

METHODS FOR COMMUNITY INVOLVEMENT IN PRIVATE WATER SUPPLY SCHEMES – A CASE STUDY OF NAMAACHA CITY, MOZAMBIQUE

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Abstract

This study concerns the community involvement in water resource management in Namaacha City in Mozambique. The city has approximately 16 000 inhabitants. In 2005, the World Bank invested in new infrastructure for the water provision of the city, and water supply is since then handled by a private company. Water provision in the city is still insufficient and besides this, the water system faces problems of low revenue coverage for the private company, stolen infrastructure, and excessive leakages. The reasons behind the failure of the water supply system has been investigated and measures to establish a sustainable community involvement in the water supply of the city has been pin-pointed. Based on the understanding of these problems, possible solutions of how to improve the water resource management are presented.

The study shows that there are improvements to be made to the water supply in Namaacha City. Neither water tariff system used, nor the type of water meters and their locations are well adapted to the local circumstances. These are structures that impede the establishment of a sustainable community involvement. An increased community involvement in the water management is recommended to improve the awareness within the community and to create additional accountability for the water provider.

Key words – Small scale water supply; Mozambique; Community involvement; water management; water tariffs

Introduction

The privately managed water supply of Namaacha City, Mozambique, is at present neither economically nor technically sustainable. The most apparent problems are insufficient cost and household coverage, prevalence of illegal connections and vandalised infrastructure, which impede the water provision system's possibilities of sustainability and hinder its expansion to reach more inhabitants. The purpose of this study is to investigate the origins of and reasons behind the failure to study what is needed for establishing a sustainable community involvement in water resource management in Namaacha City. "Sustainable community involvement"

is to be interpreted as community involvement that is active in and improves the water supply of the city, in the sense that more water can be supplied and that the system can be expanded to reach more inhabitants, without decreasing the quality and quantity of future water supply.

The main research questions are:

"What are the characteristics and extents of the community's unsustainable behaviour within the water resource management?"

"Are there any outside factors/structures that can be identified as resulting in and bearing responsibility for the community's unwanted actions?"

Table 1. *Bairros and Inhabitants in Namaacha City.*

Bairro	Inhabitants	Covered in this study
Bairro A	4186	Yes
Bairro B	2107	Yes
Bairro Fronteira	1897	Yes
Bairro 25 de Junho	2754	Yes
Bairro Cascatas	435	Yes
Bairro Chimuchuanine	879	Yes
Povoado de Germantine	730	No
Povoado de Cocomela	663	No
Povoado de Ndonguene	322	No
Povoado de Matianne A	186	No
Povoado de Matianne B	350	No
Povoado de Matianne C	137	No
Povoado de Macuacua	889	No

Based on the understanding of the problems and the local conditions, possible future improvements will be proposed and hopefully implemented.

Background

Namaacha City is located in South West Mozambique near the border of both South Africa and Swaziland. It has a border post to Swaziland and is located approximately 70 kilometers west of Mozambique's capital Maputo. Namaacha City is district capital of Namaacha district. In the beginning of 2009 Namaacha City was granted municipality status, which meant that it received its own local governing body, as compared to before when it was governed by the district's office of Namaacha District. The city is officially divided into 13 areas (bairros), out of which this study covers those 6 bairros that are covered by the private water system (see Table 1). For each bairro there are normally unofficial subdivisions used by the inhabitants.

In total the city has 16,165 inhabitants (Namaacha

municipality 2009:1). The majority of the inhabitants (12,888) live in the 6 bairros that this study covers. The bairros vary in wealth and status. A part of Bairro Fronteira (Fronteira A), holds more affluent inhabitants and consists mostly of buildings from the Portuguese colonial era. The president of Mozambique has a house in this area and some of these houses are only used as weekend-houses for residents otherwise living and working in the capital Maputo. Bairro 25 de Junho is reported to be poorer than other bairros and have higher crime rates than the other bairros. Except for the main road that passes through the city and ends at the border post to Swaziland, roads are generally small, unpaved and difficult to use with cars. The administration of Namaacha City is presented in Figure 1.

Each bairro has one Secretary. The number of Section-chiefs and "Head of 10 houses" in each bairro depends on the number of inhabitants in the bairro. Each "Section-chief" is supposed to be in charge of 600 houses, and each "Head of 10 houses" of 10 houses. However the number of houses under each administrative position does not seem to be that strict. All of these posts are appointed by elections. Each local representative is supposed to hold meetings with and gather information from the area they are in charge of, and pass this information on in the hierarchy. These channels can also be used to spread information downwards.

In the city there are several elementary schools, an academy for teachers and a local hospital. Besides two hotels and a chicken farm there are not many larger businesses established, but instead many small scale service providers who meet the demands of the outsiders from other parts of Mozambique and neighboring Swaziland.

