Handpump Sustainability

PRACTICA Foundation

October 2013

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Abbreviations

CBO	Community Based Organisation
CCC	Community-Company Contracts
CM	Community Management
DWO	District Water Office
HP	Handpump
HPM	Handpump Mechanic
HPMA	Handpump Mechanics Association
IRC	International Water and Sanitation Centre (The Netherlands)
MP	Mobile payments
NGO	Non-governmental organization
O&M	Operation and maintenance
PO	Private Ownership
PPP	Public-Private Partnerships
PSO	Piped Scheme Operator
RWSN	Rural Water Supply Network (Switzerland)
UNICEF	United Nations Children's Fund
WEDC	Water, Engineering and Development Centre (Loughborough University, UK)
WPC	Water Point Committee
WSP	Water and Sanitation Program (World Bank)
WUA	Water User Association

1. Introduction

According to the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (WHO/UNICEF, 2012), worldwide approximately 780 million people use unimproved water sources for drinking water. Apart from Oceania (where data is limited), Sub-Saharan Africa is the region with the lowest percentage of people with improved drinking water sources. On average this percentage is 61, but for urban areas it is 83 and for rural areas 49. The lack of improved water supplies in rural areas of Sub-Saharan Africa has motivated governments, non-governmental organizations and other entities to highly invest in this sector. In the last few decades, wells and boreholes with handpumps are promoted as the most viable option for rural water supply in many developing countries and have become the principal technology (Harvey & Reed, 2004). Although solar pumping and piped water systems are growing also in rural areas, 'the humble handpump will be supplying safe water to millions of rural water users for decades to come' (Baumann & Furey, 2013).

However, after implementation, many handpumps stop functioning within a few years. Currently in Sub-Saharan Africa, between 30 and 40 percent of all handpumps are not functioning (RWSN, 2009). The low post-construction sustainability of handpumps is a much described problem in literature. For the beneficiaries, the local governments, the donors and also for PRACTICA it means that a lot of effort and financial means are spent to make water available in wells and boreholes, but that the actual effect on the continuous availability of good water is limited. PRACTICA has a proven record in making well drilling more sustainable by developing local entrepreneurship and training professionals and thereby making and keeping all required knowhow available in developing countries. In addition to that, PRACTICA has taken up the challenge to deal also with this O&M bottleneck to make water supply as a whole more sustainable.

The objective of this report is to find out what the main problems related to handpump sustainability are, which promising alternatives to the current approaches exist and how the expertise of PRACTICA can contribute to an improvement in handpump sustainability. The focus is on long term sustainability in a development context, in contrast to emergency situations where sustainability is often determined for a shorter period.

This report starts with a chapter (2) on the used methodology. After that the problem analysis is elaborated and alternative approaches and management models for handpumps are described and evaluated (chapters 3 and 4). The last chapter (5) gives some first steps in the direction of a strategy for PRACTICA regarding handpump sustainability.

2. Methodology

2.1 Problem analysis

The first part of the problem analysis is a literature review. An inventory is made on which problems are mentioned to be the main problems causing the low post-construction sustainability of handpumps. Used information sources for this literature review are:

- WEDC (Water, Engineering and Development Centre), Loughborough University, UK;
- RWSN (Rural Water Supply Network), Switzerland;
- IRC (International Water and Sanitation Centre), The Netherlands;
- World Bank;
- Google; and
- ScienceDirect.

Used keywords are: handpumps, community handpumps, community management, sustainability and rural water supply. In total eleven case studies (in ten different African countries) and three expert studies are reviewed.

Besides the literature review a questionnaire was send to two Dutch partner organizations of PRACTICA Foundation who have handpumps in their programs (Simavi and AMREF). This questionnaire consists of a list with problems, in the following categories: finances, follow-up support, participation, spare parts, water committees and other problems (see annex 1 for the full questionnaire). The local partners of the Dutch organizations had to tick all problems that occur in their area and also had to give their opinion on which the three main problems are. Table 1 gives a list of partners who have filled in the questionnaire.

Table 1 Partners who gave input for the problem analysis

Partner	Country	Local organization	Number of handpumps	Handpumps in function	% of handpumps in function
Simavi	Bangladesh	SATHKIRA	6	6	100
	Ghana	PRESBY GYAM AFORD NABOCADO	0 7 3 21	0 5 3 20	- 71 100 95
	Kenya	KAMADEP	10	9	90
	Tanzania	TDFT MAMADO	120 13	75 9	63 69
	Uganda	EMESCO JESE HEWASA	135 10	132 10	98 100
AMREF	Ethiopia	AMREF Ethiopia	47	20	43
	Kenya	AMREF Kenya	15	12	80
	Tanzania	AMREF Tanzania	405	344	85

2.2 Alternative management models

After the problem analysis an inventory is made on alternative management models for handpumps. The same literature sources as for the problem analysis are used to find information on alternative management models for rural water supplies. Some documents used in the problem analysis gave information about alternative management models already. These documents were used as starting points and from there other literature was found via references of the previous literature. The alternative hand pump management models are described and evaluated based on the experiences described in literature and on personal communication with some main authors. Next to that, input on alternative management models was asked from the same partner organizations.

2.3 Strategy for PRACTICA

In terms of strategy for PRACTICA, it is tried to base any activities on known best practices. The study on problems and alternatives gives a solid base for the direction which should be chosen and directions which should be avoided. Future activities are specific relating to the main problems with handpump sustainability.

3. Problem analysis

3.1 Literature review

Table 2 gives an overview of the results of the short literature review on problems related to the sustainability of community managed handpumps. The problems are described in the order of number of times mentioned in the reviewed studies.

