installing the pumps and fulfilling the 10-year guarantee maintenance and repair system through local contractors.

(See Annex 8.2 for "Detailed Roles and Responsibilities" by stakeholder.)

During this phase, there were clear roles and responsibilities, but MEC and its directorates at provincial level did not play a very active role after the schools were selected. The need to monitor the quality of the work done by the different stakeholders was also not taken seriously. MOPH-DNA had granted exoneration of the import duties for 150 PlayPumps out of which DNA have received 107 by the time of the evaluation mission took place.

The average cost of the PlayPump water systems was equivalent to USD 4,443 (data from UNICEF).

(See Annex 8.3 for detailed "Information about Imported Pumps").

The clear and extensive list of indicators, approved by all stakeholders was never used for a consistent monitoring of the pilot phase. Only one formal and joint visit was made in June 2007, as a response to the request by the provinces after a series of problems were detected by the district governments.

The cost for installing a PlayPump unit in Mozambique was approximately USD 6,500 including the pump, down hole components and the tank system.

PlayPump systems were financed by the World Bank's International Finance Corporation – IFC; Lemelson Foundation; British American Tobacco Company among others, through the networking and fundraising activities of PlayPumps International Africa.

The boreholes were paid by TNT and the system operation (maintenance and repair) should be fully financed by income from advertisement. However, only 22

out of 100 pumps have commercial advertisements. So far and according to Roundabout Outdoor, the shortfall in revenue is subsidized for the time being by advertisement surplus in other countries (Zambia and South Africa).

The only cost to the recipient government was the cost for the importing duties.

During the guarantee period of 10 years, the maintenance will have to be funded by the advertising revenue from the billboards. It is claimed by Roundabout Outdoor that this model is making the water supply solution financially sustainable. This is clearly not the case in Mozambique.

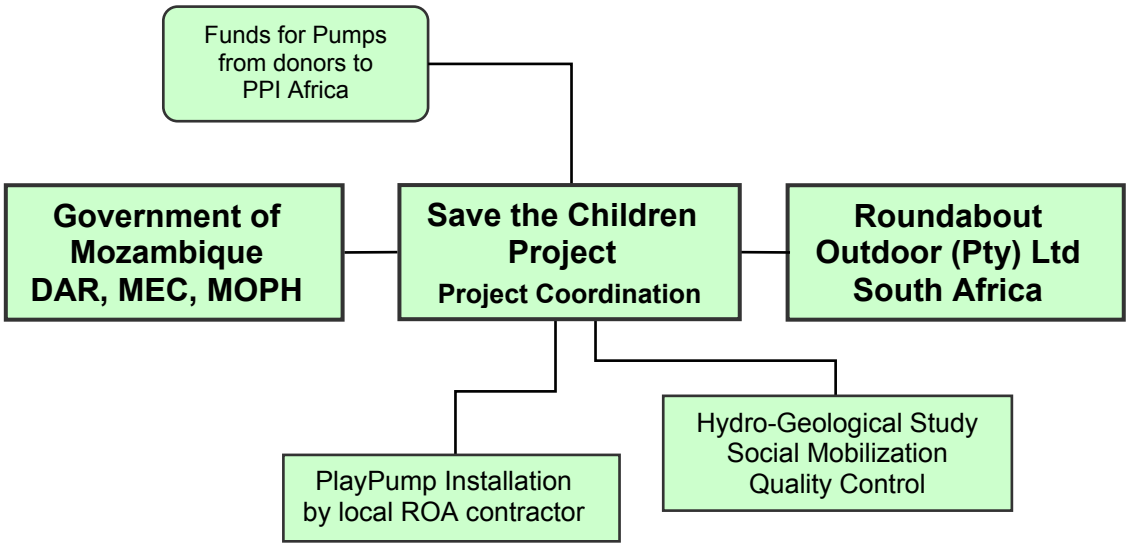
Paul Ristic of ROA informed:
The advertisement has previously been supported by Vodacom Mozambique on the first 30 installations and is currently under consideration by various Mozambican advertisers.

Although pumps were installed on new boreholes, **three pumps out of the 13-WFP-UNICEF pumps visited never worked** (2 pumps no water and 1 pump with collapsed borehole). ROA recognized the lack of cross checking the information related to borehole performance and water quality, which has caused several corrosion problems of the pumps affecting the quality of water. There were also no quality checks made on the installation of those pumps that were not properly working. This reflects the lack of coordination and missing response to problems raised on the field.

As part of the expansion of the Pilot Phase and, responding to the request of having an in-country presence, ROA contracted Mr. Samuel Manhiça, a former WFP employee as a country supervisor of ROA inside Mozambique.

He seemed to be fully knowledgeable about the procedures and able to supervise the maintenance and repair system for all 100 pumps installed, during the 10-years guarantee period.

b) Private-NGO Partnership



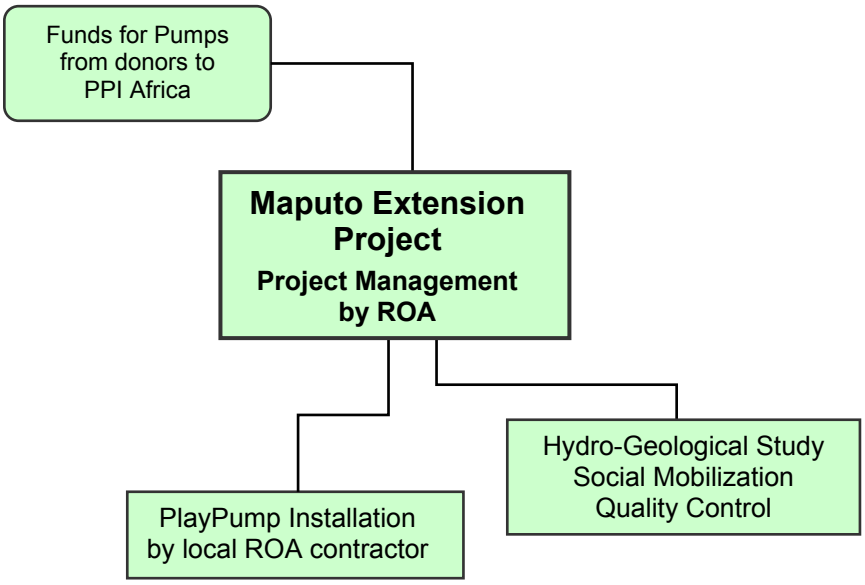
In the project with Save the Children (SC) to install 80 PlayPumps in the Gaza Province, the coordination and communication with central, provincial and district level including communities and ROA was supervised by SC. Due to fluctuations of their staff, SC had poor performance on government liaison, in community mobilization and communication with stakeholders in general.

In this project, PlayPumps were installed on existing boreholes and, as explained in previous sections, some of them substituted operational Afridev pumps. Unfortunately, the information on water quality and borehole performance, done by the same hydrologist as in the WFP-UNICEF project, was also of very poor quality.

The substitution of the existing pumps and installation of PlayPumps was made without proper involvement and information of school administrations and the beneficiaries nearby. The consequence of poor borehole information for each site was a series of breakdowns, followed by complaints from the pump users.

Ignoring the declining satisfaction of the users who are dealing with a complete different product and new ways of collecting water can be disastrous for the introduction of a new product.

c) Private-Private Partnership



The project in Maputo Province was directly managed by Roundabout Outdoor and local contractors. During this project the communication and government liaison had deteriorated even more. The local contractor for site selection, the same contractor of previous phases, had no initial communication with government at provincial level, went straight to the local government with a list of potential sites for assessment. The consultant was contracted to provide a list of 50 selected sites for pump installation to ROA. The contract amount was USD 14’000.

The quality of site selection got worse than in the previous projects, exacerbating the number of complaints.

Performance problems and poor quality installations gave raise to complaints from communities to local government level, who requested the assistance of DPOPH.

DPOPH in turn also requested the intervention of DNA and, as a result, a monitoring mission was commissioned to visit both provinces, looking at the following issues:

a) Installation of PlayPumps not only in school but also in communities;
b) Lack of communication, coordination and involvement of provincial government on these two expansion phases;
c) Replacement of working Afridev pumps to be substituted by PlayPumps;
d) Low level of satisfaction of beneficiaries.

As part of this evaluation mission, meetings with different stakeholders altogether were held in both provinces to hear different parties at the same time and to identify the main problems. Although few communication cases were shown, it appears that there was a clear lack of coordination among SC and DPOPH-Gaza and between the local contractor and DPOPH Maputo. The meetings also highlighted the problems of contracting the same players or individuals along different steps of the implementation phase. Such a system is putting at risk the independent judgment and institutional quality control like:

During the time of the evaluation, Dale Jones from PlayPumps International US visited two PlayPumps that had been recently installed on boreholes rehabilitated by Concern International. The installation crew under Mario Mussafa and Roundabout Outdoors responsibility substituted two-months old Afridev Pumps, perfectly working.

a) local contractor for site selection, pump installation and M&E being the same person,
b) drilling quality control individuals being DPOPH´s staff.

5.2.3 Costs

- **Costs of Project**

Table 2: Approximate Costs of the Pilot Projects

Activity / Item	**approx. Price**	**paid by**
Borehole drilling	USD 10'000	TNT
Site selection, borehole identification USD 2'800	USD 14'000 *	Funds from donors to PPI Africa
PlayPump with supplement equipment USD 5'600		
Storage, transport & installation USD 5'600		
Social awareness / community mobilization	??? **	Project organization
Local costs for government	??? **	DPOPH
Total costs per PlayPump	**???**	

* according to 5.2.4 Sponsorship (see below)

** These costs were not available

5.2.4 Sponsorship

Geoff Hopkins of PlayPumps International Africa provided the following with regard to sponsorships sought by PlayPumps International Africa:

The $14,000 sponsorship of a PlayPump® water system was calculated based on a ten country average. This new sponsorship level was developed in 2006 after pilots in Swaziland and Mozambique were initiated and costs for entry into a new country were assessed.

The ten country average was calculated to allow for variances per country (transport, labor costs, etc.), unplanned expenses, exchange rate fluctuations, and borehole failure rates.

For example, when embarking on a borehole identification programme in any given area, multiple sites are visited for consideration. Of those sites, a select number are then chosen for borehole testing and some are not put forward for installation despite the fact that costs have been incurred to identify them. Of those selected for testing, many will fail and do not make it to the installation phase. The costs associated with identification and testing of sites (whether successful or not), are spread out across all installed PlayPump® water systems.
In the fiscal year 2008, PlayPumps International Africa spent on average approx. 35'000 ZAR for a successful site (4'500 - 5,000 USD depending on exchange rate). This cost was above budget (see estimates below), but given that most of the sites were in RSA, this cost was offset by lower installation charges, which meant that the PlayPumps® Water Systems were installed within the overall budget.

Any programme funds associated with an individual sponsorship that are not spent are applied towards programme expenses not operating expenses.

For example, the installation of a PlayPump® system in Ethiopia may be more than $14,000 depending on fuel and transport costs but the installation of a PlayPump® system in South Africa may be less given the proximity to the factory.

General sponsorship is common practice among non-governmental organizations seeking support for a programme implemented in multiple countries (e.g. child sponsorship, bed nets, etc.).

PlayPumps International Africa breaks the $14,000 into 3 major budget categories (estimates only) including:

Borehole qualification (site visits, water quality testing, water quantity testing, community orientation and acceptance) - $2800.

Equipment (PlayPump® system, supplemental equipment, donor plaque) -$5600.

Installation (warehousing, transport of pump from Johannesburg, transport within country, system installation) - $5600.

Six percent of each budget category was applied to the operating costs of PlayPumps International Africa. If funds were received via PlayPumps International US, the six percent was shared equally among the two organizations.

PlayPumps International Africa purchased the PlayPump® system from Outdoor Fabrication and Steelworks for 31,500 ZAR (4,000-4,800 USD depending on exchange rate at the time of the donation was received).

5.2.5 Target Groups for PlayPump Installations

- **Pumps for Primary Schools**
  Primary schools have been targeted in the first place for PlayPump installations. The water pumped by the children should be enough for drinking and washing hands during their school attendance.

- **Pumps for Communities**
  Some PlayPumps have been installed in communities with functioning water user committees. Existing pumps (Afridev) were replaced by PlayPumps and the water user committees were stripped of their task to organize and maintain the water point with pump and to collect money for maintenance and repair interventions.

- **Pumps shared between Primary Schools and Communities**
  This idea sounds great, but it has proven to be the most problematic approach and leads to conflicts between the different users.

5.3 Site Selection and PlayPump Installation

- **Hydrological Assessment for Site Selection**
  The hydrological assessment work for pump placement was done by a local consulting company Hydropesquisa Consultores Lda., which was contracted by Roundabout Outdoor following recommendations by UNICEF Maputo.

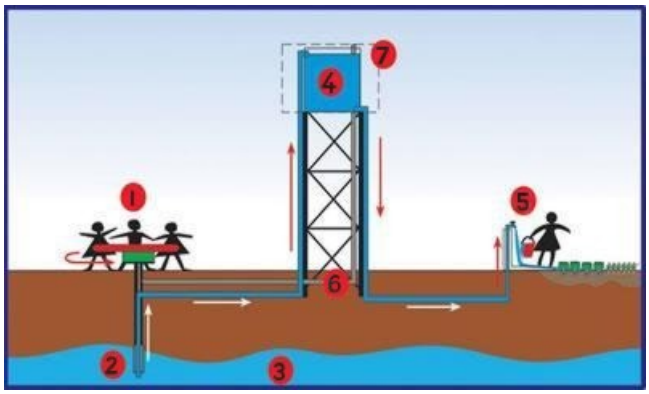
- **Consultation of Beneficiaries**
  There was not one community visited by the mission who claimed to have had a decision on the selection on the pump type to be installed.

- **PlayPump Installations**
  The installation of all Pilot PlayPumps in Mozambique was done by 2 different private installation and maintenance crews, Mati mâ Tsâkissa and the crew of Mario Mussafo.
  In April 2008, ROA took the decision not to extend the contract of the second crew of Mario Mussafo (initially appointed by “Hydropesquisa” and trained by ROA), because their performance and quality of work was beyond expectations.

- **Service Providers Capacity**
  During the pilot face of the PlayPump, too few pumps were installed in the Maputo Province to give enough work for the present Roundabout Outdoor Installation & Maintenance Crew “Mati mâ Tsâkissa”. Therefore they were also used to install and maintain pumps in the Gaza Province, which takes them too long to react within a few days.

5.4 Technology Issues

5.4.1 Description of the PlayPump



The PlayPump is a water pump, operated by the motion of a playground merry-go-round (1). When the play wheel is turned, a curve in the wheel housing is moving a guided steel bar up and down.

The reciprocating movement of steel bar is then transformed by the connected pumprod to the plunger in the cylinder (2), which is placed in the water bearing layer (3).

A pressure attachment at the end of the rising main makes it possible to pump the water into an overhead storage tank, which is placed on a water tower, 7 m above ground. The capacity of the storage tank (4) is 2'500 litres and an overflow pipe (6) is provided to lead excessive water back into the well.

Water can be drawn at the tap of the standpipe (5), which is connected to the storage tank by a feeding pipe.

The storage tank is covered by four large billboards (7), which are used for commercial advertisement and also for public health messages.

The information on PlayPumps International US website is as follows:

*The **PlayPump(R) Water System** uses the energy of children at play to operate a water pump. It is manufactured by the South African company Roundabout Outdoor. It operates in a similar way to a windmill-driven water pump.*
At a cost of approximately R96,000 (approximately US$14,000), it is suitable for shared use by villages, particularly in areas where water is accessed from deep underground (up to 100 meters) using a bore.
There are more than 1000 PlayPump systems in *sub-Saharan Africa*, providing clean drinking water to more than one million impoverished people. On *September 20*, 2006, at the *Clinton Global Initiative*, First Lady *Laura Bush* announced a $16.4 million public-private partnership to install more PlayPump systems -- the beginning of an effort to install 4,000 pumps to provide water to up to 10 million people in Africa by 2010. The announcement includes $10 million from the U.S. government, $5 million from the *Case Foundation*, and $1.4 million from *The MCJ Foundation*.

The PlayPump water system is a like a playground merry-go-round attached to a water pump. The spinning motion pumps underground water into a 2,500-litre tank raised seven meters above ground. The water in the tank is easily dispensed by a tap valve. According to the manufacturer the pump can raise up to 1400 litres of water per hour from a depth of 40 meter. Excess water is diverted below ground again.
The storage tank has a four-sided advertising panel. Two sides are used to advertise products, thereby providing money for maintenance of the pump, and the other two sides are devoted to public health messages about topics like HIV/AIDS prevention. There are more than 1000 PlayPump systems in five countries of Sub-Saharan Africa, providing clean drinking water to more than 1 million people in need.

5.4.2 Service Capacity of the PlayPump

According to the advertisement made on www.playpumps.org , a PlayPump is:

> *Capable of producing up to 1,400 litres of water per hour at 16 rpm from a depth of 40 meters, it is effective up to a depth of 100 meters.*

In addition, the website claims that 2'500 people can be served with one PlayPump.

5.4.3 Situation in the Field

- **Product Design**

  The design of the PlayPump is very attractive and special attention has been paid to avoid any type of injury for children while playing. Especially the finish of the wheel is very smooth and all welded steel pipe joints have been rounded to eliminate any sharp corner.

  It has been noted that most pump covers are corroding at the top.

- **Pumping Mechanism**

  The pumping mechanism uses a double curve in the pump box, which moves a precisely guided horizontal bar up and down when rotating the play wheel.

  With this mechanism, the rotation of the play wheel is transformed into a reciprocating movement of the horizontal bar, which is connected to the pumprods and the plunger in the pump cylinder.