Water provision in Namaacha City

As a result of a new national policy set for so called "small scale piped water system" in Mozambique, the water provision in Namaacha City is now private. Water

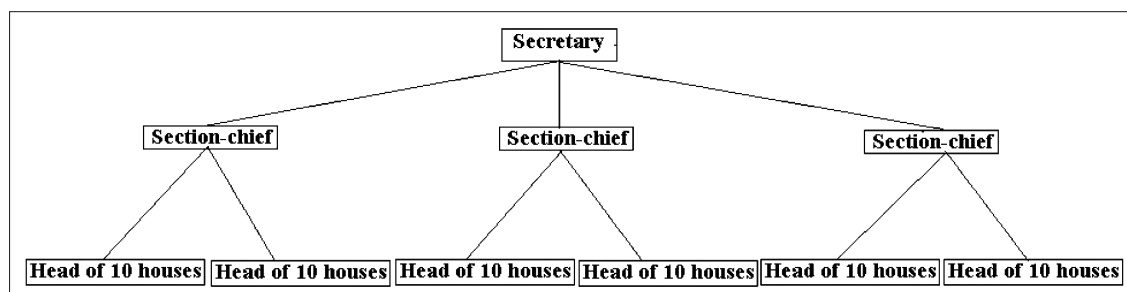


Figure 1. *Administrative division in each bairro in Namaacha City.*

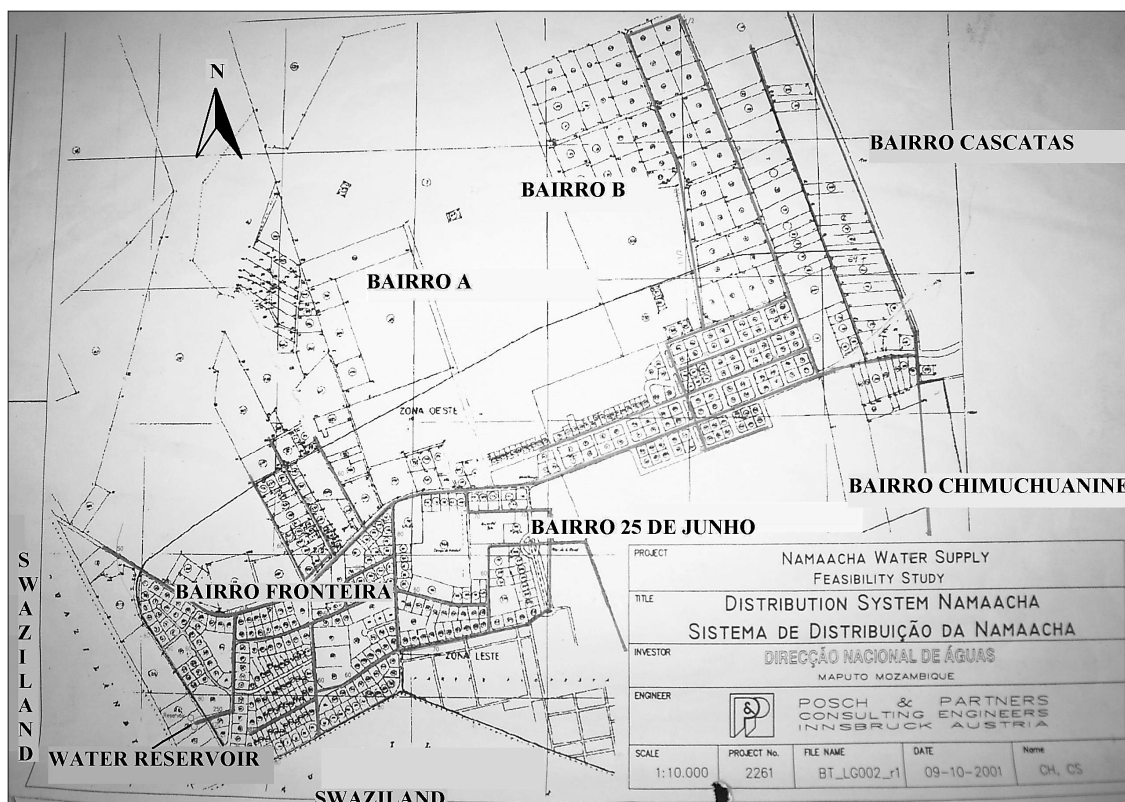


Figure 2. Map of Namaacha City with water distribution network.

system management in small cities and villages is claimed to be strengthened by such autonomous involvement by either private operators or municipalities (Nhacume 2009). The current water supply system was built in 2005. It consists of two dams for capturing and storing raw water, a water-treatment plant, two water reservoirs and a piped distribution network. For a map of the city and the distribution network, see Figure 2. Surface water is captured by the dams, led to the water treatment plant, pumped to the reservoirs and finally distributed to 910 connections (as per March 2009) at households and water posts. One connection equals one customer, serving 1 to 50 persons, depending on family size and how many families that share the connection.

According to the local administration, the system is reaching 5000 inhabitants (Nhacume 2009). The long-term goal is that everyone in the city shall be supplied by the piped water system either in households or at water posts. At present the distribution network only covers 6 bairros of the central part of the city. Extending the network to all the customers in these bairros requires less expansion, as compared to reaching the other 7 bairros

of Namaacha City. Water supply contracts are controlled by the National Water Authority and given to private companies on a 5-year term. The private company is supposed to cover costs for operation, maintenance and minor expansions of the network. Being given that it is a small-scale system with limited revenues, central water authorities are in charge of investing in larger improvements and expansions of the water system, as these tasks would otherwise be too demanding for the private company.