Users' payments

The most often mentioned problem is related to the users' payments. Within community management users are expected to collect money, at least for the regular maintenance, but almost all studies mention problems with these payments. The contributions are not enough to pay for the O&M. Case studies mention more specific the inability of committees to raise and manage the money, the misappropriation of funds and a lack of willingness to pay.

Follow-up support

The second factor is the follow-up support by either the government or NGOs. This support is needed for monitoring, community collaboration, spare parts provision, technical training and training on managerial and administrative skills of water committees.

Spare parts

Five case studies mention problems related to spare parts. Spare parts are not easily available. One study mentions that the government does not assist in the spare parts provision. Another study mentions that the existence of different handpump types makes it difficult to set up a profitable spare parts provision. And even if the handpump type is standardized, the little or unstructured demand for spare parts makes it hard to set up a profitable supply.

Participation

Another factor is the participation of the community, during the implementation and also later on. Case studies mention a lack of participation as a cause for a lower sustainability. Some communities were never convinced of the desirability of new water sources and they did not have a say in decision making.

Other

A part of the other factors are related to the functioning of the water point committees (WPCs). They do not meet regularly, they are not divers enough (different kind of people from the community), they have not received maintenance training, they do not cooperate enough with local leaders, do not exist anymore, lost interest or moved away. One study states that the WPCs do not fulfil their tasks and responsibilities because everything is voluntary and only altruism is not enough motivation. Less often mentioned factors are: low user satisfaction, no preventive maintenance, no village level understanding of government water policy, no accountability for policy compliance, lack of incentives/motivation for trained mechanics, sabotage by people who are against the existence of handpumps, long fetching time, bad construction quality, bad reliability of water supply and the use of alternative sources.

Summary

The problems with the users' payments are mainly related to the capacity of the committees to manage the finances. This capacity is again dependent on the follow-up support they get. In summary two main problems can be divided: the lack of a regular money collection and the bad spare parts availability.

Table 2 Main problems with handpump sustainability per case study

	#	1. User payments	2. Follow-up support	3. Spare parts	4. Participation	5. Other
Ghana (Harvey, et al., 2002)	10		No support for monitoring, community collaboration and spare parts provision	Spare parts provision not profitable	No participation in implementation	Low user satisfaction
Kenya (Harvey, et al., 2003)	6	Misappropriation of funds	No support for technical backstopping and spare parts	Poor availability of spares and equipment		
Malawi (Kalulu, et al., 2012)	30	No regular contributions for O&M	No follow-up by government workers			No preventive maintenance
Mali (Jones, 2010)	3	Insufficient payment for O&M				
Mozambique (Godfrey, et al., 2009)	52	Lack of community capacity to manage financial contributions for O&M		Poor spare parts availability		
Mozambique (CARE, 2012)	103		No follow-up by implementers	Bad supply chain for spare parts		WCs without regular meetings, diversity and maintenance training No village level understanding of government water policy No accountability for policy compliance
Sudan (Bönda, 2006)	344	Misappropriation of funds by community members		Reluctance from State Water Corporation to assist communities with access to spare parts	Community no direct say in running affairs	Lack of incentives/motivation for the trained mechanics Sabotage by people who are against existence of handpumps
Swaziland (Peter & Nkambule, 2012)	15	Lack of willingness to contribute funds			Non-involvement in decision making	Lack of cooperation local leaders and the users committee Long fetching time Absence of users committee
Tanzania (WaterAid, 2009)	38	Poor financial management – weak revenue collection				
Uganda (Harvey, 2003)	3	No funds available for maintenance				
Zambia (WaterAid, 2012)	23	Inability of communities to raise sufficient money to pay for repairs	No on-going support to WPCs for managerial and administrative skills			WPCs do not fulfil their tasks and responsibilities, voluntary, altruism not enough motivation
WaterAid / IRC (Carter, et al., 2010)		*Financial contribution for community unacceptable, unaffordable or impracticable*	*Communities never felt ownership and government does also not take care*		*Communities have never been convinced of desirability of new water sources*	*Community committees lost interest or trained people moved away* *Bad construction quality and reliability of water supply*
WEDC (Parry-Jones, et al., 2001)	*10*	*No cost recovery for maintenance*	*No ongoing training and support*		*No choice of technology*	*No preventive maintenance* *Use of alternative sources*
World Bank (Lockwood, et al., 2010)		*No adequate tariff for recurrent costs*	*No external follow-up support*			

3.2 Input from partner organizations

A complete overview of the input from the partners is given in annex 2. All ticked problems are given a value of '1' and the ones ticked as a main problem '1.5'.
Two of the 36 mentioned problems were most often mentioned:

- Spare parts are not easily available and
- Voluntary basis is not enough motivation for committee members.

Other often mentioned problems are:

- Water committees do not have the capacity for the financial management;
- Communities do not feel ownership over the handpumps;
- Too many users per handpump;
- There is no external support to strengthen the spare parts supply;
- Government does not take care of the handpumps;
- Spare parts are too expensive;
- Water committees do not have regular meetings; and
- There is no preventive maintenance.

Spare parts

Problems with spare parts are most often mentioned. Spare parts are not easily available, there is no external support to strengthen the spare parts supply and the spare parts are too expensive. It is beyond doubt that in many Sub-Saharan Africa countries there are problems with the spare parts supply chain for handpumps. Out of the 14 partners who gave input, there was one partner from outside Africa and that was the only one who did not mention problems with spare parts.

Water point committees

After the spare parts, most mentioned problems are related to the water point committees. The voluntary basis is not enough motivation for the committee member, they do not have the capacity for the financial management, they do not have regular meetings and do not conduct preventive maintenance. At many locations the committees do not fulfil their tasks and responsibilities.

Other

Other often mentioned problems are that communities do not feel ownership over the handpumps, which also makes them feeling less responsible for the maintenance. And the fact that too many people are using the handpumps makes that the handpumps need more maintenance. The last point is that governments do not take care of the handpumps.