  Due to this system, the torque on the wheel is not constant, because during the up-stroke of the plunger, turning the play wheel is harder and during down stroke the rotation is free (there are two up and down strokes in one full wheel rotation).

  In this design, the maximal plunger stroke is kept at a minimum between 55 to 78 mm, so that the torque is not too high for children to start turning the play wheel.

- **Down hole Components**

  The pump cylinder is made of stainless steel and the pumprods and the riser pipes are hot dip galvanized (GI pipes).

  Having only a very short pump stroke, the plunger and footvalve need to be closed immediately after the water has passed, so that any loss of water can be minimized (backflow during valve closing). Therefore the valves are loaded with a spring to make the closing movement faster.

- **Pressure Attachment**

  The stuffing box of the pressure attachment mounted on a flange plate is sealing the top of the rising main. The pressure seal is made of a set of bushes and rings made of PUR and Rubber.

- **Casing Seal**

  The casing pipe for the PlayPump pipe is cut about 1 cm below the surface of the platform to accommodate a flange plate.

  A layer of silicon based sealing paste is applied underneath the flange plate to seal the casing properly.

  To avoid water intrusion trough the ventilation hole in the flange plate, an O-Ring is placed between flange plate and the pump stand flange.
  As soon as the pump stand is fastened to the platform by 4 anchor bolts, the flange plate is securely held in position.

- **Pump Platform**

  The platform for the PlayPump has not the function of draining spill water like a platform for other handpump types and therefore only a flat surface is required for the children to play on.

  The platform is in most cases about 2 m larger in diameter than the play wheel, so that the playing children are able to accelerate the play wheel while running on the platform.

  For every removal of the rising main (i.e. for maintenance of cylinder parts), a specific section of the platform needs to be demolished, to disconnect the pressure pipe that leads to the overhead tank.

  Each time a repair or maintenance intervention is completed, the platform has to be closed with a layer of cement mix that requires a curing time of about one week.

- **Water Tank**

  For each PlayPump, a HDPE Water tank of 2’500 litre storage capacity is provided, nicely placed on a tower (about 7 meters above ground) and covered by 4 large billboards for advertisement purposes.

Besides the pressure pipe for filling the tank, and the feeding pipe leading the stored water to the stand post is made of GI pipes. In case the water tank would be filled completely, an overflow pipe made of HDPE pipe is provided that would lead the water directly back into the borehole.

- **Stand Post**

  A stand post is provided with a single tap and a small platform for draining the spill water away from the water discharge point.
  The taps are assembled with simple pipe fittings of cast iron, which is robust but not costly so that theft of taps can be prevented.
  For sturdiness, the pipes and fittings are placed in a PVC pipe filled with concrete.

- **Billboard Tower**

  The structure of the billboard tower is made of galvanized angle irons, strong enough to accommodate the water tank and 4 bill boards (board size is about 200 x 150 cm).

  The tower structure is anchored in 4 concrete foundations.

  The tower provides the opportunity to place commercial advertisements on 2 boards and social messages (Government, Development Organizations etc.) on the 2 other boards.

  ROA uses the revenue provided by the billboards to guarantee 10 years of maintenance.

  It is intended that the revenue of the 2 commercial advertisements should cover the costs for any maintenance required for the PlayPump.

  The mission noted that many of the visited PlayPumps had blank billboards and some also no signboards.

- **Water Point Setup**

  There are general design rules for the setup of a water point i.e. how far the billboard tower and the stand post need to be placed away from the PlayPump or minimal distances from latrines etc. However, when placing PlayPumps on existing boreholes inside school yards etc., the situation requires often a more flexible approach.

- **Ergonomic Issues**

When watching children operating the PlayPump, the wheel height of about 60 cm above the pump platform seems to be just right.

To accelerate the play wheel, children place themselves inside the two rings and pushing the connection bar between the two rings.

Depending on the force that needs to be applied to move the play wheel and on how many children just sit idle on the ring pipes, the play wheel turns about 2 to 4 rotations before needs to be re-pushed.

The operation speed of the play wheel reaches seldom 20 RPM and this speed cannot be maintained for a longer period.

In most schools visited, children were not always moving the play wheel – they often enjoyed the PlayPump as a gathering place, just sitting on it and chatting.

However, as soon as the evaluation team (foreigners) walked towards the PlayPump, the children rushed to the pump (like they have been told), showing their ability to rotate the play wheel at an enormous speed. The children pushing the wheel with such a high speed could only keep up this pace for a few minutes before being exhausted.

For smaller children and mainly girls just sitting on the pump, one minute of constant rotation was enough for them to leave the pump before getting dizzy.
In most cases children used to turn the wheel to pick up speed, jumped on it and waited until it slowed down.

There was no constant turning by sitting on the wheel and using one foot for acceleration. This technique would only be possible for tall children (above 13 years) or adults.

Adult water users refuse to sit on the play wheel and to move it with their feet.
A strange operation technique that has so far not been accepted by African women.

All users prefer to stand outside of the play wheel and rotate it by pulling the outer ring by hand.

Pregnant women refrain from drawing water after their belly is getting too big for operating the play wheel and elderly people have no chance to move the play wheel for getting water.

Used for many years to operate the handpump by a handle, almost all pump operators (only women) are not happy with the pulling movement to turn the play wheel.

One remarkable comment was: "We like the pump for its reliability with less repair interventions, but please replace the play wheel with a handle to draw water".

- **Frequency of Pump use**

  Boreholes are not drilled close to trees and are therefore exposed to the sun. This a common problem for all handpumps (or human operated pumps) and that's why the play wheel cannot be placed in a shady place – ideal playground for children.

  In hot weather with sunshine, it is unpleasant to operate the pump during the time between late morning to early afternoon. Early morning and late afternoon is also the time when the adults want to fetch water. During this time they don't like if their hard work of drawing water is interrupted by playing children.

  According to the water users, a PlayPump is operated between 6 to 12 hours per day, depending on the number of beneficiaries and the location (school or village).

- **Design Adaptations to Mozambican Conditions**

  Small diameter boreholes with 4" casing pipes are in Mozambique common practice for handpump installations. Lately new boreholes have been drilled with 6" casings.

  The largest PlayPump cylinder with an inner Ø of 100 mm requires a Ø 6" casing pipe. However, this large cylinder can only be used for shallow wells (few of them installed in RSA). Largest cylinders installed in Mozambique are Ø 80 mm cylinders that also can be fitted in a borehole with Ø 4" casing pipe. Smallest cylinders in use for the PlayPump are Ø 50 mm cylinders.

5.5 O&M Management

5.5.1 Operation & Maintenance

- **Maintenance System**

  Whenever an information of a defective pump is arriving at the headquarter in RSA, ROA is requesting the installation & maintenance team responsible (presently only Mati mâ Tsâkissa) to repair the pump.

- **Downtime of Pumps**

  11 communities who experienced a breakdown of their PlayPumps where asked to comment on the downtime of pumps. Please see the result in Table 3 below:

Table 3: Downtime

Nº	Pump Number	School	Beneficiaries	Instalation Date	Breakdowns since installation	Breakdowns in the last 3 months	Type of Problems	Downtime (Days)	Date of last breakdown
1	MOZ0006	EPC Mabanja	School	2005	1	1	Pump heavy	120	-
2	MOZ0001	EP1 Intaca	School	2005	3	2	Little water flow, tap	21	01.04.08
3	MOZ0021	EP1 Chonguene	School	2006	1	1	Little water flow	120	30.01.08
4	MOZ0015	EP1 Chaguala	School/Community	2006	1	0		60	26.12.07
5	MOZ0017	EP1 Tetene	School/Community	2006	3	1	Tank do not keep water	300	01.07.07
6	MOZ0041	EP1 Magul	School/Community	2006	3	2	No water flow	30	05.04.08
7	MOZ0008	EPC Tenga	School	2006	1	1	Tap	15	30.03.08
8	MOZ0054	EPC Siaia	School	2006	1	0	No water since installation	520	01.05.07
9	MOZ0062	EP1 4 de Outubro	School/Community	2007	1	1	Little water flow	60	01.03.08
10	MOZ0014	EP1 Coca Missava	School/Community	2006	1	0	Little water flow	20	-
11	MOZ0055	EP2 Chalala	School/Community	2007	2	1		90	02.02.08
					1,6	1,0		60	
					Average Nº of Breakdowns since installation	Average Nº of Breakdowns in last 3 months		Average Down Time	

The average downtime (including two permanently non-operational pumps) is over 100 days. When taking the downtime of the repairable pumps only, the average downtime is reduced to about 60 days waiting before an intervention takes place. This is by far too long for the communities in need.

- **Maintenance & Repair**

  Technical Quality of the Work done for the Existing Pumps:

  Two maintenance teams contracted and trained by Roundabout Outdoor, a) Mati mâ Tsâkissa and b) the team of Mario Mussafa installed all pumps in Mozambique.

- **Market Sharing**

  According to information provided by PlayPump International Africa and Roundabout Outdoor, a service provider (Installation and Maintenance Team) would require about 100 PlayPumps for being occupied and run the small business successful.

- **Communication of Breakdowns**

  The new approach of reporting a pump breakdown by sending an SMS to a special service number seems to be a brilliant idea at first glance. However, this type of communication has shown its limits and there were various reasons why in many cases the reporting by SMS did not work:

a) Mobile phones are not that everywhere found in rural areas of Mozambique.
b) Some users are afraid that provided local number might cost a lot of money when contacted.
c) Many users do not know how to send an SMS (but they might know someone who knows how to send such a message).
d) For those who would prefer to make a phone call, they are afraid that the one on the other end is not able to understand Portuguese.
e) There are still large areas in rural Mozambique that have not yet been covered by a network for mobile phones.
f) Some pump installations (0072, 0091, 0092, 0093, 0094) had no sign boards with contact numbers provided.

Paul Ristic, managing Director of Roundabout Outdoor informed as follows:
This communication method will be improved upon improved community consultation and education as well as a handout brochure informing the community of the steps to be taken in the event of a breakdown.

Table 4: Number of Pumps to be maintained by one private crew (or company) so far

Timeframe	Project	Management Model	Province covered	No. of pumps to maintain
1) From 2006 up to day	Direct Roundabout Outdoor management with task contract orders with Mati mâ Tsâkissa	Private-Private Partnership	Maputo and Gaza	77
2) From October 2006 up to April 2008 *	Direct Roundabout Outdoor management with task contract orders with Mr. Mario Mussafa	Private-Private Partnership	Maputo	23

* The contract of the team of Mr. Mario Mussafa has been terminated

- **10 years Guarantee Period**
  For the pumps installed, Roundabout Outdoor directly manages repairs extended by local contractors. Roundabout Outdoor aims to dedicate one contractor in a specific geographical area. Based on their experience in South Africa (RSA), a contractor needs to support at least 100 pumps for the business to be economically viable.

5.6 Social Issues

5.6.1 Benefits

- **Social Benefits**
  Water Coverage:
  Every additional drinking water pump installed is a contribution to the aim of increasing water coverage for the rural population in need.
- **Clients Satisfaction**
  The clients satisfaction is an important indicator how the communities are accepting the new pump type (PlayPump) and the new management model.
- **Users Preference**
  This reflects directly the users choice of the pump technology they like best.

5.6.2 Expansion Strategy

ROA plans to install approx. 1000 PlayPumps in Mozambique over the next years.

6. Findings and Conclusions

6.1 Visions Targets and Strategies

6.1.1 Water Policy and Sector Guidelines

- **National Policy**

  The concept of the PlayPump and its maintenance and repair system does not comply with the VLOM concept applied in the country. However, the government is piloting some new initiatives that can support to find sustainable solutions like the PlayPump pilot project. It is comparable with the service provided by a water utility and the quality indicators might be related to the following three indicators:

  a) The quality and quantity of water,
  b) Disruptions of Water Service,
  c) The Price of the product that is not only the monetary cost but also the perceived costs that users have to pay for the product e.g. fetching water time; pumping efforts; distance to water source.

6.1.2 Roundabout Outdoor and PlayPump International Africa

- **Vision**

  The vision and mission of PlayPumps International Africa and Roundabout Outdoor is not shared among all partners and stakeholders. The lack of close monitoring and quality control made it possible that several local partners, only driven by the ambition of easy money, had taken advantage of presenting poor quality work. The consequences are high costs for the frequent repairs and complaints from pump users due to the lack of their involvement on the process.

6.2 Pilot Project

6.2.1 Partners

- **Roles and Responsibilities of Project Partners**

  The mission found that it was not clear for national stakeholders to understand the organizational structure related to the PlayPumps at international level. Please see the operation models of PlayPumps International Africa and Roundabout Outdoor on Pages 10/11 and also the operation models of the 3 pilot projects on Pages 14/17.

- **Adaptation to Mozambican Strategies and Policy Context**

  The mission came to the conclusion that during the expansion to Mozambique, Roundabout Outdoor and PlayPumps International Africa used their experience in RSA without major adaptation to policy, stakeholder capacity, and cultural issues that are jeopardizing the acceptance of the PlayPump in the new market. Stakeholders in the PlayPump project will benefit from modifying their core business and by identifying the characteristics of the product and repair service from the perspective of the pump users and policy requirements in Mozambique.

  For instance, poor performance in borehole siting or identification has drastically affected the quality of water and increases the number of breakdowns of the pumps. In addition, the lack of understanding by users about the breakdown communication system is limiting Roundabout Outdoor's capacity to promptly respond and decrease the pump downtime, affecting customer levels of satisfaction.

This adversely affects local and provincial governments' perspective of the PlayPump technology and the efficiency of the repair service.

Since the PlayPump pilot phase in Mozambique did not fulfill these principles it will be necessary to start a dialogue with the government to arrive at a mutually accepted mode of operation. This method also needs to be communicated to the province and district authorities.

- **Communication & Liaisons with Government and Project Partners**

  The communication between the project partners deteriorated through the process and stopped completely by the beginning of 2007. Since then there was clear lack of knowledge about progress and pending responsibilities. Unclear communication channels and poor coordination and liaison prevented timely actions to solve the major problems that are affecting the expansion of the PlayPump water systems into the new Mozambican market.

  The government authorities are not part of the monitoring process.

  Missing communication and monitoring has been critical at all levels in Mozambique. Only Roundabout Outdoor in South Africa has updated reports of PlayPump performance, maintenance and breakdowns and had not shared this information with other stakeholders. The local maintenance and repair crews also have this information but do not use it for analyzing costs or weak points of the pumps.

  Roundabout Outdoor has not benefited from the lessons learnt or weak points during the pilot phase. It appears that implementation mechanisms have deteriorated from the initial setup to the present poorly organized interventions by the Maputo Province. The problems are as follows:

  a) In-country coordination appears to have become less coherent, and liaison with government was reactive to problems.
  b) The process of site selection was not operating with clear criteria based on policy and experience to date.
  c) There was no information exchange and collaborative assistance among the two installation and maintenance crews.

- **Liaison with Communities**

  Poor community mobilization before installation of the PlayPumps had the fatal consequence of poor knowledge about how to communicate breakdowns, making the repair service provided by Roundabout Outdoor and its local contractors inefficient.

  It is important to recognize that explaining only to the school director will never ensure passing the knowledge of the communication system to others and it might be lost by the frequent fluctuations of school personnel.

6.2.2 Target Groups for PlayPump Installations

- **Pumps for Primary Schools**

  Schools are the main target groups according to the Roundabout Outdoor and PlayPump International Africa, for which 5lt/day should be enough.

  With limited time to play (before school, during breaks and after school), the mission is assuming that the PlayPump will be in operation hardly longer than 5 to 6 hours daily.

  Example for schools:

  6 hours continuous pumping x 785 litres per hour = ~4700 litres.

  4700 litres divided by 5 litres per person = ~940 students can be served.

- **Pumps shared between Primary Schools and Communities**

  Children are not immediately thinking of drawing water when going to the PlayPump (this is typically wrong thinking of adults), they like to turn the play wheel of the pump just for having fun.

  Depending on the size of the school and the number of hours the PlayPump is occupied by the children, not much time is left for the community to draw water for serving a large user group.

  Communities in need of getting water are therefore not happy when being interrupted by children in their daily task.

  There was only one specific case in EPC Martirez de Mueda, in which teachers and women addressed this type of problems of sharing water amongst themselves.

  Example for communities (sharing pump with schools):

  6 hours continuous pumping (remaining time) x 785 litres per hour = ~4700 litres.

  4700 litres divided by 20 litres per person ~235 beneficiaries that could be served.

- **Pumps for Communities**

  If a PlayPump is installed in a community, the users could theoretically operate the pump for the whole day (12 hours) without interruption. Under such circumstances maximal 470 beneficiaries (2 x 235) could be served, far less than the 2'500 claimed in the advertisement.

  As a comparison

  An Afridev Handpump operated under the same conditions (6 hours) would provide an amount of ~6'000 litres. Please see calculations in "Service Capacity of PlayPumps" on Page 33.

6.3 Site Selection and PlayPump Installation

- **Hydrological Assessment**

  During a meeting with Mr. Herminio C. Novela of Hydropesquisa (the consultant company in charge of the assessment for placing the PlayPumps in Mozambique by UNICEF), DPOPH-DAS Maputo, no substantial information on the assessment criteria was provided. Mr. Novela however promised to send us a copy of the assessment including water quality testing, but unfortunately the mission never received these important documents.

  Problems with corrosion of metal parts (GI rising mains and MS pumprods), dry wells and collapsed boreholes started soon after installation of the PlayPumps. This showed clearly that fundamental information of the assessment was not correct or missing (water quality, characteristic of boreholes etc.).

During the field visits, the mission found one pump installed on an old borehole that was suffering from sand intrusion (defective screen). According to Mati mâ Tsâkissa the first cylinder was fully worn after a short time (within 6 months after installation). The second cylinder is showing signs of wear again (after another 7 months) and is due for replacement soon.