Besides the piped water system, there are also several alternative water sources used by the inhabitants, such as wells and surface waters. Some wells are private; others are built by the government and handled by the respective bairro. The local hospital conducts tests of the water quality in these alternative sources and supply medicine to the inhabitants using contaminated sources. According to the local hospital, very few inhabitants come to the hospital to be treated for water related diseases.

The water tariff used for the water system is decided upon by both government actors and the private water provider. The government has the final say in the matter

Table 2. *Water tariff system in Namaacha City (100 MZM = €2,3).*

Monthly consumption (m ³)	Monthly cost (MZM)
0–10	200 (fixed cost)
> 10	200 + Additional cost of 18 per m ³ above 10 m ³

and therefore, the tariff system can not be changed solely by the private water provider. The tariff system is presented in table 2.

So consuming any amount of water up to 10 m³ per month will result in a monthly bill of MZM 200 (≈€4,6). After 10 m³, the customer is charged for each cubic meter consumed. A monthly consumption of 11 m³ equals a cost of 200 + 18*1 = MZM 218 (≈€5) and so on. If a customer pays a bill to late, a fine of 20 % of total bill value will be added. Unpaid bills is a problem in the city. The private company's policy is that if a customer does not pay its bill for two months consecutively, the connection to the water system will be closed. When water is scarce, the private company rations water for the different bairros. The amount of water available depends on the amount of rainfall, highest in November – March and lowest in May–October. Least safe supply is during September – October.

Theories concerning community involvement in water management

In general, poverty reduction strategy of Southern Africa shows a consistent focus on privatization, decentralization and trade liberalization. The water sector has over the years received very little focus in these strategies, and even today approximately only 30 % of the countries in Southern Africa focus enough on the water sector. However, both among countries with and without sufficient water focus there is a general promotion of increased ownership by local communities of water systems (Harvey 2008).

Decentralization can be seen to come from the criticism that centrally governed regimes have received. Increased involvement for local inhabitants should be strived for because these are the actors that are mostly affected by the outcomes of the policies set in their area. The basis for their evaluation of how the system is performing will be to what extent water is supplied to them. As this should be the main goal for a water system, actors with such incentives should be given good possibili-

ties to influence the management. With an increased local involvement in decision making politics can be run with access to valuable local knowledge, which will increase changes of adaptation to local circumstances. Local inhabitants are probably the first to notice what effects extraction of a natural resource has. They are often directly dependent upon the resource, and changes in the resources will therefore have direct effects on their livelihoods. Because of this, these actors should have a central role in decision making and planning of the handling of the resource. Private, public or non-governmental actors will probably not be as affected by a changed resource, and can also be driven by other incentives than the inhabitant's access to the resource. However what these actors lack in incentives, they can make up for with greater management capacity and knowledge than local inhabitants might possess (Andersson & Ostrom 2008).

With an increased community involvement there are hopes for a creation of more explicit demands for water and sanitation solutions, which will create better conditions for private sector involvement. If local inhabitants are to formulate demands, their capacities to negotiate with and assess aid agencies and private actors must be strengthened (Montgomery et al. 2009). With a strengthened and involved community, chances will increase that proposed solutions are locally adapted and accepted. An increased community involvement should result in more social pressure put on individuals to act loyally towards the community. Participation is however sometimes not representative; rules that apply locally may not be compatible with human rights (Falk et al. 2009) and gender inequality and racism may occur (Ribot 2002). Local institutions may have less capabilities to address inequalities and extreme poverty, than central organs have (Falk et al. 2009). Studies show that decentralized local regime's capacities to address the interests of the poorest mostly depend on to what extent such incentives are given from central organs (Crook & Sverrisson 2001, in Ribot 2002). Local communities may not be capable to handle and take part in decision making for water resources (Neef 2009), especially where water resources are scarce. Short-term interests might be given much focus, which could worsen the possibilities of sustainability. It is necessary to limit the power of the local institutions to make sure that resources are not exploited because of short-term interests (Ribot 2002). It can be argued that with increased involvement in water management the involved actors will gain knowledge and understanding of the situation and the problems and therefore be able adapt more sustainable approaches. In this sense, the local community's capacity to handle the water resource will improve with time.

Methodology

Data was gathered during fieldwork in Namaacha from beginning of July to the end of August 2009. As different stake holders could have different views of the problems and their origins, the methodology was constructed to receive information from all the different stake holders found relevant. Retrieving information and perspectives from different stake holders was also important to gain a good understanding of the local conditions and its different actors. In addition, information was given by Mr Nhacume at the National Water Directorate (DNA); the private company in charge of the water provision in the City; the local public sector; consumers; inhabitants; local represents in the different bairros; World Bank officials working in the area; and health officials from the local hospital. Most information was received in Portuguese, but in household interviews, a local interpreter was brought along, as some informants preferred responding in local languages.