3.3 Discussion

Combining the literature review and the input from the partners, two main problems remain: poor spare parts supply and disfunctioning of the water committees (in literature review in reverse order). Peter Harvey in a RWSN/UNICEF publication states that it is very difficult to have a good supply chain for spare parts in Sub-Saharan Africa since the production of handpumps and components is mainly in India and most customers are water committees or private mechanics based in rural areas. This requires a good distribution network from the point of manufacture to the points of use (Harvey, 2011). All actors in the chain need to have some profit and still the price and quality need to be acceptable.

It is clear that there are many problems with the local water committees. They are having difficulties conducting their job, partly because they have to do everything on a voluntary basis. They face

problems in collecting money and managing the finances well. They neglect to conduct preventive maintenance. And related to that, they do not get the external support they need.

It is also useful to analyse this situation from a higher organizational level. For example in one district there might be a few hundreds of handpumps. At every handpump there is a local water point committee who needs training on financial matters and on preventive maintenance. And in literature it is widely acknowledged that this support is not only once at the beginning but it needs to be followed up. This takes an enormous amount of time for the local government or any other local institution.

Summarizing the problem analysis, it is clear that the main problems which came out are not in first instance technical. The quality of the handpumps is not often seen as a main problem. In contrast, most problems are related to the management of the activities related to the handpumps. It has become clear that the most common management model, community management, goes together with many problems. Therefore the next step is to make an inventory on alternative management models.

Looking from a country or province perspective with many handpumps, it seems that the current (maximal decentralized) situation is not the most efficient option. In the process of searching for alternative management options, it is important to look for options where the management is arranged at a more central level (e.g. district level).

4. Handpump management models

4.1 Community management

Community management is currently the most widespread management model for community handpumps. Community management can be defined as 'a bottom-up development approach whereby community members have a say in their own development and the community assumes control – managerial, operation and maintenance responsibility – for the water system' (Doe & Khan, 2004). The main principles are: community participation, community control over O&M, perception of ownership and cost sharing (Lockwood, 2004). The concept of community management (or village management of maintenance) was mentioned as the key issue in improving rural water supplies, in the large UNDP/World Bank handpump study during the 1980s International Drinking Water Supply and Sanitation Decade (Arlosoroff, et al., 1987).

According to the previous chapter it can be said that community management faces many problems in practice. Stef Smits from IRC even stated: 'Community management is dead' (Smits, 2012). The main problems that came out of the problem analysis are:

- Community committees do not have the capacity for the financial management and preventive maintenance and they do also not get external support for this.
- Altruism is not enough motivation for the committee members to fulfil their tasks and responsibilities.
- Spare parts are not easily available.

Erich Baumann (2006) promotes an adapted form, named Community Management Plus, in which the responsibilities of the communities and the government entities are clearly defined:

- Communities:
    - Minor repairs including transport of mechanic
    - Spare parts including transport
    - 30% of major repairs and borehole maintenance
- Local government:
    - 70% of major repairs and borehole maintenance
    - Monitoring performance of individual facilities by the districts
    - Mechanisms for conflict and problem resolution
    - Marketing social facilitation retraining mechanics and communities
- Central government:
    - Monitoring performance of O&M system including supply chains

Within the concept of Community Management Plus, the same structure with the community water committees remains. But with the extra support from the local government their functioning might become better in terms of conducting preventive maintenance and collecting users' fees. But if the committee members still conduct their work on a voluntary basis, they might still not have enough motivation for fulfilling their tasks. Baumann (2013) agreed that there are no large scale examples of this concept.

4.2 Alternative management models

Several different alternative management models exist. Table 3 gives an overview of alternatives, including some experiences with it. The first alternative, private ownership is simple and straightforward. Several other models are (like) public-private partnerships. These 'delegate operations and maintenance, or maintenance only, to the private sector through formal contracts and performance agreements' (Kleemeier & Lockwood, 2012). The user community owns the water supply and is responsible for financing the O&M and the public sector is responsible for regulation of the private sector and for providing additional funding/subsidy (Harvey, 2005). Different options are possible for the contracting authority, contract types, the role of community organisations, regulation and external support services.

Table 3 Examples of alternative management models (Kleemeier & Lockwood, 2012; Foster, 2012; Kleemeier, 2010)

Approach	Description	Country	Experiences
Private ownership	Private entity owns and maintains HP, community pays to owner. Comparable to e.g. many maize mills.	Kenya (Kyoso district and Western Kenya (Adams, 2012))	These handpumps showed very high functionality rates. But high investment costs make this model being not widely applied.
HPs under responsibility of piped scheme operator in the area	Maintenance of HPs in supply area of piped scheme included in responsibility of piped scheme operators.	Angola (FairWater)	Handpump functioning not improved. No cost recovery, maintenance stopped.
		Burkina Faso (Vergnet Hydro)	Many problems, especially with the payments (Barbotte, 2011). HPs within 500m of standpost were closed.
		Rwanda (Eastern Province)	Results are not yet documented.
		Ivory Coast (SODECI)	No improvements compared to community management (Trémolet, et al., 2002).
Maintenance contracts between community and company	Users pay a fixed fee to a private company. This company in return provides a guaranteed maintenance service. Depending on the agreement, spare parts might be included. Can be regulated by government.	Mauritania (Vergnet Hydro)	Results were not satisfactory because community committees were too weak to collect the user payments and to manage the funds.
		Niger (Vergnet Hydro)	Results were not satisfactory because community committees were too weak to collect the user payments and to manage the funds.
		Benin (Vergnet Hydro)	Results were not satisfactory because community committees were too weak to collect the user payments and to manage the funds.
		Burkina Faso (Vergnet Hydro)	Results were not satisfactory because community committees were too weak to collect the user payments and to manage the funds.
		Angola (FairWater)	First results positive, but not replicated elsewhere in Angola.
		Kenya (Catholic Dioceses)	Project failed, but it is unclear why.
Maintenance contracts between local government, Water Users' Associations and private enterprise.	Local governments sign maintenance agreement with private maintenance operator. WUA pays annual fee for inspection visit to commune and costs for repairs to private maintenance operator. WUAs hire local handpump managers for money collection.	Burkina Faso	33 local governments signed 39 contracts. User resistance against payment of the annual fee to the (corrupt) communes (Besselink, 2013). Communes were bypassed and technicians were directly involved in case of problems (Zoungrana, 2013).
		Madagascar (Medair)	Results are not documented in detail yet. And if a community does not pay, a WUA umbrella federation exerts pressure downwards, in some cases removing the pump.

