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**Multi-village water systems sustainability:
the case of Chomba system in Mueda Plateau**

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Sustainability is one of the key challenges of rural water supply. In Sub-Saharan Africa, only two out of three water points in the continent's rural areas are functional at any given time. Among these, the multi-village supplies offer significant opportunities for increasing the sustainability of the services, facing the challenges of coverage, management and equity. This paper studies the case of the Mueda Plateau, in Cabo Delgado, northern province of Mozambique. Six systems were reviewed, and among these one (Chomba) outstands at the only given a minimum level of service. We describe the operational status of the service, and we outline the distinctive points (technical and institutional) that made it work substantially better than others in such context. Conclusion gives the challenges ahead for Chomba system and some recommendations to improve sustainability of multi-village water services.

Introduction

Water coverage is estimated at 46% in the Sub-Saharan region. Apart from the lack of infrastructures, its sustainability remains a challenge. Current estimations for Sub-Saharan Africa suggest that only two out of three water points in the rural areas are functional at any given time (RWSN, 2009). Other sources estimate the functionality of hand pumps at between 40% and 50% (Harvey and Reed, 2004), based on a wide range of studies in many countries. In deep studies for Tanzania show that less than half of the water points are working in the rural area (Wateraid, 2009), and around 30% of water points stop working in the first five years of functioning (Jiménez & Pérez-Foguet, 2010). Hence, durability of the services is a key issue if the coverage wants to be increased in Sub-Saharan Africa. Among the rural services, those including multi-village networks are facing great challenges, due to the important number of users involved (usually between 10,000-40,000), but being still in most of the cases under the rural management framework. On the other side, they offer significant opportunities, since the bigger scale of the services can provide enough resources to make it sustainable in the long term. That is why the management of rural services at a multi-village scale is seen by many experts as the way forward to provide more sustainable solutions for the rural areas of low-income countries (SKAT, 2008).

In Mozambique, with 80% rural population largely scattered all along a huge territory, immense efforts have been done during last 30 years to provide sustainable access to water in rural areas, mainly through hand pump equipped shallow or deep wells. Success for these interventions has been diverse in terms of long-term sustainability, spare parts availability or social involvement. Five years ago, piped water systems strongly emerge in national water agenda, as the only feasible response to fast-growing small urban centres, where water service delivery incorporates the complexity of system's technical and financial management into to date considered as non economically-viable rural areas. The Manual for water system's management modalities was officially approved in 2007 (MOPH, 2007), clearly focused on: (i) private sector involvement and (ii) government institutions regulatory and supervision's role; oriented by the national water policy within the objective of improving water service delivery in rural and peri-urban areas. Traditionally, the main problems documented for partially functioning water systems in Mozambique have been technical and management issues, either because of old poorly-maintained infrastructures or lack of adequate organizational scheme with sufficient human and material resources. Aspects like financial

autonomy of the operator, efficiency, participation and equity arise as fundamental aspects to work with for sustainably improving water service delivery in multi-village systems and small towns. This paper examines the characteristics of the 6 multi-village water systems of Mueda Plateau (Nangade, Ntamba, Chomba, Chude, Muambula and Muatide), in Northern Mozambique. Field visits and interviews with service managers and government officials were conducted over one year of survey. The paper focuses specifically on the description of Chomba water supply, as the one giving the best level of service and having special institutional conditions that can be replicated elsewhere. Conclusions give some policy recommendations.