When gathering information concerning the water situation, the views and perceptions held by the local inhabitants and consumers were in focus, as supplying water to them was the main goal of the water provision in the City. The viability of the company was merely seen as a prerequisite to establish this. During this phase mostly quantitative methods were used. When withdrawing information from local inhabitants, both semi-structured and structured interviews were chosen. Semi-structured interviews were conducted with 8 local representatives of the different areas. Structured interviews were conducted with 217 households, spread out of over different areas. Local inhabitants were consulted to be able to find out their view of the water situation. Topics of concern when consulting them were: were they satisfied with the water supply, if and how they were involved in decision-making in the water provision, and if they would like to be more involved in issues concerning water provision. The structured interviews with the households consisted of the following questions:

1. Are you connected to the piped water system?
2. If yes, are you satisfied with the service?
3. In the area, there are cases reported of consumers not paying their water bills. Do you know why they choose not to pay their bills?

4. In this area, has there been meetings concerning the water situation this year?
5. Would you like to have more meetings concerning the water situation?

Quantitative information was also gathered from the private company. Information of special interest was consumer patterns in the city and number of paid/unpaid bills.

Results and findings

Water losses

A general problem in Namaacha City is that the water system does not have enough water to satisfy the inhabitant's demands. By reducing the amount of unaccounted for water, more water could be available for sale to customers. To be able to charge the customer for the amount of water consumed, water meters are used.

In Namaacha City, all connections had a water meter in 2005. Water meters are always installed on new connections. Still, some connections lack water meters. These will automatically receive a fixed tariff of MZM 200 per month, which is the same value that those customers consuming up to 10 m³ a month pay. The reasons given for not having water meters are that they are either stolen for sale as copper scrap or broken. It is easy to steal a water meter. When workers of the private company change or remove water meters for maintenance or for disconnecting households who have not paid the bills, this job takes around 30 seconds for two persons, using only a wrench. Installation and locations of the water meters are obviously not adapted to local circumstances.

In table 3, the total number of connections and those that lacked water meters in June 2009 are presented. Bairro Fronteira and Bairro 25 de Junho are divided in subbairros.

Data for Bairro Chimuchuanine is entirely missing. In total, the system has 910 connections, out of which the above table is based on data from 871 connections. For June 2009, 125 of these 871 connections (=14,4 %) are reported not to have water meters. The vast part of these connections used to have meters, which are stolen or broken. By changing from copper containing meters to pure plastic meters, the value on the scrap market de-

Table 3. *Total number of connections and connections without water meters (fixed tariffs) in June 2009.*

	Bairro A	Bairro B	Bairro Fronteira A	Bairro Fronteira B	Bairro Cascatas	Bairro 25 de Junho A	Bairro 25 de Junho B	Total
Connections	154	166	162	166	43	180	n.a.	871
Fixed tariffs – June 2009	28	21	20	4	4	48	n.a.	125

creases drastically. The private company try to change meters, but lacks necessary financial resources for this, and will probably have to wait for central authorities to grant them new ones. Another solution is to protect water meters with constructions that make them harder to steal. There are a number of examples of how customers have decided to do this, including solutions like concrete constructions surrounding the water meter, but also cheaper ones like barrels and simple rope constructions. The incentives for doing so are however weak. With a monthly water consumption of less than 10 m³, the cost will remain the same with or without a water meter. And if you consume more than 10 m³ each month, the fixed tariff will result in a lower cost than if a water meter is used. So if customers are solely driven by personal direct economic advantages, they can actually remove the water meter, claim it was stolen, and with a fixed tariff receive an equal or lower cost, depending on their monthly consumption.

By using a tariff system that punishes the use of the fixed tariff, more incentives would be given to customers to protect the water meter. However, forcing customers to protect their water meters would add extra costs to already poor households. But with a different water tariff system that results in higher costs with fixed tariffs, the possibility of having customers removing their water meters to receive a lower monthly cost would be removed. Preferably, these additional “protection-costs” would be borne by the private company supplying the water service, or public water authorities which today pays for new water meters when old ones gets stolen. Under current water tariff system, the private company has greater incentives to make such investments than customers do. The private company is interested in maximizing its income by charging the customers as much as possible, meaning to have as many meters as possible. The public water authority should be interested in not having to buy new water meters all the time, and could therefore defend the higher one-time costs that for instance plastic water meters or additional “protection-costs” would mean.

Leakages

Another problem concerning water losses is water leakages that occur in the pipes. To determine in whose domain and under what circumstances the leakages occur is essential when trying to reduce the amount of water lost through leakages. Water leakages observed during field studies are presented in Table 4. In total 20 days were spent working in the different bairros.

No specific investigation of the amount of water lost through these leakages have been performed, yet by decreasing the number of leakages, obviously more water could be provided to the customers. Spotting 16 leakages in 20 days for a network with 910 connections is a

Table 4. *Observed water leakages in Namaacha City.*

Classification of leakage	Number
Responsibility of consumers with water meter	4
Responsibility of consumer without water meter	3
Leakages in above-ground pipes of the water supplier laying	6
Leakages in subterranean pipes of the water supplier	3
Total	16

very high prevalence of leakages (Swedish statistics for drinking water mains indicate 0,1 leakages per km of pipes and year as a reasonable value; Stahre et al, 2007). When a leakage emerges in a private connection the incentives for the customer to do anything or even care about this leakage is reduced when the connection lacks a water meter, which in table 4 is the case for 3 out of 16 leakages. Without a water meter the monthly bill is not related to amount of consumed water, but is instead set to a fixed tariff – the monthly bill will not be affected.