In many installations, the water smells bad (rotten eggs) and the color of the water is slightly red.

Unfortunately, also the installation crews did not re-check the water with a simple method (pH Meter or pH paper), avoiding to install GI pipes and galvanized pumprods in wells with aggressive water.

- **Consultation of Beneficiaries**

  The mission team also found no signs that communities had been consulted prior to installation or had a say in choosing the pump type of their choice.

- **PlayPump Installations**

  The installation of the 100 Pilot PlayPumps in Mozambique was done by the two installation and maintenance crews, Mati mâ Tsâkissa and Mario Mussafo.

  Mati mâ Tsâkissa

  The mission was invited to attend a preventive maintenance intervention, to see the pump components, to check the performance of the maintenance crew and to ask questions.

  The crew of Mati mâ Tsâkissa trained by ROA was competent, well equipped and their working approach was perfectly organized. They have a small truck with a cabin for the whole crew and a trailer, in which they have all spare parts including pipes and pumprods. This set-up makes it possible to do all types of repair work at the site, without having received correct information on the pump failure in advance.

  Mario Mussafo

  The second installation and maintenance crew lead by Mario Mussafo was also trained by ROA. This crew was dismissed lately because they were not showing good performance and the quality of their work was below expectations. Since they are no longer in operation, the mission team was not able to meet them for an interview.

  However, several installations executed by Mario Mussafo could be visited and it was obvious that the work was not done professionally and many details were lacking carefulness.

  Know-How of Installation, Maintenance and Repair Teams:

  It appears that none of the installing teams had been trained to re-check the borehole (depth and water level) and the water quality (pH Meter) prior to pump installation.

- **Service Providers Capacity**

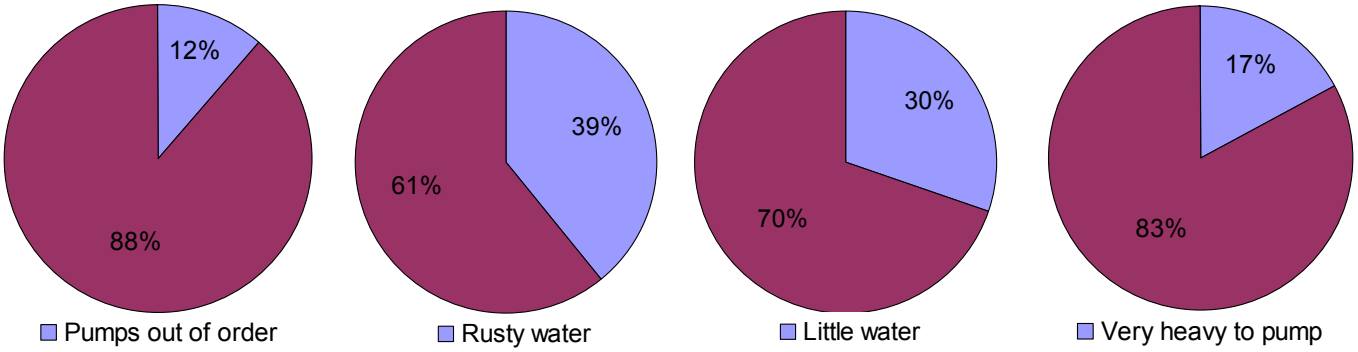
  At present, only one installation and maintenance crew is not able to maintain and repair all installed pumps in the provinces of Maputo and Gaza, because of the large distances between the pumps installed.

  At least two crews, one in each province would be required to provide a minimal maintenance and repair service.

- **Rectification of Technical Problems**

  The mission was able to visit 26 out of 100 PlayPumps installed. 3 pumps were out of order, of which 1 pump was already removed,

  Of the remaining 23 operational pumps, the following problems exist:
  - 9 pumps had water with rusty taste,
  - 7 pumps had little water discharge,
  - 4 pumps were very heavy to operate,



This shows the urgent need for immediate inspection of all PlayPumps installed and to rectify or repair wherever required.

Way back in the early 90-ties, the Afridev Handpump was selected as the national handpump. One of the reasons was the corrosive waters in large areas of Mozambique and the Afridev with non-corrosive down hole components (PVC risers and Stainless steel pumprods) was the best option to solve this problem.

With installing of PlayPumps with GI risers and Mild steel pumprods, it seems that this problem has been overseen or neglected.

6.4 Technology

6.4.1 Service Capacity of the PlayPump

The theoretical water discharge of a PlayPump can be calculated as explained below:

a) Ø 100 mm cylinder

Calculation of projected cylinder area: $d^2 \times \pi/4$ or $10^2 \times 3.1416 / 4$ = **78.54 cm²**

Calculation of discharge/stroke: 78.54 cm² x 6.5 cm = **510.51 cm³** = **0.510 litres**

Discharge per minute (20 RPM) 2 x 20 strokes x 0.510 litres = **20.40 litres**

Discharge per hour 60 x 20.40 litres = **1224 litres**

b) Ø 80 mm cylinder

Calculation of projected cylinder area: $d^2 \times \pi/4$ or $8^2 \times 3.1416 / 4$ = **50.26 cm²**

Calculation of discharge/stroke: 50.26 cm² x 6.5 cm = **326.69 cm³** = **0.327 litres**

Discharge per minute (20 RPM) 2 x 20 strokes x 0.327 litres = **13.08 litres**

Discharge per hour 60 x 13.08 litres = **784.8 litres**

c) Ø 50 mm cylinder

Calculation of projected cylinder area: $d^2 \times \pi/4$ or $5^2 \times 3.1416 / 4$ = **19.63 cm²**

Calculation of discharge/stroke: 19.63 cm² x 6.5 cm = **127.59 cm³** = **0.128 litres**

Discharge per minute (20 RPM) 2 x 20 strokes x 0.128 litres = **5.12 litres**

Discharge per hour 60 x 5.12 litres = **307.2 litres**

Pump strokes in the range between 55 mm to 78 mm are possible (for the calculation above, 65 mm has been used).

How much water a PlayPump is able to draw is mainly depending on the physical condition of the pump operators (age of children) and on the daily operation time.

With greater installation depths the pump effort is increasing and therefore cylinders with smaller diameters are used to assure that pumping (turning the play wheel) is still fun for the playing children. However, the use of smaller cylinders sizes automatically reduces the water discharge.

As comparison please see the discharge of an Afridev Pump (**Ø 50 mm cylinder**):

Cylinder area		Pump stroke		Volume in litres		No. of strokes/min		litres/min		litres/hour
19.6 cm²	x	22.5 cm	=	0.44 litres	x	40	=	17,6 litres	=	**1'056 litres**

6.4.2 Situation in the Field

- **Product Design**

  The wheel structure is built very robust and can take a heavy load without giving problems to the pump stand or to the functioning of the pump.

  The pump cover seems not to be strong enough. If children stand or jump on it, it gets indented. Collected rainwater stays in this dent and that is a starting point for corrosion.

- **Pumping Mechanism**

  The pumping mechanism is robust and easy to be maintained (regular greasing of curves, bearings and guiding parts is required).

- **Down hole Components**

  The pump cylinder made of stainless steel was directly connected to the GI riser pipes. This are places where corrosion starts due to electrolytic reaction.

- **Pressure Attachment**

  The stuffing box of the pressure attachment is mounted on a flange plate that seals the top of the rising main.

  The pressure sealing is made of a set of bushes and rings made of PUR and Rubber.
  A ready-made “sealing set” (bushes, rings & vegetable oil) is available for preventive maintenance. The seals are planned to be replaced by the maintenance crews in an interval of 18 months.

- **Casing Seal**

  For most handpump installations, the casing pipe is protruding the pump platform by 10 to 15 cm to prevent surface water from flowing into the well (contamination).

  For the PlayPump, the casing pipe is cut about 1 cm below the surface of the platform to accommodate a flange plate. Below the flange plate a layer of silicon based sealing paste is applied. This system is secure against water intrusion as soon as the pump stand is securely fastened to the platform, pressing the flange plate onto the seal.

- **Pump Platform**

  The edge of concrete platforms to the play ground (sand, soil or grass) must be smooth, so that no playing child can be hurt when “falling accidently of the play wheel”.

  Special care is required where platforms are placed in sandy ground, because the sand will be moved easily by playing children, leaving the platform edge exposed.

  The exposed edges are easy to break and the sharp corners could cause injuries to playing children.

  The system of demolishing the platform every time a pump intervention is made (removal of the rising main for maintenance reasons) is not a smart idea and the mission is regarding this system as a non satisfying solution.

- **Water Tank**

  Not one single water tank was found by the mission that was used for storing excessive water from pump operation. The users were all pumping only just as much

to fill their own canisters and the small amount of water that children were able to pump was immediately used for drinking purposes - surely not enough to satisfy all children's need (for drinking and washing hands).

In one of the water points visited, the mission found two water towers next to each other. Besides the standard PlayPump tower, there was a concrete tower in good condition, but not in use due to a leak in the water basin. With little effort, the water tank of the PlayPump could have been placed in the water basin of the old tower and the feeding pipe connected to the existing pipes of the toilets nearby and the new pipe stand.

- **Stand Post**

  If the tap of a stand post is opened fully, the water discharge is a powerful jet of water - too strong for school children to drink (considerable loss of water), but just right for communities, where water users are filling their canisters or buckets.

  In 3 villages (MOZ 0092, 0093 and 0094) we found stand posts that were locked by removing the handle for opening the water tap, in order that unauthorized persons have no access to the water.

Another system that can be used for locking the pump is to attach a smaller tap and taking off the faucet key.
The plastic pipe used for the outer face of the stand post is of PVC, which might become brittle and can break after being exposed to sunlight for a longer period of time.

Therefore special care is needed when casting the cement mix, so that all air is escaping. Such a stand would still be acceptable even if the PVC pipe would be destroyed after some years, because the outer cement surface would be smooth enough.

- **Billboard Tower**

  The strategy of generating enough funds to cover the maintenance cost for 10 years, does not work in rural Mozambique. In such places, no potential clients can be reached with the advertisement on the billboards. Most billboards are therefore initially blank and according to Roundabout Outdoor (ROA), the pumps in Mozambique are cross-subsidized by South Africa and Zambia, in order to cover the costs for maintenance interventions.

Ergonomic Issues

The PlayPump is an ideal playing facility for children between the age of 7 to 13 to 14 years. Children below the age of 7 years mostly fail to get the wheel in motion, whereas children over the age of 14 years are commenting that this is “little kids” play.

Most children mentioned that the maximum time they play is around 10 minutes, otherwise they get dizzy. Although all kids experienced falling down the merry-go-round, but nobody was seriously hurt. Less than 4% refuse to play on the pump due to getting hurt or dizzy. However, 31% of the children like the Afridev Pump better for drawing water because it’s easier to pump.

For adult users, pumping is an unfamiliar motion and many of them are complained of back pain when operating the PlayPump for a while.

One should not forget that for the last 20 to 25 years, most adults were used to operate a handpump by moving up and down a pump handle (Afridev).

This is in most cases the reason why the communities are not very happy. They requested that the pump should be replaced with a hand operated pump according to their preference.

- **Frequency of Pump use**

  According to the comments of water users, a PlayPump is in use between 6 to 12 hours per day.

- **Design Adaptations to Mozambican Conditions**

  Since the PlayPump is presently only produced in South Africa and the maintenance is made exclusively by local crews selected, appointed and trained in Mozambique by Roundabout Outdoor, no other local adaptations for the use in Mozambique were effected.

6.5 O&M Management

6.5.1 Operation & Maintenance

- **Maintenance System**

  The administrative part of the maintenance system is too complicated and influences the reaction time between the receipt of the breakdown message and the actual pump repair intervention. The mission appreciates that during a pilot phase problems can arise with the selection and training of good installation crews and also finding best practices for a satisfying service system. However, looking at the downtime Table 3 on Page 26, the mission feels that the present maintenance system failed and not enough effort was made to improve this unacceptable situation.

- **Downtime of Pumps**

  The downtime of some of the PlayPumps (some even never worked) is a real disaster for all stakeholders especially for the communities in need of water. Although the breakdowns of the 2 pumps MOZ 0017 (10 months) and MOZ 0054 (17 months) were reported long ago and all stakeholders were informed, no remedial action has been taken place so far.

  Another important factor for the down time and cost of service is the distance between the pump installation and the base of the installation crew. In Mozambique with many scarcely populated areas, a repair intervention might be a very expensive venture and cannot be planned like regular preventive maintenance checks. As an example:

Assumptions	
No. of pumps	100
Repairs needed	1/year, the time needed for the repair: 1 day
Team of 3 persons (wage per worker)	USD 100 per month
Transport (light weight lorry)	Cost USD 20,000 Depreciation 5 years Cost per km (fuel, O&M, etc.) USD 0.27/km
Travel distance per trip	120 km (60 km one way)
Tools	USD 400
Spare part cost	USD 40

Fixed cost (annual)	**USD**
Wages (3 x USD 100 x 12)	3'600.00
Depreciation	4'000.00
Tool cost (life assumed 3 years)	130.00
Training expenses (spread over 5 years)	300.00
Interest Charges (10%)	420.00
Overhead cost for Base (rent, etc.)	4'000.00
Total Fixed Cost per year	**12'450.00**
Variable cost (annual 100 pumps)	
Travel (2 x 60 km x USD 0.27)	3'240.00
Repair Cost & Spare Part(USD 40)	4'000.00
Total Variable Cost	**7'240.00**
Total annual O&M cost for 100 Pumps	**19'690.00**

Note: the repair cost are for scheduled maintenance only. Major repairs (like changing Rods and Rising mains) would be more costly as they require more spare parts.

- **Maintenance & Repair**

  From the maintenance intervention that the mission was able to attend, one can clearly see that the installation and maintenance crew of Mati mâ Tsâkissa is qualified to do this kind of work. However, if a maintenance system in itself is poorly organized, the overall results will remain bad, even with a good performing crew.

- **Partnership with local Contractors**

  Roundabout Outdoor confirmed that the contractual relationship with local service providers is based on short-term working contracts without long-term commitments. Contractors complain about difficulties and delays in payments and uncertainties on future commitments. Under such conditions a fruitful and long-term collaboration is difficult to achieve.

- **Communication of Breakdowns**

  The centralized maintenance and repair system through Roundabout Outdoor in Johannesburg has resulted in long delays of up to 10 months for some pumps to be repaired. In order to make the repair system more effective, users need to be actively involved in communicating the breakdowns. However, 36% of the communities and school's management do not know what to do in case of a breakdown.

  Therefore long delays might have been due to bad communication as well as slow response from the repair crews.

  Considering the long downtime (Table 3 on Page 26), the mission could well understand if the beneficiaries would loose confidence in this system, because no-one is responding when sending an SMS.

  To make users aware how the communication system for breakdowns works is a critical factor for the prompt response, which reduces the downtime of the pump. Only 64% of schools/communities visited knew how to communicate in case of a breakdown. Even the users of those pumps that had long time no running water did not know whom to contact for pump repairs. This lack of effective training of pump users by Roundabout Outdoor is the reason for the low level of satisfaction.

- **Sustainability**

  Unfortunately during the Pilot Phase, several technical problems came up that still need fine-tuning in terms of the pump technology, the process of implementation, and most importantly, the communication system of breakdowns and the maintenance and repair system. The mission is of the opinion that the post-pump installation period has been critical for the pilot phase, mainly due to several water quality and low yield problems, factors that might have a risk in the acceptance of the product by users and local governments.

  On the other hand, from the custom documents for importing the pumps into Mozambique and the data provided by Roundabout Outdoor, only 15 pumps had the billboards with proper advertisement. So far, maintenance and repair crews were subsidized by the advertisements in RSA and Zambia according to Roundabout Outdoor. The maintenance and repair system will be available only if the commercial billboards are producing enough revenues from the advertisement and the proceeds are properly channeled to pay for the local crews. Evidently the low purchase capacity of rural communities in Mozambique will limit the attraction of well known companies in RSA.

- **10 years Guarantee Period**

  Save the Children gave some support to users through the other programs implemented in the same areas; however, neither UNICEF nor the local contractors organized any follow up during this post-installation period.

  Lack of leadership and accountability are other problems that the mission saw on the organizational structure. Everybody is responsible and, at the same time, nobody is accountable for the outputs.

  It was also pointed out that only limited local decision making is possible due to a tight centralized administration at Roundabout Outdoor and paperwork has to go all the way to Johannesburg for their approval, which takes time (e-mail??). Although these centralized controls exist, the costs for repairs and rectifications are getting very expensive if local crews perform poorly.

- **Client Satisfaction**

  It is understandable that the pump users are far from being satisfied with the service provided to them, under the circumstances how the pilot project of the PlayPump in Mozambique has started.

  Due to the wide experience with the Afridev, community users tend to compare both pumps. The free cost for maintenance and repair is not a motivating factor for communities if downtimes of the PlayPumps are high and quality of water is bad. This is aggravated by not being given the capacity for actively solving the problems.

  They prefer paying while keeping control of their services.

  There was only one case, in which communities showed satisfaction for the free maintenance and repair service of the PlayPump. This community had an Afridev Pump before, which had frequent breakdowns and the costs for repair was above their capacity to pay.

6.6 Social Issues

6.6.1 Benefits

- **Social Benefits**

  Water Coverage:

  Every additional drinking water pump installed is a contribution to the aim of increasing water coverage for the rural population in need.

  From the 100 pumps installed by the time of the evaluation took place, only 57 new pumps can be counted for increasing the coverage. The remaining 43 PlayPumps substituted Afridev handpumps that were working or had minor problems, easy to repair at community level.

  PlayPump International Africa commented:
  The substitutions were made despite their instructions to Roundabout Outdoor and Save the Children not to replace working pumps.