Handpump Mechanics Associations	All HPMs of a district are organized in an association with leadership, constitution, registration, bank account and membership fee (Nekesa & Kulanyi, 2012). Some have also set up their own spare parts stores or depots.	Uganda	Results are positive: increased cooperation and learning amongst HPMs; increased access of HPMs to spare parts, tools and knowledge; increased ability to receive service contracts (with DWO, for rehabilitation of boreholes and wells). It is not clear whether a HPMA should register as a CBO or as a company, or both.
Central service company + digital wallets	Central service company for series of pumps, responsible for money collection (with RFID card system), spare parts supply and maintenance (Aqua for All, 2012).	Aqua for all / Susteq	Not yet implemented anywhere. Costs might be high compared to costs in other models. Costs include RFID cards, scanning device, uploading point, etc. Not yet verified whether it is realistic to create vital service companies.
Water kiosk model	Private operator manages a group of handpumps. Per water point a caretaker, pays part of collected money to entrepreneur.	Uganda (Water for People)	Pilot for handpumps in 'Managing Water as a Business'. Meters help to hold caretaker accountable.
		Democratic Republic of Congo (Vergnet Hydro)	Similar system with water meters and private operators who are responsible for maintaining the water service.

4.3 Other relating developments

Several other developments related to handpump management are worth to be mentioned here:

1. The first one is the digital wallet option. Within this model, use is made of payments with a RFID card. This specific technology is widely applied in Western countries, and to a lesser extent it is also used in Southern countries. For handpumps, it is not used yet. Currently, this application for handpumps is under research and development by Susteq in the Netherlands (Suzebeek, 2013). The successes of similar technologies in urban areas makes the application for handpumps promising.
2. Above technology preferably goes together with a flow meter. Therefore the work of Susteq is combined with developing a flow meter for handpumps. Also Vergnet Hydro (France) is developing a flow meter for handpumps, one specific for their own Vergnet pumps (Leger, 2013). Also Water for People Uganda is starting towork with flow meters on handpumps.
3. Another aspect of the French company Vergnet Hydro, is working with local representatives in the countries where the pumps are installed. These representatives are taking care of the spare parts supply (Decherf, 2013). This option mainly improves the spare parts supply, but does not make the management of the pumps at the community level different.
4. The mw4d (mobile/water for development) research group at Oxford University United Kingdom has a project on using mobile phones for monitoring the handpump functioning. If a pump is not used for more than 24 hours, a message is send to a central point from where maintenance is arranged (mw4d, 2013).
5. FairWater (The Netherlands) is working with BluePumps which require hardly any maintenance. This pump is only in use for some few years yet, so it is not clear whether it really improves the functionality (Beers, 2011).
6. A highly subsidized program of Inter Aide in Malawi provides area mechanics with technical skills, bicycles, tools and spare parts. This project included 8,500 pumps and is estimated to have increased the percentage of handpumps in use from 65% to 85% (Hystra, 2011).

4.4 Evaluation

A general evaluation of the different management models is given in Table 4. This evaluation is based on the analysis above and on the comparable evaluation in a large WEDC study on 'Building Blocks for Handpump Sustainability' (Harvey & Reed, 2004).

Table 4 Advantages and disadvantages of handpump management models

	Advantages	**Disadvantages**
Community management	Fast initial response to problems Community in control of own affairs	Altruism required in committees Committees lack skills for financial management Difficulty in accessing spare parts Much external support required
Private ownership	Clear ownership and responsibility Strong incentive for rapid repair	High initial costs to owner Difficulty in accessing spare parts Lack of skills for financial management and preventive maintenance
HPs under piped scheme operator	Concentration of skills Easy access to spare parts	HPs are easily neglected since they do not bring profit for the operator
Maintenance contracts community – company	Concentration of skills Easy access to spare parts	Still user committee without motivation and skills Hard to apply sanctions
Maintenance contracts local government – WUA – private enterprise	Easy access to spare parts Concentration of skills	Potentially higher costs Potentially slower response times Needs active government regulation
HPMs Associations	Easy access to spare parts Concentration of skills Better information flow between WUCs, HPMs and DWOs	Still user committee without motivation and skills Still support required for committees
Central service company + digital wallets	No community committees required Responsibilities concentrated in one service company (finances, spare parts, mechanics, quality control) Potentially shorter response time	High installation costs (RFID cards, scanning device, uploading point, power) Power needed at local level Qualified technicians are needed Large company might be hard to realize
Water kiosk model	All involved people earn money No committees required Easy access to spare parts	Paying per volume required but might not be accepted Good enterprises need to be found

4.5 Synthesis of problems and alternatives

In the problem analysis, four main problems came out. Any potential alternative handpump management model should solve these existing problems with the community management. Thus the following criteria should at least be met:

1. No altruism required
2. Sufficient skills for financial management
3. Limited follow-up support required
4. Good spare parts accessibility

Table 5 gives a refined evaluation in which the management models are assessed based on these four criteria. In addition a fifth criterion is added: acceptable price level for the users. The water price is the main changing factor for the users in the alternative management models and is likely to be related to the willingness of people to use the water supply.