In the case when there is a leakage after a connection with a water meter the customer has every reason to fix or report this leak, as this will otherwise result in an increased monthly bill. However this argument is based on the customer actually having knowledge and is being motivated by the tariff system. Tariff systems with different prices in different blocks could be hard for customers to interpret and hence the incentives the tariff is supposed to give will be lost (Boland & Whittington 2000). Tariffs should be easily read by customers (Diakité et al. 2009). When examining the tariffs in Namaacha City, they could at first be seen as very simple, consisting only of two different blocks. However, when customers each month receives a water bill for exactly the same price, which is the case if their consumption is below 10 m³, they might interpret this as that they are only paying a fixed tariff regardless of consumption, while in fact they are just always consuming amounts corresponding to the first block of the tariff system. Without knowledge of that the price will increase with increased consumption, there will be no economic incentives to save water. And for the private water provider, who's interest is in profit, besides consumer relations there are no incentives to care about whether the customers' water is consumed or not, as long as it is paid for. In this sense, when speaking of water conservation a privatized water supply results in more responsibility put on the individual than with the water supplier. The private water supplier might also want to encourage consumers to consume as much as possible. But as the area is lacking sufficient water resources it is very important to make sure that paid water actually gets consumed, and not just paid for. Neither water conservation nor having customers concerned

with water conservation is in the interest of the private water supplier.

The water infrastructure covers a very wide area compared to the amount of workers and their means of transportation, which is exclusively by foot. Walking from one corner of the coverage area to the private company's local office takes approximately 50 minutes. Walking by foot also reduces the amount of tools that the workers can carry with them. This means that if a leak is discovered one day, the workers might not be able to repair it until the next day, as they will have to go back to the local office and fetch proper tools.

The fact that consumers seem to lack a sense of responsibility towards the water system and that there are very limited possibilities for them to inform the private company about leakages as there are no official phone numbers to be used for this concern, means that leakages are bound to be more long-running than necessary. Also, given inhabitants' economic circumstances, calling in a leak could very well be perceived as too expensive based on the benefits it results in for the caller. A solution to this could be to have a toll-free phone number, which consumers could use to make free calls concerning reports of leakages and other information of interest for the private company.

As previously described, water is rationed to different areas on different days. Based on this, it becomes more practical for the private company to fix leakages when the area concerned does not have water flowing through its pipes. This also means that a leak discovered during a day when the area does not receive water will not be repaired until two days afterwards, as the next day is "water-day".

Water pipes above ground are more prone to have leakages than subterranean pipes. The water system in Namaacha City has a large amount of pipes above ground. Having pipes (which in most cases are constructed in copper) above ground also increases the risks of thefts. In the beginning of 2009, a pipe section of approximately 10 meters was stolen in Chimuchuanine, and in July 2009 a 12 meter section was stolen in Bairro A. The company argues that they cannot buy new pipes with the risk of them being stolen as well. So when pipes are stolen, it is up to central authorities or local inhabitants to cover the costs of new pipes. They also state that they have not got the resources to cover these pipes with gravel, and are waiting for resources to be allocated to them from central authorities. In this way, management is essentially centralized in a way that makes the private water provider less responsible. Even though the motive for this handing over of responsibility is based on lack of financial resources, it can be argued that it is something that renders the system less efficient. If the resources for such investments exist on central levels, these would preferably, together with increased responsibility, be

handed over to more local actors, for example the private water provider or the municipality's office.

Water tariffs and consumption patterns

The design of water tariffs could have fundamental impacts on the performance and sustainability of a water system. Tariffs can be used to promote a number of objectives, for example (Boland & Whittington 2000b):

- Revenue sufficiency – to ensure cost recovery for the provider
- Economic efficiency – to ensure that customers obtain the largest possible benefits
- Resource conservation – to discourage excessive/wasteful water use
- Equity – users pay according to the amount of cost their consumption inflict on the system
- Fairness – a subjective notion. For some it means promoting income redistribution through subsidized tariffs for poorer households.

Increased-block-tariff structures (IBTs) are common tariff systems and widespread in developing countries (Boland & Whittington in Dinar 2000). Within these, the tariffs are divided into blocks where the cost per cubic meter increases for each block, where the initial block is supposed to correspond to basic needs (Diakité et al. 2009). In this way, it can be seen that high-consumers, who will consume water in the more expensive blocks, will subsidize the consumption of low-consumers, who are consuming water in cheaper blocks. It is claimed that this will promote fairness since richer households are supposed to consume more water than poorer ones (Boland & Whittington 2000b). However, such subsidized structures, sometimes called "social pricing", require careful adjustments for each area they are used in. In this adjustment, both consumption preferences of consumers and the preferences of the regulator must be taken into account (Diakité et al. 2009). A problem with IBT and its attempts to subsidize consumption for poor households is that the size of the initial block is not adjusted to the size of the household. As the initial block, with its reduced rate, cannot be too large, it is probable that large poor households will have a consumption that exceeds this initial block, and therefore will not receive the subsidy the system was supposed to give them. In this sense, an effective IBT-structure would need to be adjusted to for each household, which would be too complicated to implement in most circumstances. Also, the IBT is meant to promote water conservation by having a punishingly high price in higher blocks, which will discourage high and wasteful consumption (Boland & Whittington 2000b). A problem with the increasing cost is that large consumer's preferences are not prioritized. The revenue stream gen-

Table 5. Amount of billing-value paid for the period January – March 2009.