The Mueda plateau water supply

Located in north-eastern Mozambique, the *Planalto de Mueda* (Mueda plateau), is a 30 km² upland where the Makonde's culture originally emerged. This particular region has enormous influence in Mozambique recent history and politics, being the area where the national independence war started (1964-1975) and keeping nowadays the majority of the so-called ex-combatants. The Mueda plateau lay between 600 to 1000 meters of elevation and receives an average rain of 1200 mm./year that mostly infiltrates to finally discharge creating rivers and springs in the contact basement. This hydrogeological behaviour fosters agriculture activities but dramatically affects human water supply: Groundwater depth around 100 m. and no permanent rivers lead to rely on complex multi-village pumped systems to provide the water to around 133,000 people distributed in 64 villages -ranking from 275 to 8,400 inhabitants- and one district capital (Mueda), with estimated 25,000 inhabitants including peri-urban neighbourhoods. The Portuguese constructed first water system in the plateau in 1962, followed by numerous interventions including new systems, rehabilitations and extensions. In 2010, the Mueda plateau counts on 4 multi-village water systems plus 2 small town facilities, spread along three districts (Muidumbe, Mueda and Nangade), reaching 38 villages and around 90,000 people. Following the decentralization process on going in the country, in 2005 district institutions were officially established in Mueda plateau districts: Mueda, Nangade and Muidumbe. All water systems in the plateau shifted from Mueda Water Services (SAM) overall responsibility -public entity created during centralist era in charge of water delivery- to recently created *Public Works Services* (SDPI) at district level. Despite this public management at district level, the final objective, following the government, is to put in place an autonomous operator to assure system's sustainability. By conception, multi-village water systems in the plateau share the same service delivery philosophy: One 18 m³ concrete tank plus one public water distribution point (DP, 2 to 4 taps) set for each village, independently from village population, scattering, demand or necessities. These schemes clearly respond to previously supply approach, providing water points without any kind of users' participation. Hence, nowadays the water supply in the plateau faces the challenges of coverage, equity, sustainability, autonomy and efficiency.

Methodology

This study is based on an extensive review of the present status of the 6 previously mentioned multi-village water systems in Mueda Plateau developed during a water and sanitation program identification process. Personnel in charge of water services management, personnel from district and provincial public works institutions were interviewed together with district administrators and politicians. Systems functionality was observed during one year to understand their service delivery characteristics. Finally, all district capitals (3) and numerous villages (more than 40) were visited to check water service functionality and user's demand pattern. From the collected data, Chomba system was selected as the only with good functionality rate and management skills, providing acceptable water service to users; and an in deep analyses of its strengths and weakness is presented under the light of the water policy and with an equity focus.

Results, lessons learnt and future sustainability

After decentralization, Chomba water system remained under existing Mueda Water Services (SAM); currently serving 19 villages and part of Mueda small town (4 additional neighbourhoods), summarizing around 52,000 inhabitants. Daily water production is around 600 m³ delivered by gravity to 37 public distribution points (DP) and 122 private connections (PC), after elevating the water 283 meters using 2 pumping stations. Most of the distribution points are equipped with flow meters and supervised by village collectors (one per village, always women). Water is charged by bucks at DP's, meanwhile PC's owner pays in cubic meter basis. From the analyses, we confirm that the system is basically functioning, reacting to service constrains and rising money to invest in human and material resources. Other systems in the Mueda Plateau, mainly under non-capacitated district administrations with very little resources, are systematically non-functional or partially functioning; without metering delivered water and totally politically interfered

management scheme. Chomba is the only water system in the plateau able to collect sound money from water delivery and also willing to re-invest in the scheme. Last year, for example, the SAM acquired a 2nd hand truck to perform routine maintenance and emergency repairs. Next figure shows the main characteristics for Chomba water system:


WATER SYSTEM SHEET		Pop. 2010	Pop. 2025	Fuel consumption/cost
	Villages (19)	41,747	60,462	10000 L/month
	Neighbourhood (4)	10,000	14,483	430,000 MZM/month
	Water (m3)	Storage 600	Delivered at DPs 200	Delivered at PCs 400
	Money raised	dry season		rainy season
		Villages (19)	400,000 MZM	110,000 MZM
		Neighbourhood (4)	30,000 MZM	110,000 MZM
Personnel	government pays	18		105,000 MZM
	contracted (revenues)	6		30,000 MZM