  Roundabout Outdoor commented:
  The substitutions were made at the specific instance of Save the Children Fund, perhaps without the required consideration of the resulting consequences.

  Taking the maximal discharge of a PlayPump in Mozambique with a Ø 80 mm cylinder under ideal conditions, the maximal discharge is ~785 litres/hour (not 1'400 lt/h).

  Provided the PlayPump is operated continuously for 12 hours per day, 9'420 litres of water would be available to be distributed to the beneficiaries. If each person is getting 20 litres of water per day, the amount of pumped water would serve maximal 470 beneficiaries and not 2'500. See also comments of PPI and ROA below.

  After the request for commenting the figure of 2'500 beneficiaries per pump (stated in all PlayPump advertisements) and the request of the Mozambican Water Policy of a daily provision of 20 litres of potable water per person, the replies were as follows:

  PlayPump International Africa:
  Our aim is to provide access to clean drinking water. We do not police how the water is used or distributed as the school/community is the rightful owner of the pump. We have donated pumps to schools with 200 children and those with 6'000 and everything in between. We believe that the PlayPump® Water System is an appropriate technology for communities of 2,500.

  Roundabout Outdoor:
  "This is the theoretical wish of WHO; we aim to provide drinking water less than 5 litres per person".

  This shows clearly that the PlayPump is designed for schools only and that it is not a solution for communities.

- **Water Consumption and Health related Benefits**

  Based on a reduced sample of 13 groups of women and 10 groups of children interviewed in 26 of the schools visited, the evaluation mission analyzed the impact that PlayPump had on schools and communities. The main three indicators were related to water consumption, distance of water point and time dedicated to fetch water. The main results of the interviews were:

  a) Women from neighboring dwellers indicated a reduction on water consumption from 138 to 115 litres per day (per family) after installation of the PlayPump;

b) Basically, they are indicating that the distance has not changed very much because most of the pumps were installed on existing operational boreholes;

c) Users are complaining about the increase on time spent to collect water from 47 to 114 minutes after the installation of the PlayPump due to the heaviness of the pump and low yield and the fact that the water tank is never full.

- **School Attendance**

  In most rural communities where water is scarce, the collection of water is the task of women. Since also smaller girls must help to fulfill this task, quite a number of girls have not enough time for attending the local schools.

  One of the expectations when communities are getting access to water nearby is the reduction of time for fetching water. This provides a chance for many girls to attend at least the Primary Schools.

  However, the mission was not able to check whether the number of pupils increased in the local Primary Schools due to the availability of water.

  All children expressed high levels of enjoyment playing with the Merry-go-round. As expected, children identified learning as the most important motivation to come to school. Among other recreational activities, playing with the PlayPump was graded as 4th on their priorities, being ***Football***, ***Chuva,*** and ***Rope skip*** the most liked ones.

  Most of the groups of children noted various hygiene and sanitation activities facilitated and improved due to access to water. There were only few schools in with some problems were raised among women collecting water or school administrations not allowing children to drink water from the tap without playing on the Merry-go-round.

  Sixty percent (60%) of children groups interviewed informed that schools had received some kind of instruction to play on the pump, but not for longer that 10 minutes at the time.

- **Social Acceptance**

  Due to the technical difficulties that the PlayPump experiences in Mozambique, it turned out to be very heavy for women to operate the pump. Long cues and effort is needed by every women for collecting water.

  The mission experienced a new phenomenon in the local communities, in which daily work like collecting water is mostly done together. With pumps that discharge the water directly it's common practice helping each other.

  In all communities visited, the mission found that women are pumping now alone without supporting one another.

  This leaves pregnant women, elderly, disable and sick people without water because they are not able to join in operating the pump (too heavy, provoking back pain).

  When water is pumped into a tank it is not possible to access how much water is pumped. Thus women pump alone just as much to fill their own jerry-can.

  Another problem is that the water outlet is not close to the place where the pump is operated, so that the pumping person has the control of the amount of water to be pumped.

- **Users Preferences**

Table 5: Preferences

Group of Users preferring the Afridev	**7**
Prefer Afridev because is easier to pump	7
Prefer Afridev because better quality and quantity of water	4
Prefer Afridev because they have control over O&M	4
Group of Users preferring the Play Pump	**5**
Prefer PlayPump because Afridev has too many breakdowns	5
Prefer PlayPump because is easy for children to pump	3
Prefer PlayPump because water is for free	1
Group of Users without preference	**1**

The above table is providing the users point of view about the alternative products PlayPump and Afridev. It is also providing their criteria to choose for one or the other.

The percentages above are based on the number of groups that gave that answer out of the 13 focal groups interviewed.

This is just a simple analysis that can provide Roundabout Outdoor and PlayPumps International Africa, the views of the end users in order to do a more in-depth analysis of the market to understand the needs and expectations from women and children to adapt the technology in the Mozambican environment.

6.6.2 Expansion Strategy

A SWOT analysis highlights some competitive advantages of the PlayPump that can provide new and practical alternatives for self-sustaining maintenance cost recovery, for the government to be interested in:

- Advertising billboards to generate revenue throughout the pump guarantee period,
- Finding additional dedicated local contractors for maintenance and repair.

However, it also shows the threats of poor quality performance of the local private sector and the weakness in the lack of understanding the needs and expectations of the government and end users. End users are schools and also communities, for which some fine tuning of the pump design might be needed.

7. Recommendations

7.1 Visions, Targets and Strategies

7.1.1 Water Policy and Sector Guidelines

- **National Policy**

  The relevant Water Policy and Sector Guidelines as mentioned in 5.1.1, Page 12, are not followed by the PlayPump Pilot Project. Therefore it might be a problem in future to communicate the different approaches to the rural community, whereby the majority has to pay for pump maintenance and some not.

- **Rural Water and Sanitation Strategy**

  As earlier noted in the report, the Rural Water and Sanitation Strategy (RWSS) prioritizes three main strategic directions to reach the Millennium Development Goals, these are:

  - Increasing coverage by attracting funds for investment, and setting up management mechanisms leading to greater sustainability.
  - Improving research and innovation on alternative technologies to reduce costs and finding more sustainable management models.
  - Institutional and human resource development to support decentralization of the water supply sector.

- **Adaptation to Mozambican Strategies & Policy Context**

  Since the PlayPump pilot phase in Mozambique did not fulfill the principles of RWSS, it will be necessary to start a dialogue with the Government to arrive at a mutually accepted mode of operation.

  This method also needs to be **Accepted and Endorsed by the Government** and communicated to the province and district authorities as also to all stakeholders.

  Concerning the institutional collaboration, the Ministry of Education and Culture (MEC) and the National Directorate of Water (DNA) should define exactly the interfaces concerning the responsibilities in water supply for schools and communities.

  Also about the necessity of informing and discussing any change of pump type with the beneficiaries, i.e. by formulating a Memorandum of Understanding (MoU).

7.1.2 Roundabout Outdoor and PlayPumps International Africa

- **Communication and Liaisons**

  Now that PlayPump International Africa has terminated its relationship with Roundabout Outdoor, the situation going forward in Mozambique is not clear yet and it makes it more difficult for the Mozambican stakeholders to know, with which organization to deal with.

  The mission is recommending that the two parties (ROA and PPI) have to discuss about their responsibilities and future approach in Mozambique. The decisions taken needs to be communicated clearly to all the stakeholders in Mozambique.

7.2 Pilot Project

7.2.1 Partners

- **Practical Strategies**

  It is important for Roundabout Outdoor and PlayPumps International Africa to translate their organizational missions into practical strategies and performance indicators across different stakeholders from the following perpectives:

  a) **Customer:** How do customers view the product and service provision? What are their needs and expectations?
  b) **Internal Process:** Where must the organization improve to ensure lowest pump downtime (10-year guaranteed maintenance & repair)?
  c) **Learning/Growth:** How can breakdowns be reduced and communication system improved to create an additional value of the product?
  d) **Financial:** How do shareholders view the sustainability of the pumps?

7.2.2 Target Groups for PlayPump Installation

- **Pumps for Primary Schools**

  Schools should be the main target points for the installation of PlayPumps in the present form. There is less pressure of producing a large amount of water, because it is only used for drinking purposes and for washing hands after using the latrines.

  For larger schools (i.e. in Ndlavela de Matola, with 6'000 pupils daily), more pumps should be installed or solutions found with more yield (i.e. borehole with submersible pump).

  Sharing the water with a community is always problematic and is only possible if the school would strictly organize the management of the water point.

- **Pumps for Communities**

  Special care should be taken when planning to install PlayPumps in communities. It is advisable to select the communities carefully and let them participate in the decision taking process. Experiences made in communities shows that it is not advisable to just using an existing borehole and replace an operational handpump by a PlayPump. Whenever possible, the PlayPumps should be installed on new boreholes.

  Concerning the operation technique, Roundabout Outdoor & PlayPumps International Africa are advised to look into different opportunities to satisfy the need of the communities, which is most important for the future of the PlayPump in Mozambique.

7.3 Site Selection and PlayPump Installation

- **Hydrological Assessment**

  Under normal circumstances, a pump manufacturer or supplier is not responsible for the correct performance of the borehole and the selection of a suitable place for installing the pump.

  This is different with the placement of a PlayPump, because the pump supplier ROA is providing a 10 years guarantee and all interventions (installation, maintenance and repair) are made by the service crew of ROA.

  Therefore it is important for ROA that all borehole parameters important for a good performance of the pump are met and the water quality is known.

Roundabout Outdoor made the mistake not to provide exact instructions about the data required. Any data presented to them should have been double checked.

Improvement of Assessment Procedures:

The mission regards the following points as important:

a) Clear instructions what to test,
b) Guidance during the assessment,
c) Double-check the test results.

A hydrologist of their choice could be employed to check the assessment system and to verify the data received.

The mission is not clear whether DNA/DAR has drilling records and water testing reports of all boreholes existing in Mozambique. This information collected by the water authority could also be taken into account before deciding to place any pump.

- **Consultation of Beneficiaries**

  If any new type of technology is introduced in rural areas, it is most important to involve the end-users right from the beginning and to take their worries and suggestions seriously. The beneficiaries of the new product will be the key point to decide whether the introduction of such a technology will be successful or not. Worst case for the pump users is a non operational pump, which is not repaired within a few days.

- **PlayPump Installations**

  Improvement of Installation Procedures:

  Also for the installation procedures, the installation crews should fill a specially designed Installation Form. Furthermore, basic training about water quality testing and the borehole characteristics for the installation crews would be recommended.

  Paul Ristic commented:
  The installation crews are provided with a printed installation instruction form containing all technical details of the borehole (as provided by the responsible geo-hydrologist) and the installation specifics. This form is then returned to our office with any changes in information, which the installation crew may have found at the site.

  Rectification of PlayPumps installed in the Pilot Projects in Mozambique:

  However, the gravity of the problems encountered requires immediate remedial action.

  A second assessment of all boreholes including a check of the water quality is a must to get reliable data for being able to start the improvement of the pumps accordingly.

  In places where pumps are not working, they have to be taken out and replaced by new PlayPumps or other pump models.

  Important: The pump users must have the opportunity to decide on the pump type they prefer!

  Paul Ristic of Roundabout Outdoor promised during a meeting held in Xai Xai on 23 April 2008 that he is trying to get funds for a second assessment of the boreholes (excluding the boreholes funded by TNT) and the rectification of the pumps. He is aware that the total costs for a second assessment and the costs for rectifying all pumps installed so far will be very high.

  Paul Ristic also noted:
  We will, where possible endeavor to recover part or all of the retesting costs from the parties responsible for the provision of the defective information.

7.4 Technology

7.4.1 Service Capacity of the PlayPump

General Comments:

The mission feels that the "Merry go Round" part of the PlayPump is a wonderful toy for school children in Mozambique and elsewhere. All children love to play and have fun by turning the wheel, jump on it, rest for a while and chat etc.

Nowadays there are better technical solutions available to provide drinking water for the price of a PlayPump, without urging children to work and providing adults with a daily dose of back pain.

Why not to provide a "Merry go Round" in the shade at schools or communities and install a solar driven submersible pump, which would guarantee a much larger amount of water. This would not only make school children happy, also would surely satisfy the need of all water users including old, sick and disabled people.

Paul Ristic's comment:
The merit of the above solution is beyond question in circumstances where there is a guarantee that its solar panels are not stolen or vandalized and there is sufficient financial capacity in the recipient community to pay for the maintenance of the submersible pump.

7.4.2 Product

- **Product Design**

  The pump cover could be improved in a way that standing or sitting on it would not be possible by making a conical shape. This would also have the advantage that rainwater could drain easily without any movement of the play wheel.

Paul Ristic, Managing Director of Roundabout Outdoor commented:
"This problem has been noted and will be rectified by the provision of galvanized and painted pump covers for existing and future installations".

- **Pumping Mechanism**

  Besides having the existing pumping mechanism, it might be worthwhile to check alternative possibilities i.e. using the PlayPump with a Mono cylinder (and gearbox) or look into wind or solar energy for backing-up or to substitute the pumping operation.

Information from Paul Ristic:
ROA has already developed and field tested a deep well PlayPump based on a Helical Rotor pumping principle. ROA is in the process of concluding research and development on a PlayPump model that generates electricity.

Information from Geoff Hopkins:
"As part of their new Water for All programme, on June 13 PlayPumps International Africa signed an MOU with Mono for the development and supply of the next generation of merry-go-round pumps using Mono technology, as well as solar pumps and a new pump which comprises a merry-go-round with solar backup." Feedback previously received from Governments, UNICEF, World Vision and Save the Children will be incorporated into the new pump.

- **Down hole Components**

  The mission is recommending using stainless steel riser pipes and pumprods in general. Since all pump cylinders are made of stainless steel, no GI pipe should be

attached to it without using a connecting part of brass (avoiding an electrolytic reaction that leads to corrosion).

To connect the stainless steel pumprod to the horizontal bar (mild- or tool steel), a brass bush is required to avoid direct contact of the different steel qualities.

Paul Ristic of ROA noted:
ROA is aware of recurring problems as a consequence of aggressive water quality and has already implemented PVC risers for situations where the information of aggressive water became available. ROA is in process of preparing a rollout of stainless steel.

- **Pressure Attachment**

  The installation & maintenance crews must be instructed to use no other oil or grease than the vegetable oil provided in the "sealing replacement set" for lubricating the contact surfaces of the pressure attachment, avoiding contamination of the well water.

- **Casing Seal**

  The sealing plate must not be removed before the access hole in the platform is opened (surface to be demolished) avoiding concrete chips falling into the well.

  Special care is required whenever the sealing is made new after each removal of the rising main for maintenance or repair. Clean working conditions prevent small stones and residue from the old seal from falling into the well or disturb the proper function of the new seal.

- **Pump Platform**

  For sandy ground it might be necessary to increase the platform size by approx. 2 m in diameter, so that the sand is not moved by playing children and the platform edge is not too much exposed and starts to break.

It is a must that the play ground near the play wheel is cleared of larger stones, rocks or any other obstructing objects that could hurt playing children seriously!

A concrete cover for getting easy access when the pressure pipe needs to be disconnected (removal of the rising main) could be designed, in order to avoid demolishing the platform for each intervention on pump cylinder or rising main.

- **Water Tank**

  In case the billboards would be used for public health messages only, the height of the water tower could be reduced to about 3 m. This height would still be enough for feeding the stand post and the tap near the toilets and it would be easier for the water users to read the health messages (not to forget the reduction in price).

  After the experiences made during the field visits, it might be worthwhile considering a smaller tank size. The mission would suggest to replace the 2'500 litre tank with a tank size of 1'000 litre.

Another possibility could be placing a Water tank on a pedestal on the ground with a tap provided at the bottom side of the tank for filling jerry-cans and buckets with the stored water. The public health messages could surely be placed at the walls of the schools.

This option would reduce the costs considerably (no water tower) and at the same time would reduce the effort for turning the play wheel (maximal feeding height 2 m).

- **Stand Post**

  In the present situation it would be an advantage for school children to have more than one water tap for drinking. Therefore the drinking taps could be of a smaller size and maybe self closing, in order to reduce the loss of water.

  Paul Ristic, Managing Director of Roundabout Outdoor commented:
  "In a short time, children understand that they must turn tap on slowly".

  In places where the water of PlayPumps is shared with the community, it might be advisable to provide a number of drinking water taps that could be fed by a smaller additional water tank/container (50 to 100 litres). The feeding pipe of the smaller container could have a directly connection with the feeding pipe of the large water tank, in order to "top-up" the drinking water in the smaller container whenever the play wheel is operated (no interference with the community).

  The mission feels that this should be a "must" to install at least one tap near the school toilets, in order to provide an easy solution for the children to wash hands after using the toilet.

  The size of the present spout on the stand post is ideal for the community to fill their canisters and buckets. The spout pipe could be cropped to 90°, which would prevent the water users from hanging the canisters onto it during filling of water. This measure might reduce the problems of many breakages and leaks of taps.

- **Billboard Tower**

  PlayPumps International and Roundabout Outdoor with its local partners will have to decide whether the billboard tower will be used in the same form in rural Mozambique, where space for commercial advertisements might be difficult to sell.

  If a different approach is tried, costs could be reduced by using a 3 m water tower (enough for feeding water taps nearby) and the billboards could be used i.e. for hygiene promotion, aids or malaria prevention, government information etc.

  Paul Ristic, the Managing Director of Roundabout Outdoor commented:
  ROA is in the process of developing new strategies to attract funds committed to Public Service Advertisements for getting enough (additional) finances to cover all intervention costs.

  Geoff Hopkins, Managing Director of PlayPumps International Africa, commented:
  As part of their new operating model (which does not include Roundabout Outdoor), they will not be using the tank stands for commercial advertising. Only public service messages will be displayed and one board will be used for donor recognition and repair instructions so it is more visible to users.