	January	February	March
Fronteira A	29 %	79 %	62 %
Fronteira B	22 %	47 %	54 %
25 de Junho A	16 %	43 %	55 %
25 de Junho B	28 %	34 %	54 %
Bairro A	37 %	47 %	44 %
Bairro B	14 %	35 %	47 %
Cascatas	47 %	87 %	79 %
Chimuchuanine	No water supply	No water supply	No water supply
Total	21 %	48 %	54 %

erated from these consumers is very important to sustain the system, which should give these consumers influence over the design of the tariffs. To be successful, prize schemes should be based on actual water consumption by the households (Diakit  et al. 2009).

Unpaid water bills

The private company's business in Namaacha City is based on consumers paying their monthly bills. It is the sole income for the company and hence their survival depends directly thereof. The private company stated that unpaid water bills was a major problem that they faced. Table 5 shows the level of paid water bills for January – March 2009. These data are obtained from the private company's first quarterly report of 2009.

The table 5 shows that only some of the bills are paid: 21 % of the values for January, 48 % for February, and 54 % for March. The total billed value for this period was MZM 290 387 (≈€ 6679).

According to the private company, the explanation behind the lacking of payments was that their customers

generally lacked a “culture of payment”. In this argument, it is indirectly claimed that water provision is good, but consumers don't want to pay for the water. The argument is further strengthened by the fact that during politically more socialistic times, water provisions was subsidized and the bills were generally lower than today. Another explanation was given by a local politician, who claims that the reasons for not paying the monthly water bills are that: the consumers are not satisfied because water is only supplied 2 times a week during a couple of hours in the morning, that the bills don't correspond to the amount consumed, and that some consumers have not got the economical conditions to pay the bills.

Water tariff system

The water tariff system in Namaacha City does not include any “social pricing” or incentives to conserve water, as IBTs commonly used in developing countries do. Figure 3 shows how the tariff system in Namaacha City is designed in a way that results in higher costs per cubic meter for low consumers.

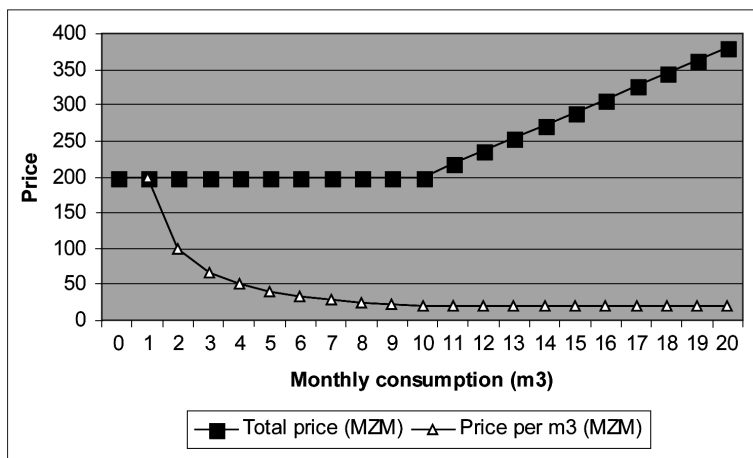


Figure 3. Water tariff system in Namaacha City.

Table 6. *Unpaid water bills for Bairro 25 de Junho A.*

	Total number of unpaid bills	Monthly consumption <10 m ³		Monthly consumption = 0 m ³	
		Number	%	Number	%
Dec-08	1	1	100	1	100
Jan-09	48	46	96	44	92
Feb-09	128	121	95	91	71
Mar-09	44	42	95	40	91
Apr-09	37	37	100	25	68
Tot	258	247	96	201	78

If the assumption is true that higher income leads to higher consumption and vice versa, then the current tariff system results in lower-income households subsidizing consumption for higher income households, if even marginally. The decreasing per cubic meter cost can also be seen to promote higher water consumptions, which can be contra-productive in water scarce areas. The argument given by officials for having a fixed tariff up to 10 m³ / month is that this is supposed to ensure that the private water provider receives sufficient revenues to be able to continue the service, assuming that customers will always receive a bill of at least MZM 200.

Consumption patterns

When studying the aspects and origins of the problem with unpaid bills the consumption patterns of these unpaid bills should be investigated. Table 6 presents the consumptions of the reported unpaid bills for Bairro 25 de Junho A.

With 181 connections to the water system, Bairro 25 de Junho is the bairro with the largest number of connections. The table shows that for instance for February 128 out of 181 customers (71 %) have not paid their bills. It also shows that out of the total 258 unpaid bills, which all could have different values, 78 % of them are billing a consumption of 0 m³, which under the current

tariff system equals MZM 200. 96 % of the unpaid bills for this bairro have a consumption of less than 10 m³, which also corresponds to MZM 200. That such a high percentage of the unpaid bills have a consumption below 10 m³ or even 0 m³ points to the conclusion that the lack of payments might be a result of an inadequate water provision, and not a result of a perceived cultural pattern, as proposed by the private company. Especially the high level of unpaid bills with a consumption of 0 m³ (78 %) should be interpreted as strong evidence for this assumption.