Table 5 Evaluation of management models based on the three criteria

	CM	PO	PSO	CCC	PPP	HPMA	MP	WK
Motivation	-	+	-	+/-	-	-	+	+
Financial management skills	-	+/-	+/-	-	+/-	-	+/-	+/-
Follow-up support	-	+	+/-	-	+/-	-	+	+
Spare parts accessibility	-	-	+	+	+	+	+	+
Acceptable price level	+	-	-	-	-	+	-	-

CM=community management; PO=private ownership; PSO=piped scheme operator; CCC=community-company contracts; PPP=public-private partnerships; HPMA=Handpump Mechanics Associations; MP=mobile payments; WK=Water kiosk model

Based on this evaluation, private ownership scores medium. In terms of motivation, there will not be a problem since the owner gets all the revenue himself. Because of this good motivation it is expected that the money collection is better, but there might still be problems in terms of saving for eventual repairs. Since there is clear ownership and no committee, less follow-up support will be required. The spare parts accessibility will not be improved since the distance to spare stocks is still large. The price for the water is likely to be higher compared to the price in case of community management, since the owner wants to make profit out of it. But the strong incentive for rapid repair might result in a good reliability of the water supply and make that users are more willing to pay. NGOs might not be open for this option because they prefer to donate to a community rather than an individual. And also for private persons themselves, the high investment costs might be a barrier to start with this option.

The approach with the handpumps under responsibility of the piped scheme operator in the area is questionable. This operator has experience in providing a water services and has therefore the potential to be a suitable manager for the handpumps as well, without requiring too much external support. But in practice it is hard to make profit from the handpumps and therefore they are easily neglected.

The maintenance contracts between communities and a company are also questionable. In practice it seems to be very difficult for companies to have contracts with communities. The communities still have the same problems with the finances and sanctions are difficult to apply. As the company is based at a central location, it is likely that he has proper access to spare parts.

The situation with the contracts between the local government, private maintenance operators and WUAs seems to score medium. In terms of motivation it is not clear whether all involved people earn money. For example the people in the coordinating water users' associations might not earn

(reasonable) money. It is also not clear whether they are able to arrange the financial management well. Because the management is more centrally organized, the access to spare parts is also likely to be improved. Within this model quite some different entities are included, which might make it too complex and inefficient.

The HPMA's score quite low, because the same structure with the unmotivated and unskilled water point committees remains the same. The positive part is that the accessibility of spare parts is expected to be better in this case. The HPM's are centrally organized and some associations have even started their own spare parts stores.

The management model with the central service company and the mobile payments gets good scores. There is no altruism required, the financial management is organized in one central service company and also the spare parts are organized by this same company. But this option has not been implemented in practice so far, and the use of such advanced technologies might be too expensive or not suitable for rural areas.

Although not applied yet, the water kiosk model gets also good scores. All involved people earn money, no committees are required and the enterprise is central organized and will have better access to spare parts. The enterprise needs skills for proper financial management. The only problem might be the water price which is expected to be paid per volume, which might not be favoured by the users.

4.6 Input from partners

From the same partners mentioned before, input was asked about alternative management models (see annex 2). Within the questionnaire only the three management models which got the best scores in the previous sections are included. Eleven partners gave their response. The responses are elaborated in the order of the asked questions.

The question on the option of private ownership for handpumps was both answered positive and negative. Six partners answered that this option could work in their area. But several preconditions were given: the operator should be an outsider, there should be government regulation and it should be clearly stated that the users have to pay for their water services. And one partner stated that it would only work in rural growth centres (where people are able to pay) or in water stressed areas without alternative water sources. Reasons why partners answered negative were: people are not used to it; people are too poor to pay for the water; there is no law for water as a profit making service; water is considered to be free; it's not clear who owns the water supply; rural people are not business minded for water; and there are other water sources.

Answers on the question regarding the water kiosk model were comparable to the answers regarding private ownership. About half of the partners answered positive. Again several preconditions were given: there should be arrangements for irregular income of households and it might work better in rural growth centres (where people are able to pay) or in water stressed areas without alternative water sources. Reasons behind the negative answers were: people are not used to it; it's not clear who owns the water supply; there are other water sources; rural people are not business minded for water and they do not understand water selling for income. Several partners mentioned that the water kiosk model might work in towns, but not in villages.

The responses to the system with the payments with chip cards were negative. Ten out of the eleven partners answered that this option is not suitable for their area. Reasons were different: people are poor and illiterate; no electricity available and no network. The absence of a proper communication

network was mentioned most often. Although, the system is able to function without a stable communication network. The payments at the pump can still be done, only the flow of information to the central company will be disturbed.

5. Developing a further strategy

5.1 Designing alternatives

Based on the evaluation in the previous chapter it can be concluded that any potential alternative handpump management model should not rely on water point committees which are often unskilled and may lack motivation. Apart from the lack of motivation and lack of skills it is potentially inefficient if for every handpump a whole group of people needs to have a say in the management of it. The management activities of one handpump are very minimal, but the committee still needs to remain as an organized group and needs to be trained and trained people often leave communities. And still there needs to be an external agent who gives support to all those water point committees.

Since none of the existing alternatives got a very positive score, some efforts are made to think of a different management model. A list of principles and requirements for an alternative handpump management model is made, see Table 6.