- **Water Point Setup**

  During the survey about where to place a new PlayPump, the positioning of the water tower and the stand post might vary from the standard setup and therefore it is advisable to consult the users and ask for their preference. The point already mentioned under "Stand Post" concerning a tap near the toilets must also be clarified and planned.

- **Ergonomic Issues**

  As commented earlier in this report, children between 7 to 13 years like this pump very much because this is the only large playing facility they have.

  The situation is changing completely when asking adults who are depending on the water source. The main issue is the unusual operation motion that gives the users problems. Therefore it might be wise to find either solutions to satisfy the majority of water users or to take a decision to install PlayPumps only at schools, in order to get a successful pump.

Paul Ristic, the Managing Director of Roundabout Outdoor commented:
Our main focus is oriented towards provision of water at primary schools.

7.5 O&M Management

7.5.1 Operation and Maintenance

- **Maintenance System**

  ROA must introduce an extensive but practical system for securing a Quality Standard of all maintenance and repair interventions.

  - Development of a systematic approach for all maintenance and repair interventions for the maintenance crews (Installation, Maintenance & Repair Manual).
  - Employment of more Maintenance & Repair crews, at least one per province.
  - Development of a Maintenance & Repair Form for every intervention made.
  - Development of a Monitoring Form, which would give the history of each pump and provide data for further technical pump improvements.
  - Long-term contracts for reliable maintenance and repair crews.

- **Downtime of Pumps**

  It is of major importance to reduce the downtime of broken pumps considerably to get better client satisfaction.

  The figure of being able to maintain 100 PlayPumps in two different provinces per one installation and maintenance crew, has shown to be too ambitious (39 in the Maputo Province and another 61 PlayPumps in the Gaza Province).

  This figure might be correct under South African conditions, but in rural Mozambique the number of pumps to be installed and maintained will be lower due to large distances between the pumps and because of the poor road conditions.

  Developing more installation and maintenance teams with at least one base per province (near the installed pumps) will surely reduce the downtime of broken pumps. Another point is the decentralization of the installation, maintenance and repair management by having a local office in charge of all interventions.

  The evaluation team recommends concentrating on quality control and capacity building and improving motivation of local contractors with long-term commitments. Periodical renewals of contracts must be based on good performance and clear terms of reference should be the guidelines for local crews. Such a system would ensure good supervision of water points in combination with an easier breakdown communication system, which would surely reduce the down-time of broken pumps.

Roundabout Outdoor should focus on creating a local subsidiary in charge of close monitoring, technical and financial audits and periodic trainings, in order to create local capacity and build trust among local partners.

It might be important for Roundabout Outdoor and PlayPumps International Africa to know the minimal population density required that makes O&M interventions profitable.

Paul Ristic informed:
There is a regular 18 month preventive maintenance programme in place in respect of the Forcehead as well as an annual Tap replacement programme. ROA is in discussions with DPOPH Gaza and Sofala regarding the development of a community training and participation programme, which would substitute the Tap replacement programme.

Geoff Hopkins of PlayPumps International Africa informed:
As stated earlier, we have requested reports regarding the 18 months preventive maintenance programme repeatedly. Unfortunately ROA never complied with our request and this lack of transparency is one of the reasons we terminated our contract with them.

- **Maintenance & Repair**

  The main tasks of the maintenance and repair crews are:
  - Preventive & regular maintenance of Infrastructure,
  - Repairs of infrastructure (as required),
  - Monitoring of pump performance (2 x yearly), together with DPOPH,
  - Monitoring of users satisfaction (2 x yearly), together with DPOPH,
  - Documenting all interventions made for each pump,
  - Report of intervention to DPOPH,
  - Transparent information on the costs and how it is refunded.

  As a role, each pump should be visited at least two times per year.

  As the number of pump installations increases (plans exist to install more PlayPumps in Maputo, Gaza and also in the Sofala Province), more maintenance crews will need to be trained by Roundabout Outdoor and PlayPumps International Africa. The number of repair and maintenance crews will not only depend on the targeted 100 pumps, but also on the area (large distances) to be covered by O&M crew.

- **Communication of Breakdowns**

  Finding a workable Communication System for Reporting Breakdowns

  The mission is suggesting:
  - to use one billboard for providing the contact number and to give an easy instruction in Portuguese how to make an SMS,
  - to develop a second system (backup system) for communicating pump failures to the local maintenance and repair team in charge.

    Paul Ristic informed:
    ROA is currently in the process of finalizing research on a telemetry device that is GSM or satellite based, which would permit remote monitoring of the water flow.

  It is important to recognize that the communication system must be well known and accessible by all users for the effectiveness of the 10-year guarantee.

  As its core activity, ensuring sustainability of the PlayPump, Roundabout Outdoor

must dedicate resources to make the system well known for users at all points served by the PlayPumps and even considering create an alternative channel that will always backup the communication system.

Therefore, it is important to involve the parent-teacher associations and community leaders in all training sessions to ensure that everybody knows how to communicate breakdowns and to be aware of the importance of a functional PlayPump.

- **Sustainability**

  Sustainability of the PlayPump Pilot Project is the responsibility of Roundabout Outdoor and PlayPumps International Africa.

  Communication channels for reporting breakdowns and the fast repair intervention must be organized as such that they are functioning well from the time of pump installation until the 10 years guarantee period is over.

  The following steps throughout implementation phase could be considered:

  - Adapt the PlayPump business model to ensure that advertising revenues or other sources can guarantee maintenance and repairs in rural Mozambique where purchasing power capacity of users is very low.
  - Address the realities of operation in a vast area with poor roads to ensure cost effectiveness of maintenance, repair and monitoring.
  - Assess the lack of technical skills and capacity building needs to ensure PlayPumps construction of new boreholes, quality borehole assessment contracting, supervision.
  - Ensure sufficient business incentives from the tasks to survive in a fairly hostile business climate to carry out maintenance and repairs of PlayPumps.
  - There is a need to communicate successes and difficulties faced, in order to improve the collaboration amongst all stakeholders and to progress faster in solving remaining problems.
  - DPOPH should be more involved in monitoring of pump performance and social acceptance of the installed PlayPumps.

    Paul Ristic of ROA informed:
    The advertisements are also funded by international organizations wishing to support public service advertisements as has been the case with the 10 installations, which display the message from the department of education.

  It is recommended that Roundabout Outdoor or PlayPumps International Africa must have a local representative that leads the market expansion and ensures a cohesive, good quality and dynamic organizational structure among partners and stakeholders.

- **10 years Guarantee Period**

  The conditions of the 10 years Guarantee have never been mentioned by ROA, though there are many details unclear:

  a) How long is the waiting time for beneficiaries from the time of the SMS contact to the arrival of the repair crew?
  b) Are there any reasons that could lead to a loss of the right of guarantee?
  c) What are the reasons for not repairing a number of pumps for many months?
  d) What happens after the 10 years guarantee period is over?

Geoff Hopkins of PPI informed:
As part of ROS's responsibility to maintain pumps for 10 years, PlayPump International Africa expected pumps to be repaired within 7 to 10 days after being reported. As noted in Skat's findings, this did not happen in Mozambique and is one of the contributing factors to our decision to terminate their contract. ROA Director, Trevor Field, also publicly stated a 72 hour turnaround period on repairs in an interview available on the web at: http://www.wise.umich.edu/img/fieldwise_WMV_384Kbit_stream.wmv.

7.6 Social Issues

7.6.1 Expansion Strategy

- **Schools**

  There is a great need for any type of water lifting options, because:

  a) 75% of the schools in Mozambique do not have water facilities yet.

  b) MEC does not dedicate the appropriate resources to keep the existing pumps operational. There is no clear definition about responsibilities as an institution in relation to the maintenance of the water supply management.

- **Community Supply**

  The water sector is willing to pilot innovative management models such as the PlayPump business model.

  However, there are several factors that Roundabout Outdoor or PlayPumps International Africa need to consider in order to expand into the Mozambican market:

  1. Define the organizational structure with clear roles and responsibilities of all partners.
  2. Indicate where there are differences to the national policy and describe how these are handled and communicated to all partners.

  Follow up (post-installation) phase:
  - Monitoring of breakdowns, communication and response;
  - Quality Control of local maintenance and repair crews;
  - Community score cards for service evaluation and benchmarking.

- **Organizational Learning and Management**
  1. Set up a local and decentralized organizational structure for the consolidation of the pilot phase and the potential expansion of the market.
  2. Actively involve the DPOPH and district governments at all stages of planning, implementation and monitoring as part of its day-to-day operations, making sure that, whatever the management models to be used, information exchange from all partners is essential for planning and monitoring.
  3. Reflect on progress to avoid costly results through continuous analysis of information, drawing lessons learned and best practices to feedback on the process at all levels.

General Comments

The mission is of the opinion that the PlayPump Pilot Project does not have a strategic planning, so that the set targets could not be compared after 2 years with the progress made.

However, to give the Government of Mozambique a possibility to discuss whether the Pilot Project should be extended or stopped, the following facts have been listed by the RWSN mission:

Table 6: Pump Performance

Comparison	PlayPump	Afridev Pump
Complying with National Water Policy	no	yes
Water discharge/hour with Ø80 mm cylinder (20 m)	~ 785 liters	---
Water discharge/hour with Ø50 mm cylinder (20 m)	~ 300 litres	~ 1'000 litres
Cost of pump in Maputo (hardware only)	4'450 USD	~ 1'200 USD
Cost for pump installation (including transport)	5'600 USD	500 – 1'000 USD
Running costs per year	not known	~ 100 USD
Expected lifetime of pump	12 – 15 years	8 - 12 years
Pumps can be locally produced	no	80% locally made
Pumps can be installed by local mechanics	only by ROA crews	yes
Pump can be maintained by the users (VLOM)	no	yes
Do users have to pay for maintenance and repair	no	yes
Pump liked by school children (age of 7-13 years)	yes, very much	yes
Pump liked by adults	no	yes

8. Annexes Annex 8.1 Terms of Reference

EINGEGANGEN
2 . Nov. 2007
Erl.....

REPÚBLICA DE MOÇAMBIQUE

MINISTÉRIO DAS OBRAS PÚBLICAS E HABITAÇÃO
DIRECÇÃO NACIONAL DE ÁGUAS

DEPARTAMENTO DE ÁGUA RURAL

À:
SKAT
Att: Sr. karl Erpf/Erich Baumann

Suíça

Nota nº 531/502/B7/2007 de 31/10/2007
V/ Ref. nº

Assunto: Avaliação das Bombas Manuais de tipo Carrossel "PlayPump" em Moçambique

Exmo Senhor,

O Governo de Moçambique, através dos Ministérios da Educação e Cultura (MEC) e Obras Públicas e Habitação (MOPH), Fundo das Nações Unidas para a Infância (UNICEF) e o Programa Mundial de Alimentação (PMA), assinaram em Maio de 2005 um Memorandum de Entendimento para a implementação do Projecto de Abastecimento de Água e Saneamento às Escolas, denominado Escolas Florescentes, no âmbito do qual foram instaladas a título piloto 30 bombas manuais do tipo Carrossel ("PlayPump") em escolas primárias das zonas peri-urbanas e rurais das províncias de Gaza (14 bombas) e Maputo (16 bombas).

Findo o projecto, e tratando-se de uma iniciativa piloto, a Direcção Nacional de Águas (DNA) pretende avaliar o desempenho e o impacto das 30 bombas do tipo Carrossel instaladas nas duas províncias. Considerando que durante o periodo da implementação desta iniciativa piloto outros parceiros instalaram nas mesmas províncias um número adicional de cerca de 100 bombas do tipo Carrocel, pretende-se igualmente que a presente avaliação abarque algumas destas escolas e comunidades para também avaliar as abordagens usadas e o impacto que as bombas estão a ter neste novo contexto.

Para a realização da avaliação, a DNA pretende contratar serviços de uma instituição credenciada nos assuntos de tecnologias de abastecimento de água rural. É nesse contexto que convida a SKAT à submeter, até o dia 03 de Dezembro de 2007, uma proposta para realizar a presente consultoria que terá lugar em Fevereiro de 2008. Na implementação da avaliação a SKAT deverá

Av. Eduardo Mondlane, 1392-4º – Tel. 323269/ 43 02 03/ 82 3177260/ FAX 430110; C.P. : 2847 e- mail: depaguarural@tvcabo. co.mz, Maputo

trabalhar em parceria com o Centro de Formação Profissional de Água e Saneamento de Maputo (CFPAS).

Os Termos de Referência para a orientação do consultor são enviados em anexo.

Com os melhores cumprimentos.

O CHEFE DO DEPARTAMENTO

Joaquim Jorge
Técnico Superior N1

Av. Eduardo Mondlane, 1392-4º – Tel. 323269/ 43 02 03/ 82 3177260/ FAX 430110; C.P. : 2847 e- mail: depaguarural@tvcabo. co.mz, Ma

REPÚBLICA DE MOÇAMBIQUE

MINISTÉRIO DAS OBRAS PÚBLICAS E HABITAÇÃO
DIRECÇÃO NACIONAL DE ÁGUAS

DEPARTAMENTO DE ÁGUA RURAL

Termos de Referência
Para a avaliação da bomba manual do tipo Carrossel em Moçambique

1. Antecedentes e Contexto

O acesso a água e saneamento rural em Moçambique é ainda muito baixo. Dados recentes indicam que apenas 43.1% da população que vive nas zonas rurais do país tem acesso a água potável enquanto 36% tem acesso a um saneamento adequado.

O Governo tem feito esforços no sentido de aumentar o acesso á água potável, através da instalação de bombas de água, em particular nas comunidades rurais. A Política Nacional de Águas inclui a padronização das tecnologias de abastecimento de água, de modo a permitir a produção local de peças sobressalentes, bem como a manutenção das bombas pelas comunidades. A Direcção Nacional de Águas (DNA) do Ministério das Obras Públicas e Habitação (MOPH), regula a construção de furos de água e a instalação das bombas de água no contexto de estimular a demanda e assegurar a sustentabilidade das fontes com base na comparticipação das comunidade beneficiárias.

Apesar destes esforços, cerca de 25% das bombas instaladas no país não estão a funcionar devido á falta de manutenção e falta de disponibilidade de peças sobressalentes ao nível das comunidades e dos distritos.

O levantamento escolar de Março de 2005[1] mostrou que o país tinha 10.016 escolas primárias das quais apenas 30 % tinham instalações de água e saneamento. Estas, em muitos casos nas zonas urbanas não funcionavam devidamente. Nas zonas rurais, o fecalismo a céu aberto á volta das escolas é a prática mais comum uma vez que não existem sanitários/latrinas nas escolas. Nos casos onde as latrinas são construídas, não existem padrões e desenhos acordados e, por esse motivo cada parceiro, incluindo o governo, usa o seu próprio desenho.

No âmbito do Memorando de Entendimento assinado a 02/06/2005 entre O UNICEF e o PMA, endossado pelo Governo de Moçambique através dos Ministérios de Educação e Cultura e Obras Públicas e Habitação, foi instituído o Projecto Escolas Florescentes. Este projecto surgiu com a iniciativa do grupo holandês TNT que coopera com o Programa Mundial de Alimentação a nível mundial, para financiar a construção de fontes de água nas escolas primárias moçambicanas através do seu parceiro PMA. O PMA convidou o

[1] Levantamento anual das escolas, 2005

UNICEF que tem no seu mandato a componente de Água e Saneamento, onde existem programas específicos para escolas, para se juntar a iniciativa. Neste sentido o UNICEF adicionou a componente de saneamento e educação para a higiene, para completar o pacote de intervenção nas escolas, passando assim a ser um programa conjunto entre as duas agências das Nações Unidas na cooperação com o Governo de Moçambique. As bombas Carrossel foram doadas pela Play pumps International.

2. Justificação

A implementação deste projecto já chegou ao fim e algumas bombas estão a funcionar a mais de um ano. Tratando-se de uma iniciativa piloto, urge fazer a avaliação do desempenho destas bombas e do impacto que as mesmas estão a ter nas escolas e locais onde foram instaladas. Considerando que durante o período da implementação deste memorando outros parceiros entraram no terreno com as bombas Carrocel, a presente avaliação poderá abarcar algumas destas escolas e comunidades para também avaliar as abordagens usadas e o impacto que as bombas estão a ter neste novo contexto.

Similarmente, alguns parceiros de cooperação pretendem introduzir mais bombas Corrossel em Moçambique sem que tenha sido feita uma avaliação da abordagem usada na iniciativa piloto e sobre que áreas deverão merecer atenção especial de modo que as tecnologias de abastecimento de água introduzidas no país sejam sustentáveis e de acordo com a Política Nacional de Águas. Neste contexto, a avaliação justifica-se e tem enquadramento no próprio Memorando de Entendimento assinado a quando da introdução desta tecnologia.

O resultado desta avaliação vai ser a base para a recomendação a ser dada para a expansão da instalação das bombas Carrossel em Moçambique.

3. Objectivos da avaliação

Gerais

Com base no acima exposto, pretende-se fazer uma avaliação do impacto e operacionalidade da bomba Carrossel, bem como a sua adaptação as condições sócio-económicas do país.

Específicos

Especificamente, pretende-se:

- Avaliar a efectividade da bomba Carrossel e o impacto que esta está a ter no melhoramento do acesso a água potável nas escolas beneficiárias e nas comunidades abrangidas; incluindo os aspectos de acesso e retenção dos alunos nas escolas;

- Avaliar a eficiência desta intervenção em termos de custos (financeiros e humanos) comparados com os resultados obtidos aplicando outras tecnologias de abastecimento de água, por exemplo a bomba Afridev;

- Avaliar a sustentabilidade desta tecnologia tendo em conta os requisitos da Política Nacional de Águas e as abordagens usadas na instalação desta bomba e na manutenção da mesma;

- Obter pontos de vista de todos os envolvidos, particularmente dos alunos e comunidades beneficiárias no que se refere a bomba Carrossel como uma tecnologia efectiva e adequada para a provisão de água potável, bem como sobre os seus níveis de satisfação/aceitação;

- Dar recomendações concretas sobre como proceder na eventual expansão deste tipo de tecnologia para as escolas e comunidades.