The assumption is that consumers feel that the billed value does not correspond to the amount of water consumed, and decide not to pay the bill. If the assumption is correct, current water tariff system and inadequate water supply are identified as the main problems for the water provision in the area. Water meters are read each month to form the basis for the monthly bills. The consumption data for June and July 2009 are presented in Table 7. The bairros included in Table 7 represent a total number of connections of 775, in total the system consists of 910 connections. Out of these, the consumption data is based on data from 550 connections for June, and 465 connections for July. The reason why the data is not based on all of the connections is that all connections don't have water meters and hence it is not possible to receive any data of their consumption. And for July,

Table 7. *Water consumed June – July 2009.*

	Monthly consumption of less than 10 m ³				Monthly "consumption" of 0 m ³			
	June		July		June		July	
	No of connections	%	No of connections	%	No of connections	%	No of connections	%
Bairro A	52	53	40	42	13	13	10	11
Bairro B	33	34	11	28	8	8	0	0
Bairro Fronteira	55	34	50	31	14	9	12	8
Bairro 25 Junho A	97	75	81	62	29	22	16	12
Bairro 25 Junho B	36	57	26	62	13	21	7	17
Tot	273	50	208	45	77	14	45	10

which was the month when data was gathered, all of the water meters still were not read by the workers of the private company, which explains the sudden drop of meters read between June and July.

The data in table 7 shows that for these months almost half of the consumers consume less than 10 m³ each month, and that 10–14 % “consume” 0 m³. It can also be concluded that the occurrence of these “low consumptions” is more frequent in certain bairros, namely Bairro 25 de Junho A and Bairro 25 de Junho B. This could be explained by the fact that these two areas are situated at higher points and further away from the systems’ water tanks than other bairros, which results in lower pressure in the water pipes and therefore a lower water supply.

Fixed charges are effective if consumptions always are above the limit set for the initial block (Diakité et al. 2009). In Namaacha City all costumers consuming less than 10 m³ will have a higher per cubic meter cost than customers consuming higher amounts of water. If lower-income households consume less water than higher-income households, they are subsidizing the costs of water consumption for households with higher incomes. There is also a significant occurrence of zero-consumption, 14 % of all consumers in June–July 2009. Besides the obvious unfairness of having a “reversed subsidy” with zero-consumers paying and contributing for the water provision of the whole area, the billing of zero-consumption could have further negative effects by creating mistrust and anger among the consumers towards the water provider. Besides giving reasons for consumers not to pay the relatively high monthly bill, this will also decrease the possibilities of having a responsible community involvement in the water provision.

Results from the household interviews are presented in Table 8. The results show that 60 % of the 131 respondents who have piped water connections state that they are not satisfied with the water service they receive. The reason given for this dissatisfaction is that the amount of water supplied is not sufficient. When asked what motives there are for not paying the monthly bills, 27 % of the households with piped connections state

that monthly bills are too high or don’t correspond to the amount of consumed value.

These results support the assumption that the main problem concerning the water provision in Namaacha City is not the willingness to pay for water, but rather the design of the water tariff system and the inability to supply water to consumers.

Community involvement in decision-making

Results from household interviews conducted on site in Namaacha City clearly show that local inhabitants are interested in being more involved in the local water sector (see Table 8). Virtually everybody, 96 % of the respondents, stated that they would like to have more meetings concerning water issues. Only 35 % of the 217 respondents stated that there had been local meetings concerning water provision issues this year.

Involving the local community more in the water provision could have many preferable effects. With its widened involvement, a greater understanding of the water systems capabilities and conditions could be reached within the local community. This would also ensure that local preferences are taken into account when establishing management changes and new constructions.

According to national regulation documents (DAR 2004) a water committee is supposed to be established to engage in regulation matters. Such a committee is yet to be created in Namaacha City. According to the officer responsible for water and sanitation at the municipality’s office, such a committee is well under way to be created. The reason for why this committee was yet to be created was that the municipality’s office was still new, and they hadn’t had time to commence this work. The municipality’s office in Namaacha City was created when the city was granted municipality’s status in the beginning of 2009. The water committee is intended to hold regular meetings to discuss and resolve the water problems in the city. It would consist of local people from different bairros as well as representatives from the private company.

Table 8. *Results from household interviews.*

	Amount	Percentage
Households interviewed	217	8
Numbers of households who have a piped connection (=consumers)	131	60
Consumers who think that the water service is not good because the water supply is not sufficient	79	60
Consumers who think that bills are too high or don’t respond to the amount of consumed water	36	27
Persons who state that there have been local meetings concerning the water situation this year	76	35
Persons who would like to have more meetings concerning the water situation	209	96

Only one of the six Secretaries for each bairro had heard of or had any knowledge about this committee that according to the municipality's office was "well under way to be created". This stresses the need for community involvement, which was also very clear when the local government decided to construct five new wells in the city. From the municipality's office it was claimed that each concerned bairro was integrated in the process of choosing locations for the construction of these new wells. However, out of 54 inhabitants interviewed in two of the areas where wells were to be constructed (Chimuchuanine and Bairro 25 de Junho) only 22% had heard of the construction plans for new wells in their bairros.