Some few considerations might be contradictory to the principles below:

- Currently most handpumps are community owned and community managed. Ownership might be a problem in case of shifting to a more business oriented model.
- Some studies mention that it is very difficult to make hand pumped water supplies fully paid by the users. The IRC project WASHCost has developed benchmarks for required money to ensure sustainable water service from a handpump. It is stated that these amounts are low but still in many countries 'too much for the available budgets and levels of economic development'. Therefore they state that a clear commitment from government and donors to subsidize part of the recurrent costs over the long term, is required.
- In the current situation, water prices are extremely low, often less than USD 0.50 per person per year. In any alternative the water price will be higher than that, which might result in resistance from users or people might simply go to other (unimproved) water sources.

Table 6 Requirements for alternative handpump management model

Financial	Water is not for free. Users pay at least for the maintenance costs and preferably also for the initial costs and depreciation.
	Costs for the water should not exceed the economic resources of the users (including guaranteed long term external contributions).
	Entrepreneurs must have access to suitable (micro-) finance options with reasonable interest rates in order to invest in hand pumped water supplies. This money can be paid back from the income from the users.
	Sustaining the water supply is not dependent on volunteers. All involved people earn money from their activities.
Institutional	Agreements regarding tasks and sanctions need to be officially established.
	A pump is only installed if agreements regarding maintenance, finances and sanctions are established.
	Users who do not pay are excluded from the water supply.
	If a responsible person does not fulfil his tasks, he does not receive income.
	The government is not the service provider. The government is only regulating, controlling and facilitating.
	Planning and implementation is a gradual expansion from a central (geographical) starting point. This facilitates also the maintenance (including spare parts supply).
Environmental	Regular water quality monitoring is part of the established tasks and responsibilities.
Technical	The water point density should be such that the user amount does not exceed the pump and well capacity.
	Per situation the requirements for preventive maintenance should be assessed (depending on pump type, water depth, user intensity and water quality).
	Maintenance should be done by an entrepreneur with experience in comparable activities.

	Maintenance should only be conducted by skilled mechanics.
	Spare parts must be available within less than 24 hours.
	Spare part are not bought by the users or community committees. A supplier prefers 20 regional mechanics to 2000 committees coming for spare parts.
	The water supply system must be able to develop into a higher service level (e.g. with a motorized pump, storage tanks, extra extensions, kiosks and/or house connections).
Social	The implementation of improved water supplies goes along with awareness raising regarding the importance of clean water.

Based on the evaluation in the previous chapter in combination with table 6, three alternative handpump management models get the best scores: private ownership, the mobile payments model and the water kiosk model. Next to that, in specific situations it might be feasible to think of other alternatives, in which the requirements of table 6 need to be taken into account.

5.2 PRACTICA and handpumps

PRACTICA has several activities in collaboration with partners who are working in the rural water supply sector. Part of these activities are related to professionalizing manual drilling and water point development, including handpumps (with UNICEF and other partners). Activities within these programs include:

- Feasibility studies: hydrogeological conditions, market conditions, private sector assessment and national policy conditions;
- Support to development of country-specific programs for implementation of manual well drilling and handpump installation;
- Selection, training and certification of drilling enterprises and handpump installers;
- Training of supporting businesses.

Evolving activities of PRACTICA relating to handpump sustainability are directly connected to the activities mentioned above. The activities match with the two main problem, the bad spare parts supply chains and the bad functioning of the water committees.

Spare parts supply

Relating to the bad spare parts supply chain, PRACTICA has several activities.

- In the mentioned study on sustainable supply chains (Harvey, 2011) an integrated supply chain is suggested. This means that one private enterprise includes the whole chain from importing pumps, conducting installations, pump repairs and spare parts. Especially the establishment of in-country importers is a major shift. It requires a thorough feasibility study and identification of potential enterprises. But also the legislation might need adaptions. PRACTICA has been involved in the exploration of possibilities for local handpump procurement (in collaboration with UNICEF) from 2009 onwards. A problem with local procurement is that many NGOs and others prefer importing themselves, because of the lower initial price. But although the initial price might be higher, the long term sustainability of the pump (including spare parts availability) might be better guaranteed by the in-country importer.
- Related to this is technical advice on handpump types. Although the choice of a handpumptype is often not a determining factor for the handpump sustainability, it has its influence on the possibilities for local procurement and on setting up a good functioning O&M mechanism.
- A third option of improving the spare parts supply is the local production of pumps and spares. Handpumps are most often imported as a whole. Local production is only feasible if supported by the government. Import taxes are often high for raw materials and low for whole pumps. PRACTICA has experience with the development of local production of Volanta

pumps in Burkina Faso and Senegal. With most other pumps (especially the ones from India) it is hard to compete with the very low prices of the pumps from abroad. For low-cost handpumps for smaller groups, e.g. the rope pumps, the situation is different. Local production of these pumps is feasible in many developing countries.

Functioning of water committees

Based on the current study, PRACTICA wants to advocate handpump management models that do not rely on community committees. Key is more private sector involvement in the management of the hand pumped water supplies. Two related activities are:

- Country-specific feasibility study for innovative private sector O&M mechanisms which can be used in the programs. In any management shift, the requirements from table 6 need to be taken into account.
- A totally different activity is related to the earlier mentioned model with the mobile payments. This model eliminates the need for a water committee at every handpump. The technical development of this option is currently conducted by the company Susteq in collaboration with PRACTICA Foundation. The first prototype has been developed and is planned to be tested in collaboration with SNV Kenya in Western Kenya in September 2013.

5.3 Future activities

In order to get more evidence on the performance of business oriented management models for handpumps, it is proposed to set up several pilot projects with this models. Important elements in these pilots will be:

1. Assessment of the handpump sector in the specific country or region, including
    - Supply chain of pumps and spares
    - Maintenance arrangements
    - Financial management
2. Identification of potential partners/entrepreneurs who can play a role in management improvements
3. Elaboration of the area specific business model for the handpump management
4. Training of entrepreneurs
5. Further facilitation of management shift.