4. Metodologia do trabalho

Para este trabalho a metodologia inclui:

- Compilação de toda a informação existente ao nível de gabinete, referente a introdução desta tecnologia, baseada no contacto com as instituições chave de implementação desta iniciativa, nomeadamente MEC, MOPH, PMA, UNICEF, e outros, incluindo as DPOPH's de Maputo e Gaza, Governos Distritais das áreas abrangidas e a SAVE THE CHILDREN USA.

- Elaboração dos questionários a serem usados no levantamento de campo;

- Visitas e recolha de dados em todas as escolas em que foram instaladas as bombas Carrossel com o apoio deste projecto, como também nas escolas e comunidades onde as bombas foram instaladas por outros parceiros. Nestas visitas de trabalho o consultor deverá ter encontros separados e conjuntos com as direcções das escolas, alunos e membros das comunidades beneficiárias. Com base no questionário chave, orientar a discussão de modo a apurar a efectividade da bomba e o grau de satisfação dos beneficiários.

- Interagir com as comunidades escolares e circunvizinhas, provedores de serviços e autoridades escolares a todos os níveis, desde que envolvidos nesta iniciativa.

- Depois do trabalho de campo, reunir com os promotores da iniciativa ao nível do MEC, MOPH, PMA e UNICEF e informar sobre os principais resultados do trabalho e colher os seus pontos de vista.

- Elaborar o relatório final com resultados finais e recomendações específicas.

5. Implementação da avaliação

Para a implementação da presente avaliação são solicitados os serviços de consultoria da STAK, que deverá trabalhar em parceria com o Centro de Formação Profissional de Água e Saneamento de Maputo (CFPAS). A STAK é a instituição que irá liderar a avaliação.

6. Actividades e tarefas

- Em colaboração com os principais parceiros (DNA, MEC, UNICEF e PMA), elaborar o questionário para a avaliação da efectividade da bomba Carrossel nas escolas.

- Elaborar o programa de levantamento nas escolas listadas (lista anexa);

- Fazer entrevistas ás crianças nas escolas, professores e elementos da comunidade circunvizinha no que concerne á funcionalidade da bomba Carrossel;

- Preencher os questionários elaborados de forma legível e processar a informação;

- Verificar quem e quando fez a instalação das bombas Carrossel;

- Verificar a existência de um sistema de instalação, manutenção e reparação das bombas baseado em pessoal local/empresas locais;

- Verificar o estado em que se encontra a bomba, utilização e disponibilidade da água desde a instalação e concretamente durante a avaliação;

- Contactar a entidade que fez a instalação e manutenção e colher dados sobre o número de avarias verificadas em cada bomba, tipos e duração das avarias. Verificar a mesma informação junto as comunidades e DPOPHs;

- Verificar o funcionamento do mecanismo de informação das avarias;

- Compilar e confrontar esta informação com aquela obtida a partir dos directores das escolas, comunidades e DPOPHs;

- Actualizar os dados dos alunos nas escolas e o número aproximado da população que beneficia da fonte;

- Apurar e analisar a satisfação da comunidade com o uso da bomba Carrossel, dificuldades que tiveram e o treino que lhes foi dado;

- Verificar o comportamento de higiene nas escolas visitadas, nomeadamente o estado das latrinas e a organização existente para higiene e limpeza das mesmas;

- Verificar a existência ou não de horta escolar e a contribuição que a existência da bomba dá para a sustentabilidade desta iniciativa;

- Elaborar um relatório conciso com os resultados do levantamento e as recomendações pertinentes. As recomendações devem basear-se no desempenho da bomba, grau de satisfação dos utilizadores e funcionalidade da bomba.

7. Resultados, submissão da proposta e execução da avaliação

7.1 Resultados

Desta avaliação da playpump espera-se um relatório conciso com recomendações claras sobre a operacionalidade da bomba incluindo o número de avarias, duração, existencia ou não de equipa de reparação e a prontidão da mesma na resposta. Espera-se também uma informação sobre o grau de satisfação dos beneficiários, nomeadamente alunos nas escolas e comunidades beneficíarias assim como a conformidade com o preceituado na Política Nacional de Águas. O resultado desta avaliação vai ser a base para a recomendação a ser dada para a expansão da instalação das bombas Carrossel em Moçambique.

7.2 Submissão das propostas e execução da avaliação

- O consultor deverá submeter a sua proposta técnica e financeira até o dia 03 de Dezembro de 2007. As propostas deverão indicar claramente os arranjos metodológicos, logísticos e financeiros da colaboração entre a SKAT e o CFPAS para a realização da presente avaliação.

- A avaliação terá uma duração de um mês, a partir de Fevereiro de 2008, dividido em uma semana de trabalho de gabinete e contacto com as instituições chave, duas semanas de trabalho de campo e uma semana para a elaboração do relatórios final que inclui encontros de informação dos resultados de campo.

8. Gestão da consultoria

- O Consultor subordinar-se-á ao Chefe o Chefe do Departamento de Água Rural (DAR) da DNA em estreita colaboração com o Chefe da Secção de Água Saneamento e Promoção de Higiene (WASH) no UNICEF.

- O Consultor fará o seu trabalho no terreno, devendo se deslocar a cada uma das escolas no âmbito das suas atribuições e responsabilidades.

9. Língua de trabalho e relatórios

- A língua de trabalho no âmbito da presente consultoria é o Português.

- O consultor deverá apresentar três cópias impressas do relatório final da avaliação e duas cópias digitais em CD.

10. Modalidades de Pagamento

Em princípio, o consultor será pago em Metical de acordo com as seguintes modalidades:

- 30% de adiantamento após a assinatura do contrato;

- 20% após o trabalho de campo e a realização do encontro para a apresentação dos principais resultados do trabalho de campo aos promotores da iniciativa ao nível do MEC, MOPH, PMA e UNICEF;
- 50% após a aprovação do relatório final contendo os resultados finais e recomendações específicas.

11. Qualificações

O Consultor/a para esta avaliação deve reunir as seguintes qualificações/requisitos:

- Formação superior em área relacionada com o abastecimento de água (Engenharia Civil/Hidráulica, Geologia);
- Conhecimento da Política Nacional de Águas e Estratégias do Sector de Águas em Moçambique;
- Experiência comprovada, de pelo menos 5 anos, na avaliação de projectos do Sector de Águas, em particular na avaliação de projectos de abastecimento de água e saneamento rural;
- Domínio da língua portuguesa.

Annex 8.2 Roles and Responsibilities identified in the Memorandum of Understanding for the PlayPump Pilot Project in Mozambican Schools with Roundabout Outdoor as part of the Flourishing School Program

1. MEC Ministry of Education and Culture	• School identification; • Overall coordination; and • Channeling funds for implementation.	• Its leading role became less evident than the MOPH which was responsible for all construction contract management.
2. MOPH-DNA Ministry of Public Works and Housing through the National Directorate of Water	• Customs duties exoneration for 150 PlayPumps entering into Mozambique; • Collect the imported PlayPump systems from the customs warehouse in Mozambique into a government warehouse; • Technical support for monitoring and evaluation of the performance of the PP systems in comparison with the Afridev hand pump; and • Ensuring strategy adaptation in the context of the national water policy, monitoring and the evaluation of the sustainability of PlayPump systems in Mozambique.	• Few monitoring field visits carried out without applying the system designed and agreed among stakeholders.
3. MISAU Ministry of Health	• Testing Water Quality.	• **???**
4. DPOPH-DAS Water and Sanitation Department of the Provincial Directorate of Public Works	• Contract Management for borehole drilling, community capacity development, and drilling quality control; and • Supervision of implementation.	• Supervision poorly done due to lack of funds.
5. WFP World Food Program	• Channeling of funds from its private sector donor TNT for the construction of boreholes; • Borehole siting hydro geological studies in selected schools (WFP contracted hydro geologist).	• WFP gradually passed its coordination responsibilities to UNICEF. • WFP´s hydro geologist transferred to UNICEF for the follow up of implementation phase.
6. UNICEF	• Technical support and • Funding for contracting the construction of sanitation facilities and of appropriate school and community capacity development. • Design of water and hygiene messages, and commercial advertisers. • Funding for seven boreholes of the Flourishing Schools.	•
7. Roundabout Outdoor …(ROA) together with the International Finance Corporation (IFC),	• Installation of PlayPumps at no cost to the Mozambican government. • 10-year Guarantee for the maintenance and repairs of PlayPumps at no cost to the users; • Contracting and training of small enterprise called Mati ma Tsâkissa and a second independent team to install and maintain PlayPump systems. • Promote commercial and public interest advertising for financing 10-year guarantee of PlayPump systems; • Attached to the tank stand small plaque as a record of donor contribution;	• Second team has poor quality installations and it is no longer recognized by ROA. • Only 22% of PlayPump systems had the advertisements on place. • For ethical reasons associated with children's education and health, difficulties in accepting support from BAT and it being advertised was not continued.
8. The Donors, (TNT, BAT and Lemelson Foundation	• Financing the PlayPump systems / borehole / community education and auxiliary support costs. • Technical Support.	

Annex 8.3 Information about imported PlayPumps

Factura	Data da Factura	Data de Desalfandegamento	Unidades Totais	Bombas Recibidas Acumulado	Bombas Pendentes de Recepção	Sub-Total	IVA	Custo Total 150 PlayPumps	Custo Total Acumulado	Custo Unitário da Bomba por Lote	Bomba Levantada por
Factura Mãe											
06/901	**31.03.2006**	Fraccionada	**150**	**0**	**150**	**4,317,000**	**0**	**4,317,000**		**28,780**	
Entregas Fraccionadas											
PP 06/01	14.06.2006	29.01.2006	11	11	139	355,061	0	355,061	355,061	32,278	DPOPH Gaza
PP 06/02	14.09.2006	21.09.2206	11	22	128	350,930	0	350,930	705,991	31,903	DPOPH Gaza
PP 07/04	20.10.2006	26.10.06	11	33	117	352,630	0	352,630	1,058,621	32,057	DPOPH Gaza
PP 08/05	20.10.2006	26.10.06	11	44	106	352,630	0	352,630	1,411,251	32,057	DPOPH Gaza
PP 08/06	04.12.2006	12.12.06	11	55	95	361,759	0	361,759	1,773,010	32,887	DPOPH Gaza
PP 08/07	05.12.2006	12.12.06	11	66	84	365,035	0	365,035	2,138,045	33,185	DPOPH Gaza
PP 08/08	12.02.2007	15.02.2007	11	77	73	353,030	0	353,030	2,491,075	32,094	Maputo
PP 08/09	22.03.2007	28.03.2007	11	88	62	353,030	0	353,030	2,844,105	32,094	Mario Mussafo
PP 08/10	16.10.2007	19.10.2007	8	96	54	262,790	0	262,790	3,106,895	32,849	Maputo
PP 07/03	20.10.2006	Documentos de Importação não existentes	11	107	43	352,630	0	352,630	3,459,525	32,057	Documentos de Importação não existentes
PP 08/11	30.11.2007	Pendente de recepção	11	118	32	353,030	0	353,030	3,812,555	32,094	Bombas pendentes de entrar nos Armazenes do DAR
PP 08/12	30.11.2007	Pendente de recepção	11	129	21	353,030	0	353,030	4,165,585	32,094	
PP 08/13	15.12.2007	Pendente de recepção	11	140	10	353,030	0	353,030	4,518,615	32,094	
PP 09/02	31.01.2008	Pendente de Facturação	11	151	-1	353,030	0	353,030	4,871,645	32,094	

Valor Unitário na Factura 06/901	
Cilindro e Forceheads	**1500**
Carrousel	**6880**
Torre, bases e quadros de publicidade	**14950**
Coluna e Varetas	**5300**
Chapas de Publicidade e Contactos	**150**
Valor Unitário não apresentado na Factura 06/901	
Custo Unitario JOJO Tanks	**1700**

Moeda	**Rand**	**Metical**	**USD**
Taxa de Cambio	Taxas de Cambio	Taxas de Cambio	25
Custo Total 150 Bombas	4,518,615	15,544,037	621,761
Custo Unitário por Bomba	32,288	111,070	4,443

Annex 8.4 List of Persons met

Name	Function / Title	Organisation / Company	E-Mail Address	Mobile Phone
Manuel E.M.de Freitas	Head W&S and Hygiene Promotion	UNICEF Mozambique	mfreitas@unicef.org	+258 82 317 91 70
Joaquim Jorge	Chief of Rural Water Department	DAR/DNA, Maputo Mozambique	j.jorge@dnaguas.gov.mz	+258 82 326 33 80
Ana Lucia Obiols	W&S Specialist, Consultant SKAT	Matola Mozambique	analucia@intra.co.mz	+258 82 329 00 70
Karl Erpf	Programme Officer RWSN - SKAT	SKAT, St.Gallen Switzerland	karl.erpf@skat.ch	+258 82 626 48 25
António Cristo	Mechanical Engineer	DAR, Maputo Mozambique	acristo2004@yahoo.com.br	+258 82 822 49 00
Pedro Cicico	Mechanical Engineer	CFPAS, Maputo Mozambique	chicico_p@yahoo.com.br	+258 82 267 99 20
Alberto Ngovene	Social Specialist	CFPAS, Maputo Mozambique	angovene@yahoo.com.br	+258 82 267 99 20
David Wright	Acting Country Director	SC, Maputo Mozambique	dwright@savechildren.org	+258 82 304 52 17
Patricia Cavhenis	Provincial Project Manager	SC, Xai Xai Mozambique	pcavhenis@savechildren.org	+258 82 502 50 50
Nelson Massinghe	Technical Official	SC, Xai Xai Mozambique	nelson.massingue@gmail.com	+258 84 639 65 40
Geoff Hopkins	Director	PlayPumps International, JHB, RSA,	geoff@playpumps.org	+27 83 288 62 75
Carla Honwana	Programme Officer	WFP, Maputo Mozambique	carla.honwana@wfp.org	+258 82 890 60 50
Marcello Frederico	Director	Mati mâ Tsâkissa Lda, Mozambique	mati.matsakissa@yahoo.com	+258 82 390 10 20
Titus	Mechanical Engineer	Mati mâ Tsâkissa Lda, Mozambique	mati.matsakissa@yahoo.com	+258 82 925 87 60
Y.S. Paul Ristic	Managing Director	Roundabout Outdoor (Pty.) Ltd.	ysp@roundabout.co.za	+27 83 577 77 20
Marléne Nunes	Operations Manager	Roundabout Outdoor (Pty.) Ltd.	nunes@roundabout.co.za	+27 82 606 12 46
José Alves	President of Directors Board	Agro Alfa Lda, Maputo Mozambique	jose.alves@agoalfa.co.mz	+258 82 301 99 90
Carlos Lofonte	Deputy General Manager	Agro Alfa Lda, Maputo Mozambique	carlos.lofonte@agroalfa.co.mz	+258 82 300 75 03
Benito E. Wetela	Administrator, Mech. Eng.	IATA Lda, Maputo Mozambique	uetela@teledata.com.mz	+258 82 312 65 90
Justino E. Bahane		DPOPH-I, Inhambane Mozambique	dpoph.ibane@tdm.co.mz	+258
Edmundo A. de Almeida	Business Administrator	DAR, Maputo Mozambique	mundinhoalmeida@yahoo.com.br	+258 84 399 78 90
Pedro Moisès Cuco	Technical Assistant	LEM, Maputo Mozambique	labengcdit@teledata.mz	+258 82 540 28 90
Joseph Lai	Country Director	Samaritan's Purse, Mozambique	jlai@samaritan.org	+258 82 324 53 40
Herminio C.Novela	Chief of Technical Department	Hydropesquisa	hydropesquisa@tvcabo.co.mz	+258 82 314 81 90
Messias Macie	Acting Head of DAR	DAR, Maputo Mozambique	jjmacie@yahoo.com.br	+258
Samuel Manhiça				+258

Annex 8.5 Evaluation Formats

PlayPump Evaluation Mission
for DAR Mozambique

Evaluation date: . 04 . 08 | Name of evaluator: Karl Erpf

General Data								please fill in
Name of Organisation		Village / District						
Type of pump	Roundabout PlayPump	Date when the pump was installed						
Pump code No.	Moz	Number of pump users		people				
Depth of borehole	m	Static Water Level	m	Pump location	school	village		
What pump type was replaced by the PlayPump								

Place (Environmental and quality conditions)							please tick or fill in
Is well sited neatly	yes	no	Any pollution sources near the well				
Is water source / playground protected (i.e. fence)	yes	no	other protection				
Water quality is acceptable	yes	no	Is the water quality regularly tested	yes	no		
Did the well ever run dry	yes	no	What alternative water source is available				
Other comments:							

Product (technical aspects)					please tick or fill in
Is the pump easy to operate by small children 5 years	yes	no			
What is the pumping speed	RPM	Pump discharge (20 RPM per minute)	lt		
Did the pump ever breakdown	yes	no	How long was the pump out of order	days	
Whom to contact if pump is broken					
Other comments:					

Pump Users						please tick or fill in
Age of pump operators (children)	years	Approximate operation time per day	hours			
Do children like to operate the pump	yes	no	Problems faced during operation	yes	no	
Is a First Aid Kit available neer the PlayPump	yes	no				
Who is pumping if the children are not around						
Other comments:						

Promotion (Billboard and water tower)	please fill in
What promotion is displayed on the billboard	
Other comments:	
Additional notes at reverse side — Signature of evaluator	

Playpumps

Performance Indicators/Scorecard

Owner: DNA-DPOPH

Summary Indicators	Value	Data Source	FY200x						Next 6 Months Target Ending 6/30/07	Comments
			6 Months Ending 6/30/06	6 Months Ending 12/31/06	Target for Current Period	Baseline	Variance (vs. Target)	Variance (vs. Baseline)		
Performance and Maintenance Indicators										
Indicators										
Utilisation of Play Pump										
° No.of hours spent on average daily by children playing on the pump										
Training local conntractors										
° Program for training local contractors available										
° Local contractor trained by Roundabout										
° Number of trained Mozambican technicians										
Maintenance										
° Availability of spare parts with the local contractor										
° Local availability of spare parts for AFRIDEF pumps										
° Down time of Play Pumps										
° Down time of AFRIDEF pumps										
° List of problems identified and solved										
° List of problems identified and not solved										
° Involvement of schools/communities in the installation proces										
° Involvement of schools/communities in the maintenance proces										
Service performance										
° Responsetime contracter to pump breakdowns in working days										
° Time to repair pump in working days hours after arrival contractor										
° Number of visits per year per pump										
Sanitation and Hygiene										
° Number of Latrines - Total										
° Number of Separate Latrines for Girls										
° Number of Urinals										
° Is there a School Sanitation Committee present in the school?										
° If there is a School Sanitation Committee present, does it have a work plan?										