The already established divisions of responsibility and power in the area (Figure 1) where each area is administratively divided into smaller areas, could be used as channels to disseminate information and involve inhabitants in decision making. In this sense, there are already clear structures to be used as information- and involvement-channels. What is lacking is the initiative to promote these structures for these ends.

The establishment of a water committee could play a vital role when it comes to involving and informing the local community about local water issues. Today the level of dissatisfaction with the water service is high (60% dissatisfied, see Table 8), which in part could be explained by subjective individual expectations held too high relative the water systems capacity. The water system in Namaacha City does not have enough water to supply all its inhabitants with a large amount of water. With a greater understanding of the systems capabilities and shortcomings, the level of satisfaction could be increased. However, this raised level of satisfaction would not tackle the more fundamental problem, namely that of insufficient water supply.

In an ideal context, increased community involvement would besides granting the managers of the water system access to valuable local information also increase accountability for both the private company and the local government, which would give these actors increased incentives to establish and uphold the most efficient water resource regime. To be able to create this accountability for the private provider and the local government it is important to create a channel where inhabitants' views and claims can be put forward. Today, complaints are put forward to the company by individual confrontations. Without the means to organize and collectively stand behind a claim, individual claims will not create much accountability. Such possibilities would be enhanced with a water committee that takes claims from inhabitants. This is a prerequisite for a private sector involvement in water management. Such structures would also be enhanced by increased level of education for the

inhabitants by increasing their capacity to express their claims and know what they can demand (Montgomery et al. 2009).

Increasing the awareness of the long term consequences of the current situation within the community could create an increased sense of responsibility and ownership towards the water resource and its infrastructure. This awareness could be built up by providing better information and establishing increased community involvement in the management process. Under such structures water and concerned infrastructure would be seen as more precious and therefore decrease the amount of water that gets wasted.

Under decentralized political programs, essential responsibilities have been handed over from central authorities to municipalities' offices. One of the main arguments normally used for this political agenda is to enable the public actor to work more closely with the community that its policies affect (Harvey 2008) and politics are supposed to be able to be more adapted to local circumstances. While the possibilities for collaboration between the public and the community in this sense are increased within decentralized structures, this does not guarantee the establishment of such collaboration. In Namaacha City it can be argued that the municipality's office has not been able to fulfil its duties concerning the water management. It is clearly stated in national regulation documents that some kind of water committee is to be established when having private companies handling the water supply (DAR 2004). The current water provision system with a private provider has been in place since 2005, and the municipality's office was created in the beginning of 2009. Before that, the city's political administration was placed within the districts office, but no efforts was made there to initiate community involvement.

Conclusion

The following problems have been presented concerning the water provision in Namaacha City.

A lot of connections ($\approx 14\%$) lack water meters. Without water meters, incentives to spare water and treat it as a valuable resource are reduced. Revenue streams to the company are also affected negatively by this. The main reason for the missing water meters is said to be because of thefts. The water meters have some parts constructed in copper which is a valuable commodity.

Excessive amounts of water are lost through leakages. Leakages occur both in subterranean and ground laid pipes and in connections both with and without water meters.

A large number of water bills are unpaid.

Water supply is insufficient and numerous consumers

don't receive water, even though they are connected to the water system. The tariff system is formed in a way that even when no water is consumed, consumers will be charged a monthly fee of MZM 200.

The community involvement in decision-making in water provision is low. Inhabitants have little influence and receive little information concerning the water provision in the city.

Some possible solutions have been presented. If increased sustainability is to be reached, these solutions should be integrated in the management of water provision in Namaacha City. They are the following:

Thefts can be reduced by using water meters without copper parts. Water meters can be installed and constructed in ways that make stealing them harder.

Leakages and unaccounted for water can be reduced by: increasing the awareness amongst the inhabitants concerning the water system's scarcity and the consequences of an unchanged situation, increasing the level of connections with water meters and thereby giving consumers incentives to spare water, changing the tariff system to give increased incentives to spare water, decreasing the amount of pipes above ground by increased decentralization to make local actors more responsible for the management instead of central ones.

The large amount of unpaid bills is to be interpreted as a result of: insufficient water supply, poor economical conditions and the structure of the tariff system. Water supply can be increased by improved leakage management and a more responsible community involvement. However, the tariff system should be changed in way that it no longer charges consumers for zero-consumption. Fixed tariff should be removed and replaced by tariffs that charges the consumer per cubic meter consumed to avoid billing of the zero-consumption and "reversed subsidy". This should result in a higher amount of paid bills for the water supplier and increases the incentives to save water. By implementing IBTs, where per cubic meter cost increases with increased consumption, further incentives could be given for this.

Increased community involvement in decision-making should be promoted and the present public interest in contributing to the decision-making be developed. The responsibility for this lies both within the local government (municipality's office) and the local inhabitants. A water committee should be created to engage in regulation matters and to act as a forum and information-channel for inhabitants and other actors to express their opinions and receive information. The municipality's office works with creating such a committee, which should be preceded and followed by meetings with the inhabitants. In this way, inhabitant's opinions could be put forward to the committee and the results from the committee's meeting would be given to the inhabitants.

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