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Annex 1: Questionnaire and input from partners on sustainability problems

General:

Country	
Number of handpumps in the project	
Number of handpumps in function	

Problems: **Allowed to give more answers per question**
Just put a 'x' in the cell before the problems in your project area

Finances – Which of the following problems occur at the handpumps?

	Users are not willing to pay
	Users are not able to pay
	Misappropriation of funds
	Water committees do not have capacity for the financial management
	Payment scheme does not fit with users' income (e.g. income only during harvest time)
	Tariff too low to cover the recurrent costs
	Other:.....
	No problems related to finances

Follow-up support – Which of the following problems occur at the handpumps?

	NGOs do not come back after they implement a handpump
	Government does not take care of the handpumps
	There is no performance monitoring of the handpumps
	There is no ongoing maintenance training for water committees
	There is no ongoing managerial and administrative training
	Other:.....
	No problems related to follow-up support

Participation – Which of the following problems occur at the handpumps?

	Communities do not feel ownership over the handpumps
	Communities have never been convinced of the desirability of the new water sources
	Communities did not have influence in technology choice
	Users have no say in running affairs
	Other:.....
	No problems related to participation

Spare parts – Which of the following problems occur at the handpumps?

	Spare parts are not easily available
	Spare parts provision is not profitable because of different handpump types
	Spare parts are too expensive
	There is no external support to strengthen the spare parts supply
	Other:.....
	No problems related to spare parts

Water committees – Which of the following problems occur at the handpumps?

	Water committees do not have regular meetings
	Water committees are not enough divers (different kind of people from the community)
	Lack of cooperation between local readers and the water committee
	Absence of water committee
	Committee lost interest
	Voluntary basis is not enough motivation for committee members
	Other:.....
	No problems related to water committees

Other – Which of the following problems occur at the handpumps?

	Users are not satisfied with the water supply
	There is no preventive maintenance
	No village-level understanding of government water policy is low
	Activities of the government and NGOs do not correspond to the official policies
	Lack of incentives/motivation for trained mechanics
	Sabotage by people who are against the existence of the handpumps
	Too many users per handpump
	Trained people moved away
	Bad construction quality
	Bad reliability of the water supply
	Alternative water sources
	Other:.....

Final question
Which of the mentioned problems do you think are most important in you project area? Which problems have the biggest influence on the long term sustainability of the handpumps? And why? (name a maximum of three problems and explain why you think these problems are the most important ones)

Further remarks:

	#		SU1	SU2	SU3	SG1	SG2	SG3	SG4	SB1	ST1	ST2	SK1	AT1	AK1	AE1
Finances	7,5	Users are not willing to pay	1	1,5	1,5				1,5		1	1				
	4	Users are not able to pay					1,5	1					1,5			
	4,5	Misappropriation of funds	1		1							1		1,5		
	11,5	Water committees do not have capacity for the financial management	1,5	1,5	1	1	1		1		1	1		1		1,5
	4	Payment scheme does not fit with users' income (e.g. income only during harvest time)					1	1			1	1				
	5	Tariff too low to cover the recurrent costs	1		1		1			1			1			
	1,5	*Users are not able to manage their little money*					*1,5*									
Follow-up support	6,5	NGOs do not come back after they implement a hand pump	1		1						1	1			1,5	1
	10	Government does not take care of the hand pumps	1	1				1	1		1	1,5	1		1	1,5
	9	There is no performance monitoring of the hand pumps	1	1	1		1		1		1	1		1		1
	8,5	There is no ongoing maintenance training for water committees	1,5	1	1	1		1				1		1		1
	7	There is no ongoing managerial and administrative training	1	1	1		1				1	1		1		
Participation	11	Communities do not feel ownership over the hand pumps	1,5	1	1	1		1	1,5		1	1,5		1,5		
	0	Communities have never been convinced of the desirability of the new water sources														
	7	Communities did not have influence in technology choice	1					1,5	1		1				1,5	1
	4	Users have no say in running affairs							1	1	1	1				
Spare parts	14,5	Spare parts are not easily available	1,5	1,5	1	1	1,5	1	1		1	1	1	1,5		1,5
	3	Spare parts provision is not profitable because of different hand pump types	1								1					1
	10	Spare parts are too expensive	1	1,5				1,5	1		1	1	1,5			1,5
	10,5	There is no external support to strengthen the spare parts supply	1	1,5	1		1				1	1	1	1	1	1
	1	*Stockists do not stock adequately cause the demand for the parts is not regular*	*1*													
Water committees	10	Water committees do not have regular meetings	1	1	1			1	1		1	1		1	1	1
	3	Water committees are not enough divers (different kind of people from the community)	1						1						1	
	4	Lack of cooperation between local leaders and the water committee	1								1	1		1		
	1	Absence of water committee	1													
	7	Committee lost interest	1	1	1			1			1		1	1		
	14	Voluntary basis is not enough motivation for committee members	1	1	1,5	1	1	1,5	1		1,5		1	1,5	1	1
	1	*Bad documentation / record keeping*	*1*													
	1,5	*Water Committees are not functioning well*								*1,5*						
	1	*Water Committees do not have by-laws which limits their power*		*1*												
	1	*Water Committees have no term limits or regular elections*		*1*												
Other	2	Users are not satisfied with the water supply	1												1	
	10	There is no preventive maintenance	1	1	1			1	1		1	1		1,5		1,5
	7,5	Village-level understanding of government water policy is low	1	1	1				1,5		1	1		1		
	2,5	Activities of the government and NGOs do not correspond to the official policies				1,5					1					
	8,5	Lack of incentives/motivation for trained mechanics	1	1	1			1			1,5			1	1	1
	3	Sabotage by people who are against the existence of the hand pumps									1	1	1			
	11	Too many users per hand pump	1		1		1,5		1	1,5	1	1	1		1	1
	8	Trained people moved away	1				1			1		1	1	1	1	1
	3,5	Bad construction quality	1								1,5					1
	8,5	Bad reliability of the water supply	1		1,5			1		1,5		1			1,5	1
	5	Alternative water sources	1	1					1		1			1		
	1	*Not enough mechanics*	1													
	1	*Mechanics do not have sufficient technical skills*	1													

Annex 2: Questionnaire and input from partners on management models

Community management

The most common management model for handpumps is community management. This model goes together with many problems. The main problems are:

- Bad access to spare parts;
- Voluntary basis is not enough motivation for committee members;
- Too much external support is required;
- Committees are not able to manage the financial matters.