Requirements

Reports are due on the 15th every 6 months

Playpumps - Rural Schools

Operating Parameters/Scorecard

Owner: Ministry of Education

Summary Indicators	Value	Data Source	FY200x						Next 6 Months Target Ending 6/30/07	Comments
			6 Months Ending 6/30/06	6 Months Ending 12/31/06	Target for Current Period	Baseline	Variance (vs. Target)	Variance (vs. Baseline)		
Social and Educational Indicators										
Direct Impact										
Reach of Impact - Socio-demographic Data of Beneficiaries										
At Community Level:										
° Number of beneficiaries - Total										
° Number of beneficiaries - Female										
° Percentage of child beneficiaries (< 15 years old) - Total										
° Percentage of child beneficiaries (< 15 years old) - Female										
° Number of households in community										
At School Level:										
° Number of children enrolled at school - Total										
° Number of children enrolled at school - Female										
° Number of teachers										
Education / Health Indicators										
° Pass/completion rate - Total										
° Pass/completion rate - Female										
° Drop-out rate - Total										
° Drop-out rate - Female										
° Average hours spent by children on pumps per day - during school hours										
° Average hours spent by children on pumps per day - outside of school hours										
° Number of school days missed										
Resource Spending Behavior (where possible)										
° Distance to closest water source (<100m, 100-500m, >500m)										
° Average time spent per month on water collection in hours - Total Adults										
° Average time spent per month on water collection in hours - Female Adults										
° Average time spent per month on water collection in hours - Total Children										
° Average time spent per month on water collection in hours - Female Children										

Requirements

Reports are due on the 15th every 6 months

Secondary Data

° Information on illness type in community - Health Posts

° Reason for pupils missing school - Schools

Playpumps - Peri-urban Schools

Operating Parameters/Scorecard

Owner: Ministry of Education

Summary Indicators	Value	Data Source	FY200x						Next 6 Months Target Ending 6/30/07	Comments
			6 Months Ending 6/30/06	6 Months Ending 12/31/06	Target for Current Period	Baseline	Variance (vs. Target)	Variance (vs. Baseline)		
Social, Educational and Economic Indicators										
Direct Impact										
Reach of Impact - Socio-demographic Data of Beneficiaries										
At Community Level:										
○ Number of beneficiaries - Total										
○ Number of beneficiaries - Female										
○ Percentage of child beneficiaries (< 15 years old) - Total										
○ Percentage of child beneficiaries (< 15 years old) - Female										
○ Number of households in community										
At School Level:										
○ Number of children enrolled at school - Total										
○ Number of children enrolled at school - Female										
○ Number of teachers										
Education / Health Indicators										
○ Pass/completion rate - Total										
○ Pass/completion rate - Female										
○ Drop-out rate - Total										
○ Drop-out rate - Female										
○ Average hours spent by children on pumps daily - during school hours										
○ Average hours spent by children on pumps daily - outsideschool hours										
○ Number of school days missed										
Resource Spending Behavior										
○ Distance to closest water source (<100m, 100-500m, >500m)										
○ Average household income per month in MZM										
○ Average household income per month in MZM since installation										
○ Average hours spent per month on water collection - Total Adults										
○ Average hours spent per month on water collection - Female Adults										
○ Average hours spent per month on water collection - Total Children										
○ Average hours spent per month on water collection - Female Children										
○ Average household spendings in MZM on water consumption/month										
○ Average household spendings in MZM on water consumption/month since installation										

Requirements

Reports are due on the 15th every 6 months

Secondary Data

○ Information on illness type in community - Health Posts

○ Reason for pupils missing school - Schools

Annex 8.6 Summary of Data Collected

PlayPump Evaluation Mission				Summary sheet General & Technical Data								DAR Mozambique
Evaluation date	Eval	School / Village	Municipality	Installation date	Pump No.	No. Of Pump users	Borehole depth (m)	SWL (m)	Clinder position	Pump location	Previous pump type installed	More Comments see in the additional sheets
10.04.2008	KE	EPC Ndlavela	Matola	27.01.2007	MOZ 0005	7'000	54	25	**30 m**	School	Afridev	Borehole paid by Vodacom
10.04.2008	KE	EPC Kongolote	Matola	20.03.2007	MOZ 0081	350	51	19	**35 m**	School	Windmill	broken Windmill replaced
21.04.2008	PC	EPC Mabanja	Matola	23.12.2005	MOZ 0006	710	54	29	**31 m**	School	new borehole	
21.04.2008	PC	EPC Tenga	Moamba	02.02.2006	MOZ 0008	500	60	46	**50 m**	School	Afridev	
21.04.2008	KE	Intaca School	Matola	08.07.2005	MOZ 0001	800	42	12	**21 m**	School	new borehole	
21.04.2008	KE	EP2 Bairro 5	Manhica	19.04.2007	MOZ 0093	500	32	9	**24 m**	Village	Afridev	big rock next to play wheel
21.04.2008	KE	EP2 Bairro 6	Manhica	18.04.2007	MOZ 0094	200	42	13.5	**27 m**	Village	Afridev	want Afridev Pump back
21.04.2008	KE	EP2 Gesta	Manhica	12.04.2007	MOZ 0092	600	49	27.5	**36 m**	Sch/Com	Afridev	play wheel operation very heavy
21.04.2008	KE	EPC1 Malungana	Manhica	22.07.2006	MOZ 0012	?	66	22.5	**32 m**	Sch/Com	?	no people around, (visit 5 pm)
21.04.2008	KE	EP2 Pateque	Manhica	05.04.2007	MOZ 0091	385	59	27	**42 m**	School	Afridev	little water & operation not liked
22.04.2008	PC/KE	EP1 Samora Machel	Xai Xai	16.12.2006	MOZ 0057	400	56	23	**30 m**	Sch/Com	Afridev	
22.04.2008	PC/KE	EPC 3rd Fevereiro	Xai Xai	16.12.2006	MOZ 0051	1'700	70	47	**50 m**	Sch/Com	Afridev	back is sore when pumping long
22.04.2008	PC/KE	EP1 Ngulelene	Xai Xai	28.02.2007	MOZ 0072	5'000	47	21.5	**33 m**	Sch/Com	Afridev	Afridev was easy & good water
23.04.2008	ALO	EP1 Magul	Macia	24.11.2006	MOZ 0041	?	76	35	**40 m**	School	Afridev	
23.04.2008	ALO	EP1 4th Outubro	Macia	05.01.2007	MOZ 0062	?	39	17	**30 m**	Sch/Com	?	
23.04.2008	PC	EPC Coca Missava	Chiboto	15.09.2006	MOZ 0014	1950	97	67	**78 m**	School	new borehole	
23.04.2008	PC	EP Siaia	Xai Xai	07.12.2006	MOZ 0054	1'250	120	40	**51 m**	School	new borehole	pump broken since 17 months
23.04.2008	PC	EPC Conguene	Xai Xai	07.08.2006	MOZ 0021	1500	99	56	**60 m**	School	new borehole	
23.04.2008	PC	EP1 Mar. da Mueda	Chiboto	08.12.2006	MOZ 0039	900	49	35	**44 m**	School	Afridev	
23.04.2008	KE	EP1 Xonguene	Xai Xai	08.08.2006	MOZ 0020	850	84	31.5	**45 m**	Sch/Com	new borehole	water flow decreasing steadily
23.04.2008	KE	EP1 Tetene	Xai Xai	09.08.2006	MOZ 0017	300	62	24	**30 m**	Sch/Com	new borehole	pump broken since 10 months
23.04.2008	KE	EP1 Chaquala	Manjacaze	20.08.2006	MOZ 0015	600	71	14.5	**20 m**	Sch/Com	new borehole	
23.04.2008	KE	EP1 Muadjahane	Manjacaze	08.11.2006	MOZ 0028	1'000	74	9	**15 m**	Sch/Com	Afridev	
23.04.2008	KE	EP2 Chalala	Manjacaze	11.02.2007	MOZ 0055	900	16	5	**12 m**	Village	Afridev	
24.04.2008	PC	EP1 Muxuquete	Chibuto	21.08.2006	MOZ 0019	?	99	56	**59 m**	Sch/Com	Afridev	pump removed
24.04.2008	PC/KE	EP1 Chinhacanine	Guija	17.09.2006	MOZ 0018	1'600	81	45	**50 m**	Sch/Com	new borehole	

PlayPump evaluation mission		Summary sheet Place								DAR Mozambique
Pump No.	Site neat	Pollution source nearby	Water point fenced or protected	Water quality acceptable	Is water quality regularly tested	Did the well ever run dry	Other water sources nearby	Type of water source	How far away	see also Comments Summary
MOZ 0005	yes	no	yes	yes	no	no	yes	Afridev	200 m	
MOZ 0081	yes	no	no	yes	no	no	yes	Afridev	150 m	platform outside broken (dangerous)
MOZ 0006	yes	no	yes	yes	no	no	yes	other pump	500 m	
MOZ 0008	yes	no	no	yes	no	no	yes	Dugwell	450 m	
MOZ 0001	yes	no	yes	no	by UNICEF	no	yes	Electric pump	100 m	water smells rusty, used to wash hands & school cleaning
MOZ 0093	no	no	no	no	no	yes (30 min)	yes	Afridev	300 m	water smells rusty, big rock next to play wheel (dangerous)
MOZ 0094	no	no	no	no	no	yes	yes	Afridev	200 m	water smells rusty, need clean water, but what can we do
MOZ 0092	yes	no	yes	no	yes	no	yes	Afridev	600 m	water smells rusty,
MOZ 0012	yes	no	yes	yes	?	?	?	?	?	no people available for interview (visit after 5 pm)
MOZ 0091	no	no	no	no	don't no	no	yes	Electric pump	200 m	water smells rusty, big rock next to play wheel (dangerous)
MOZ 0057	no	no	no	no	only when there are diseases	no	yes	Afridev	300 m	water smells rusty in the morning, well surrounding not clean
MOZ 0051	no	no	no	no	yes (by SCF)	no	yes	Afridev	300 m	water smells slightly rusty,
MOZ 0072	yes	no	no	no	no	no	yes	Afridev	500 m	water not clean, well surrounding not clean, other source far
MOZ 0041	yes	not clean	no	no (iron)	no	no	no idea	no ides		
MOZ 0065	no	no	no	very bad	no	no		no ides		
MOZ 0014	yes	no	no	yes	no	no	no	water vendor	120 m	users are forced to buy water
MOZ 0054	yes	no	no	yes	no	no	yes	Dugwell	2 km	
MOZ 0021	yes	no	yes	no	no	no	yes	other pump	300 m	
MOZ 0039	yes	no	no	yes	no	no	yes	Afridev	250 m	
MOZ 0020	yes	no	no	yes	no	no	no	none	n.a.	

Pump No.	Site neat	Pollution source nearby	Water point fenced or protected	Water quality acceptable	Is water quality regularly tested	Did the well ever run dry	Other water sources nearby	Type of water source	How far away	see also Comments Summary
MOZ 0017	no	no	no	yes	no	no	yes	dirty river	900 m	
MOZ 0015	yes	no	no	yes	no	no	yes	Afridev & Dugwell	600 m	
MOZ 0028	yes	no	no	no	no	no	yes	Afridev & piped water	many places	water smells rusty, platform outside broken, stand post leaking
MOZ 0055	yes	no	no	no	no	no	yes	Dugwell	400 m	water smells slightly rusty, looks milky (maybe chalk)
MOZ 0019										pump removed
MOZ 0018	yes	no	no	yes	no	no	yes	Afridevs	300 m	water also used for watering plants

PlayPump Evaluation Mission			Summary sheet Product			DAR Mozambique
Pump No.	Pump easy to be operated by children (7-12 years)	Pump operation liked by the community	Did pump ever break down	How many days out of order	How to get help if pump is broken	More comments see in the Comments Summary
MOZ 0005	no	no	no	n/a	contact by mobile	
MOZ 0081	yes	no	yes (3x)	20	contact by mobile	first breakdown after 30 days, sand intrusion, cylinder worn, needs another cylinder after 8 month
MOZ 0006	no	no	no	n.a.	contact by mobile	
MOZ 0008	no	no	no	n.a.	Education Dept.	
MOZ 0001	yes	no	yes	7	contact by mobile	pump was vandalized by neighbor who is a water seller (feed pipe to stand post cut)
MOZ 0093	yes	no	yes	long time	contact by mobile	informed Hydro Pesquisa about the bad water but no reaction from them
MOZ 0094	no	no	no	n/a	contact by mobile	for pregnant women not possible to operate the pump
MOZ 0092	no	no	yes	15	contact by mobile	2 children (7 and 8 years) face difficulties to turn the play wheel, stand post (tap) problems
MOZ 0012	yes	no	?	?	?	
MOZ 0091	yes	no	no	n/a	don't know	too hot to pump in sunny days, some children get dizzy from the rotations, stand post (tap) problems
MOZ 0057	no	no	no	n/a	will ask someone	for children between 6-7 years not possible to turn play wheel
MOZ 0051	yes	no	no	n/a	community knows	School would like to have a separate tap, near the toilets
MOZ 0072	no	no	yes	20	contact by mobile	pump is very heavy to operate, adults complain about back problems, cylinder changed to Ø80 mm
MOZ 0041	no	n.a.	yes (3x)	?	contact by mobile	3 x problems, October 07, cylinder, Easter 08 whole pump taken out and checked, 3th time on beginning of April 08, very small discharge, borehole not giving enough water, footvalve also leaking
MOZ 0062	yes	no	yes	?	?	
MOZ 0014	no	no	yes	20	called Marcello	
MOZ 0054	no	no	yes	1.5 years	don't know	
MOZ 0021	no	no	no	n.a.	contact by mobile	

Pump No.	Pump easy to be operated by children (7-12 years)	Pump operation liked by the community	Did pump ever break down	How many days out of order	How to get help if pump is broken	More comments see in the Comments Summary
MOZ 0039	no	no	yes	10	don't know	instructions were given to the director of the school, but he moved in the meantime to another school - so nowbody knows.
MOZ 0020	no	no	yes	30	contact by mobile	pumprod broken
MOZ 0017	no	no	yes	10 months	contact by mobile	Hydro Pesquisa, DPOPH, Roundabout and UNICEF informed, children have to drink river water again, rapid increase of diarrhea
MOZ 0015	no	no	no	n/a	contact by mobile	pumprod broken
MOZ 0028	no	no	no	n/a	contact by mobile	
MOZ 0055	no	no	no	n/a	contact by mobile	
MOZ 0019						pump removed
MOZ 0018	no	no	no	n/a	contact by mobile	pump very hard to operate, children and adults turn wheel by hand

PlayPump Evaluation Mission	Summary sheet Pump Users					DAR Mozambique
Pump No.	Age of school children	Operation time daily	Operation liked by children	Do children face problems when operating the pump	Operators other than children	Do adults face problems when operating pump	see also Comments Summary
MOZ 0005	5 to 12	10 hours	yes	only 5 to 7 years	none	n.a.	
MOZ 0081	5 to 10	5 hours	yes	no	none	n.a.	attached houses have piped water
MOZ 0006	6 to 14	12 hours	yes	yes	none	n.a.	
MOZ 0008	6 to 14	15 hours	yes	yes	none	n.a.	
MOZ 0001	6 to 15	3 hours	yes	no	none	n.a.	
MOZ 0093	6 to 14	6 hours	not much	no	adults	sore back	adults don't like the pump operation,
MOZ 0094	adults	12 hours	not much	no	adults	sore back	children don't go there to play, adults don't like the pump operation,
MOZ 0092	5 to 14	10 hours	yes	no	adults	sore back	
MOZ 0012	?	?	?	?	?	?	
MOZ 0091	6 to 14	10 hours	not much	yes, getting dizzy	none	n.a.	
MOZ 0057	5 to 14	8 hours	not much	no	none	n.a.	
MOZ 0051	6 to 15	10 hours	yes	no	adults	sore back	
MOZ 0072	6 to 14	12 hours	yes	only 5 to 7 years	adults	sore back	sore back after pumping, children leave the pumps when adults come
MOZ 0041	5 to 10	2 hours	yes	yes	none	n.a.	
MOZ 0062	?	?	?	?	?	?	
MOZ 0014	6 to 25	13 hours	yes	yes	adults	sore back	the are organising the water use
MOZ 0054	7 to18	10 hours	don't like	yes	adults	sore back	
MOZ 0021	6 to 21	12 hours	yes	no	adults	sore back	
MOZ 0039	6 to 16	11 hours	yes	no	adults	sore back	
MOZ 0020	6 to 14	7 hours	yes	no	adults	sore back	
MOZ 0017	6 to 15	10 hours	yes	no	adults	sore back	
MOZ 0015	6 to 14	12 hours	yes	no	adults	sore back	
MOZ 0028	7 to 12	6 hours	yes	no	adults	sore back	
MOZ 0055	6 to 12	8 hours	yes	no	adults	sore back	
MOZ 0019							pump removed
MOZ 0018	5 to 14	12 hours	not much	only 5 to 7 years	adults	sore back	