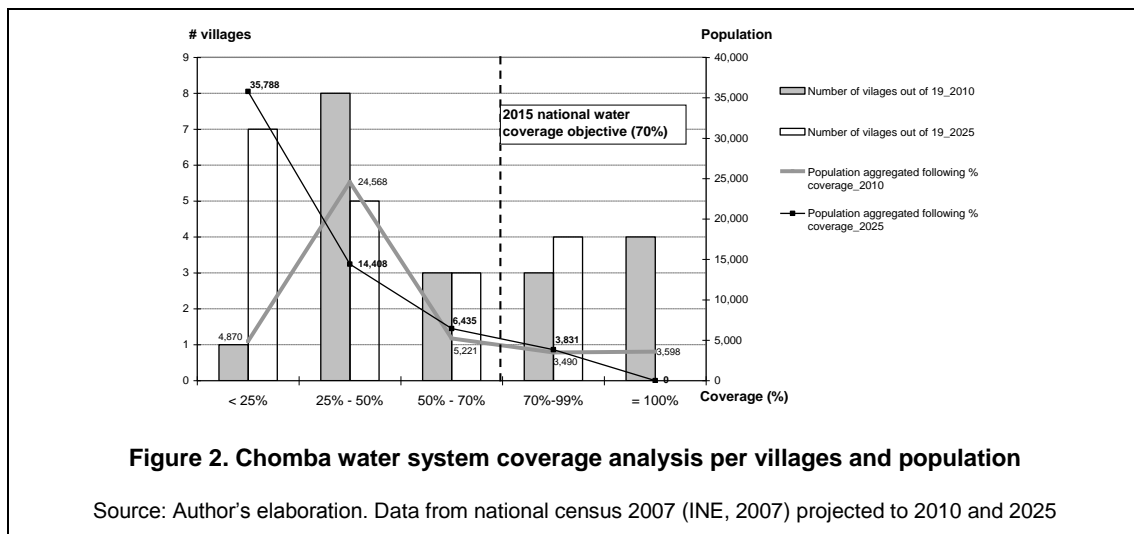
Figure 1. Chomba water system average characteristics

Source: Author's elaboration using data compilation through interviews and observations

Other water systems in the plateau demonstrate no capacity to face breakdowns (Ex. Nangade town system was out of order for 8 months during last diesel pump fail), political interference (Ex. Palma town public workers are connected without metering water, and in some places, re-selling of water to villagers has been observed) or managerial issues (Ex. In Ntamba system, with 15 villages connected, there is not any kind of management scheme in place, only basic operators to switch on and off, and district administration providing monthly fuel provision). There is no doubt that a lack of resources is present, but also an absence of experience, capacities and even institutional appropriation. The first step for these systems is to achieve an acceptable level on service provision, establishing a real water management body and metering water; creating that way the opportunity for users to ask for responsibilities and stimulating appropriation among institutions. For Chomba water system, this first stage is basically reached, so four (4) key factors identified for Chomba system's differentiated functionality are summarized as follows, providing valuable lessons learnt derived from the analyses:

1. Management scheme coming from an existing structure specifically devoted to water system's operation, with installed capacities supported by the government (key personnel are government employees) but showing quite a bit autonomy, commitment and pro-activity;
2. Payment culture in users and managers in the Mueda Plateau, mainly coming from the hydro geological context, where no alternative water sources exist and pumped water systems are clearly perceived as money-cost ones. Also quite payment capacity is observed from the around 60% ex-combatants enjoying government subsidies and productivity activities (mainly agriculture);
3. Rural and urban combined water supply, where progressive tariff is set out to distinguish water users and uses (public/private points, domestic/commercial uses), investing in flow meters and personnel to make possible rising money to cover fuel costs and others (part of running and salaries); and
4. Highly prioritized region for politics and media, where water issues are supervised even from national ministry level, demanding the best possible performance and creating somehow a commitment even without particular incentives.

At this stage, going further in future sustainability investigation for Chomba water system, an in-deep analysis is developed to detect its main risks and essential areas for improvement. Related to coverage, as it is shown in Figure 2, providing only one DP per village, the result is more than 80% of villages (12 out of 19 villages) are under the 70% water coverage (following national standards of 500 people per tap), that is the national objective for rural service in 2015. Equity emerges also as a challenge for water delivery in the plateau, being the price for water (2,5 Mtn. per bucket) prohibitive for at least 20% of the people, leaving the vulnerable without the capacity of buying enough water to assure health and opportunities. This situation also promotes vandalism in the system (234 km. of pipeline), that also reveals some lack of users feeling of ownership.



Chomba system managerial body is now taking some measures to improve their capacities and, at national level, an initiative for huge rehabilitation and interconnection of 4 plateau' water systems under Mueda Water Services (SAM) management is nowadays looking for funds and external support. With 2.5% annual population growth, the SAM has to use its present strengths to undertake the challenge of increasing coverage meeting demand, users involvement and reliability in water delivery trough increasing efficiency (technical and economical) and autonomy to finally achieve long-term sustainability and equity.

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Notes

1 EUR = 48,63 MZM (metical). Bank of Mozambique, November 2010.

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