Question 1: Do you have ideas on how to improve this situation with the community management?

Private ownership

An alternative to community management is private ownership. Private persons buy (possible with the help of a loan) a well/borehole and a handpump, and they sell water to make profit. The owner of the handpump is responsible for the maintenance. Similar to privately owned maize mills which are used by a larger group of people.

Question 2: What do you think about this option of private ownership? Do you think it might work in your project area? And why?

Water kiosk model

Another alternative is to work with a water kiosk model. In this model, an enterprise/entrepreneur pays a licence fee to the local government for rights to manage and maintain a cluster of handpumps. The licence fees are pooled in an insurance scheme for major repairs and rehabilitation. The enterprise employs a caretaker for each handpump, who collects money (per jerrycan). This caretaker pays a fixed amount of money to the enterprise (per month or per volume of water sold). The entrepreneur is responsible for the maintenance of the handpump.

Question 3: What do you think about this water kiosk model? Do you think it might work in your project area? And why?

Question 4: Are there any entrepreneurs in your area who could manage a group of handpumps as outlined in the kiosk model?

Mobile payments

Currently, a system is developed which makes it possible to pay water at a handpump with a chipcard. You get a small personal chipcard, you have to upload it with credits and every time you take water 1 credit is taken from your balance per jerrycan of water. The money is automatically transferred to a central company, which is also responsible for the maintenance.

Question 5: What do you think about this option with mobile payments? Do you think it might work in your project area? And why?

Other alternatives

There might be other experiences with alternative management models in your country. Or you might have your own ideas on alternatives.

Question 6: Are there any experiences in your country with handpump management models other than community management?

Question 7: Do you have ideas yourself on handpump management models other than community management?

		Community management	Private Ownership
Simavi	Bangladesh		No, people are not used to this and are too poor to pay for the water
AMREF	Ethiopia		No, no law for water as a profit making service and water is considered to be free
PRESBY	Ghana	Skilled people in committees, payment for committee members	yes, but operator should be outsider
NABOCADO	Ghana	Cottage industries and local manufacturing of simple parts	Problematic, who owns? And: rural people not business minded for water
GYAM	Ghana	Motivation of watsan teams in a way of sanitation credit	yes, through credit
AMREF	Kenya	Privatize HP to make management more sound	yes
TDFT1	Tanzania	Involving community from initial stage	yes
TDFT2	Tanzania	Separation of roles within community	yes, but with government regulation
AMREF	Tanzania	Private partnership	yes, it must be clearly stated that community has to pay water service
JESE	Uganda	Pumps whose parts can be fabricated locally, financial management training	no, because of other water sources
EMESCO	Uganda	By-laws	Only where people can afford payment (rural growth centres) or in water stressed rural communities

		Water kiosk	Entrepreneur
Simavi	Bangladesh	People are not used to this	yes
AMREF	Ethiopia	maybe for small towns	no, people do not understand water selling for income
PRESBY	Ghana	Might work	no
NABOCADO	Ghana	Problematic, who owns? And: rural people not business minded for water	no
GYAM	Ghana	yes	yes
AMREF	Kenya	maybe	yes, TANATHI
TDFT1	Tanzania	yes, if no alternative water sources	many
TDFT2	Tanzania	yes, with arrangement for irregular income of household	Maybe
AMREF	Tanzania	yes	no
JESE	Uganda	no, because of other water sources	not in the villages
EMESCO	Uganda	Only where people can afford payment (rural growth centres) or in water stressed rural communities	yes, some

		Mobile payments	Other experiences
Simavi	Bangladesh	No, people poor and illiterate	HP caretakers for repairing and collecting fees
AMREF	Ethiopia	no	
PRESBY	Ghana	Not for rural areas	-
NABOCADO	Ghana	No, no network	-
GYAM	Ghana	no	Artisans in bicycle fittings involved in handpump maintenance
AMREF	Kenya	may only work for towns	Total management from donor or private company: providing water source, servicing, maintenance,etc.
TDFT1	Tanzania	Technology problematic for remote areas	No
TDFT2	Tanzania	Not for rural areas, no electricity and communication network	-
AMREF	Tanzania	possible	
JESE	Uganda	Not for rural areas	HPMAs
EMESCO	Uganda	Bad network	PPP and private ownership

		Other ideas
Simavi	Bangladesh	Supply maintenance manual (including pictures) to communities, private businesses, motivational work for using safe drinking water
AMREF	Ethiopia	Simple low cost and low labour intensive hand dug technologies for households or small groups
PRESBY	Ghana	operate, pay and own
NABOCADO	Ghana	-
GYAM	Ghana	yes
AMREF	Kenya	Pulic private partnerships
TDFT1	Tanzania	Low cost pumps that can be locally manufactured (e.g. improved rope pumps)
TDFT2	Tanzania	Use existing community social groups
AMREF	Tanzania	financial cooperative society
JESE	Uganda	-
EMESCO	Uganda	water for cash - soft loans or grants