Social Indicators Data Base Crianças

Codigo da Fonte	data entrevista	Escola	Meninas	Rapazes	Gostam da Bomba PP	Porque	Vantagens que a Bomba traz?	Nº crianças que ja não brincar devido a vertigem	Nº crianças que ja não brincar por ter caído da bomba	Nº crianças que acham que é para os mais novos	Nº crianças que pensam que estão a trabalhar para puxar agua	Existe alguma orientação para puxar agua da bomba	tempo de brincar	para que usam agua da torneira	Distancia da torneira da escola para latrinas	Distancia da torneira para horta	Observações
MOZ0001	21/04	EP1 de Intaca	29	31	sim	brincar	Agua , Entertenimento, Higiene, Regar	10	0	0	0	sim	45	Lavar as mãos antes de comer, depois de latrina, para regar a horta e beber	100	10	Na saida todas as Crianças são orientadas para brincar na roda e encher o tanque
MOZ0006	21/04	Epc de Malanje	22	18	sim	brincar	Entretenimento	6	0	0	0	sim	25	Lavar as mãos antes de comer, depois de latrina, para regar a horta e beber	100	100	Preferem Afridev, porque a rodapeira e nao conseguem encher o tanque apenas 2 ou 3 baldes e a H2o acaba. Quando fes calor a roda aquece e não dá para brincar
MOZ0008	21/04	Epc de Tenga	10	12	sim	água	Agua, Entretenimento	3	0	0	0	sim	30	Lavar as mãos antes de comer, depois da latrina, para regar a horta e beber	100	N/A	As turmas são planificadas para bombar H2o uma vez por semana
MOZ0075	22/04	EP1 de Cumbene I	300	266	sim	brincar	Entretenimento	40	0	0	0	Não	20	Lavar as mãos antes de comer, depois de latrina e para regar a horta	30	N/A	Afimaram que não tem habito de lavar as mãos e são obrigados a brincar na roda
MOZ0047	22/04	EP1 de Tatene	0	0	sim	brincar	Agua	0	0	0	0	Não	20	Lavar as mãos antes de comere e beber		15	A bomba avariou a 10 meses. Ela avariou mais de 5 vezes
MOZ0039	23/04	Martires de Moeda	60	40	sim	brincar	higiene	0	0	5	0	Não	30	Limpar as salas de aulas e casas de banho	100	N/A	As mamanas não deixam tirar H2O sem brincar na Roda
MOZ0055	23/04	EP2 Chalala	12	7	sim	Educação Física	higiene	0	0	0	0	Não	20	Lavarem mãos antes de comer depois de usar a latrina, beber e regar as plantas	30	N/A	Nao temos tempo de rever porque passamos tempo na bomba. Gostariamos de uma Afridev
MOZ0019	23/04	Epc de Muxugeio	400	350	sim	brincar	Regar, Higiene	0	0	0	0	sim	20	Regar Plantas, Lavar casas de banho	N/A	N/A	Não sabemos a quem contactar em casos de avaria. A água não é suficiente
MOZ0051	24/04	EPC Samora Machel	18	9	sim	brincar e agua	Agua , Entertenimento, Higiene	27	0	27	0	sim	30	Lavar as mãos antes de comer, depois da latrina, para regar a horta e beber	300	10	Há falta de agua porque a comunidade tambem tira agua, a H2o tem cheiro, Afrideve é melhor em realação a Play Pump
MOZ0018	24/04	Epc de Chinhacanine	17	27	sim	brincar	Agua, Rega, Higiene	4	0	0	0	sim	20	Lavarao mãos antes de comer depois de usar a latrina, beber e regar as plantas	300	50	A turma bomba H2o nas aulas de educaçãomusical, nos intervalos e depois de sair das aulas. Nos fins de semanas ha um programa para tirar água bpara os Professores
			669	745									29		532,5	32	
			Interviewed Children										Average playing time		Distance to Latrines	Distance to Vegetable Gardens	

Social Indicators Data Base Sistema O&M Page 1

N°	Codigo da Fonte	data entrevista	Escola	Local da Bomba	Beneficiarios	Data de Instalação PP	No de avarias desde a instalação	No de avarias nos últimos 3 meses	Tipo de problema	tempo da avaria (dias)	Tempo de Resposta de Reparação	Data da ultima avaria	Qualidade da reparação	Porque?	As equipes são de confiança	Porque	O que fazer quando avariar
1	MOZ0001	21.04.08	EP1 Intaca	Escola	Escola	2005	3	2	pouco quadal, torneira e vandalismo	21	pendente de ser reparada	01.04.08	boa		sim	sempre respondem	Contacto Celular
2	MOZ0006	21.04.08	EPC Mabanja	Escola	Escola	2005	1	1	pesso da bomba	120	pendente de ser reparada		N/A	N/A	N/A	N/A	Contacto Celular
3	MOZ0008	21.04.08	EPC Tenga	Escola	Escola	2006	1	1	torneira	15	pendente de ser reparada	30.03.08	N/A	N/A	N/A	N/A	Informar as Estruturas Locais
4	MOZ0014	23.04.08	EP1 Cocs Missava	Escola	Escola/ Comunidade	2006	1	0	Sae muito pouca água	20	rápida resposta		boa		sim	Resposta rápida	Contacto Celular
5	MOZ0015	22.04.08	EP1 Chaguala	Escola	Escola/ Comunidade	2006	1	0		60	pendente de ser reparada	26.12.07	boa	Não avariou mais	não	Não vivem aqui na Provincia	Contacto Celular
6	MOZ0017	23.04.08	EP1 Tetene	Escola	Escola/ Comunidade	2006	3	1	Tanque não conserva água	300	pendente de ser reparada	01.07.07	N/A		não	Não fazem a reparação	Contacto Celular
7	MOZ0021	23.04.08	EP1 Chonguene 1	Escola	Escola	2006	1	1	Sae muito pouca água	120	pendente de ser reparada	30.01.08	má	Não fazem a reparação	má	Nunca fizeram manutenção	Contacto Celular
8	MOZ0041	23.04.08	EP1 Magul	Escola	Escola/ Comunidade	2006	3	2	Não sae nada de água	30	pendente de ser reparada	05.04.08	má	Avaria de novo			Contacto Celular
9	MOZ0054	23.04.08	EPC Siaia	Escola	Escola	2006	1	1	Não sae nada de água desde sua instalação	540	pendente de ser reparada	01.05.07	má	Não fazem a reparação	N/A	N/A	Não sabemos
10	MOZ0055	23.04.08	EP2 Chalala	Escola	Escola/ Comunidade	2007	2	1		90		02.02.08	Não sabemos		N/A	ainda não foi reparada	Não sabemos
11	MOZ0062	23.04.08	EP1 4 de Outubro	Escola	Escola/ Comunidade	2007	1	1	Sae muito pouca água	60	pendente de ser reparada	01.03.08					Não sabemos
							1.6 Average N° of Breakdowns since installation	1.0 Average N° of Breakdowns in last 3 months		125 Average Down time							

Sistema O&M Page 2

Nº	Codigo da Fonte	Qual o sistema de comunicação	Existe rede de celular	Custo Transporte	custo celular	Custos outros	Custo Total	O sistema de comunicação é simples	Quais os maiores constrangimentos	Observação	Recomendações
1	MOZ0001	SMS Referencia da Bomba	sim	0	2.5	Só atravez de SMS	2.5	não	Para agilizar o processo de reparação devem ligar directamente à empresa de manutenção	Enviar a SMS é facil mas não existe feedback	Precissa maior clareza de como fazer a comunicação da avaria
2	MOZ0006	SMS Referencia da Bomba	Sim	0	2.5	Só atravez de SMS	2.5	não	Não houve comunicação de retorno	Enviar a SMS é facil mas não existe feedback	Precissa maior clareza de como fazer a comunicação da avaria
3	MOZ0008	Não sabemos	sim	10	2.5	Transporte para ir a sede	12.5	não	O sistema de mensagem não é conhecido	Enviar a SMS é facil mas não existe feedback	Informação deve falar por se só devido a rotação de pessoal
4	MOZ0014	SMS Referencia da Bomba	sim	0	40		40	sim		Esta bomba tem problemas de sabotagem que não foi informado pelas autoridades da escola	
5	MOZ0015	SMS Referencia da Bomba	sim		25	Mandam se muitas SMS	25	não	Só informavam que o assunto estava sendo tratado fora do pais	Não houve esclarecimento de como fazer a comunicação da avaria	
6	MOZ0017	SMS Referencia da Bomba	sim	0	200	Mandam se muitas SMS	200	sim			
7	MOZ0021	SMS Referencia da Bomba	sim	30	2.5	Ir ao DAS a reportar a avaria	32.5	não	Não houve comunicação de retorno	Enviar a SMS é facil mas não existe feedback	Precissa maior clareza de como fazer a comunicação da avaria
8	MOZ0041	SMS Referencia da Bomba	sim		2.5		2.5	não	Não houve comunicação de retorno		
9	MOZ0054	Não sabemos	sim		0		0	não	Mudamos estruturas da escola e nenguem conhece como comunicar a avaria	Numca foram formados/informados	Informação deve falar por se só devido a rotação de pessoal
10	MOZ0055	Não sabemos	sim			Não sabemos	0	não	Não saber o que fazer quando avariar	Numca foram formados/informados	
11	MOZ0062	Não sabemos	sim						Não saber o que fazer quando avariar		

Social Indicators Data Base Impacto da bomba Page 1

Codigo da Fonte	data entrevista	Comunidade	Local da Fonte	Utentes da Fonte	Qual era a fonte anterior que utilizavam?	Tipo de Bomba Anterior	Estado da Bomba	Porque mudaram	Consumo de Água na Fonte Antiga	Qualidade de Água na Fonte Antiga	turvidade	sabor	cor	cheiro	Quantidade de Água na Fonte Antiga	Tempo que levavam para tirar agua na Fonte Antiga
MOZ0006	21.04.08	EPC Mabanja	Escola	Comunidade/Escola	Num outro furo com bomba	Afridev	operacional	não sabemos	60	boa		agradavel			boa	20
MOZ0092	21.04.08	EP2 Gesta	Escola	Comunidade/Escola	Neste mesmo furo com outra bomba	Afridev	não operacional	Não sabemos		boa		agradavel	incolor	sem cheiro	boa	20
MOZ0051	21.04.08	3 de Fevereiro 6º Bairro	Comunidade	Comunidade	Neste mesmo furo com outra bomba	Afridev	operacional	Não sabemos	60	boa		agradavel	incolor	sem cheiro	boa	30
MOZ0074	21.04.08	3 de Fevereiro 5º Bairro	Comunidade	Comunidade	Neste mesmo furo com outra bomba	Afridev	não operacional	não sabemos	160	má	suja		amarelada	Gasoleo	boa	10
MOZ0091	22.04.08	3 de Fevereiro 1º Bairro	Escola	Comunidade/Escola	Neste mesmo furo com outra bomba	Afridev	operacional	Mudaram sem nosso conhecimento	200	boa		agradavel		sem cheiro	boa	60
MOZ0072	22.04.08	EP1 Nguleiane	Escola	Comunidade/Escola	Neste mesmo furo com outra bomba	Afridev	não operacional	Não tinha reparação	400	boa		agradavel	incolor	sem cheiro	boa	20
MOZ0057	22.04.08	EP1 Samora Machel	Escola	Comunidade/Escola	Neste mesmo furo com outra bomba	Afridev	operacional	não sabemos	60	boa		agradavel	incolor	sem cheiro	boa	20
MOZ0039	23.04.08	EPC Martires de Mueda	Escola	Comunidade/Escola	Neste mesmo furo com outra bomba	Afridev	Com muitas avarias	Mudaram sem nosso conhecimento	80	boa		agradavel	incolor	sem cheiro	pouca	30
MOZ0028	23.04.08	EP1 de Nwanhadjane	Escola	Comunidade/Escola	Neste mesmo furo com outra bomba	Afridev	Com muitas avarias	Não sabemos	80	boa	boa	agradavel	incolor	sem cheiro	boa	10
MOZ0015	23.04.08	EP1 de Chaguala	Escola	Comunidade/Escola	Num outro furo com bomba	Afridev	operacional	Não sabemos	80	boa	boa	agradavel	incolor	sem cheiro	boa	30
MOZ0014	23.04.08	EP1 Coca Missava	Escola	Comunidade/Escola	Num outro furo com bomba	1 bomba solar e 1 motobomba	operacional	N/A	40	Muito ma	suja				muito pouca	180
MOZ0075	23.04.08	EP1 de Cumbene	Escola	Comunidade/Escola	Numa fonte não protegida	N/A	N/A	N/A	400	Muito má	muito suja	má	amarelada	Ferrugem	boa	60
MOZ0018	24.04.09	EPC Chihacamine	Escola	Comunidade/Escola	Num outro furo com bomba	Afridev	não operacional	Não tinha reparação	40	Muito ma					boa	120
									138							47
									Average Water Consumption before PP							*Average time collecting water before PP*

Impacto da bomba Page 2

Consumo de Agua na PP	Qualidade de agua da PP	Quantidade de agua da PP	Tempo que levam para tirar agua na PP	Operação da PP	pagavam pela agua nas bombas antigas?	Mts imes	Responsavel da manutenção da PP	Observações sobre avarias da PP	Qual a bomba que preferem?	Justificação 1	Justificação 2	Justificação 3	crianças	mulheres	mulheres grávidas/ idosos/doentes
60	boa	boa	30	não consigo dar volta a roda	sim	10	Não Sabemos		Afridev	Facil manejo	PP é pesada	Falta de Controlo da O&M			
60	boa	Razoável	30		não	0	Não Sabemos		PlayPump	Muitas avarias da Afridev	preferimos pagar para melhorar a eficiencia	PP é resistente			
60	má	pouca	120	não consigo dar volta a roda	sim	5	Não Sabemos		Afridev	Controlo da O&M	PP é pesada				sofrem da coluna
60	muito má	pouca	60	não consigo dar volta a roda	sim	10	Não Sabemos		Afridev						
140	má	pouca	180	não consigo dar volta a roda	sim	5	Save do Children		Afridev	Facil manejo	Afridev agua com qualidade	Falta de Controlo da O&M		Peso da bomba, dores da coluna	risco de cair
300	má	pouca	60	não consigo dar volta a roda	sim	6	Não Sabemos	3 meses com problemas do cilindro	Afridev	Facil manejo	Afridev agua com qualidade	PP é pesada		Peso da bomba, dores da coluna	sofrem da coluna
40	muito ma	muito pouca	300		sim	5	Não Sabemos		Afridev	Facil manejo	Afridev Bom caudal				
80	boa	muito pouca	300	não consigo dar volta a roda	sim	10	Não Sabemos		PlayPump	Muitas avarias da Afridev	PP é pesada		Crianças são proibidos beber agua pelas mamanas	Peso da bomba, dores da coluna	As mulheres idosas não conseguem manejar a bomba
80	boa	boa	10	As crianças manejam facilmente	não	0	Não Sabemos		PlayPump	PP facil manejo para as crianças	Muitas avarias da Afridev	A Play Pump é Inadequada para as comunidades	gostam brincar mas pessa muito	Peso da bomba, dores da coluna	Muito sofrimento
80	boa	boa	20	As crianças manejam facilmente	não	0	um particular		Playpump	PP facil manejo para as crianças	Falta de Controlo da O&M		gostam brincar	É só pra escola	não usam
100	boa	muito pouca	300		sim	60		1 avaria 2 meses em setembro	PlayPump	PP não se paga	PP facil manejo para as crianças		gostam brincar mas pessa muito	1 dia fonte trad e 2 dias playpump	dores de coluna e da tonturas
400	boa	boa	15	As crianças manejam facilmente	N/A	0	um particular	Um Professor para controlo das Crianças	Afridev	Facil manejo	Afridev Bom caudal	PP é pesada	PP facil manejo para as crianças	Peso da bomba, dores da coluna	risco de cair
40	Muito boa	muito pouca	60	tanque não enche	sim	10	Não Sabemos		Afridev/Playpump	PP é pesada	PP Boa Qualidade da Agua	Afridev agua muito salobre		Peso da bomba, dores da coluna	parece que o parto acelera
115 *Average Water Consumption before PP*			114 *Average time collecting water before pp*		75% *Percentage of communities paying for water before pp*	9 *Average Water Payment before PP*									

Annex 8.7 Photographs of Play Pumps visited

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0001			
MOZ 0004			
MOZ 0005		no photograph	

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0006			
MOZ 0008	no photograph	no photograph	no photograph
MOZ 0012			
MOZ 0014			

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0015			
MOZ 0017			
MOZ 0018			

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0019			
MOZ 0020			
MOZ 0021			

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0028			
MOZ 0039			
MOZ 0041		no photograph	

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0051			
MOZ 0054			
MOZ 0055			

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0057			
MOZ 0062		no photograph	
MOZ 0072			

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0081			
MOZ 0091			
MOZ 0092			

Pump Number	Well Point	Stand Post	Water Tower
MOZ 0093			
MOZ 0094