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PROMOTING EQUITY IN WATER ACCESS: THE LIMITS OF FAIRNESS OF A RURAL WATER PROGRAM IN SEMI-ARID MOZAMBIQUE

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Abstract

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Key words:

Africa; borehole maintenance; decentralization; project design and execution; spatial coverage

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Solving the water infrastructure gap has become a major policy concern. In rural areas of Africa, access to water is as much constrained by territorial coverage as by the poor conditions of water points due to the difficulty in mobilizing the community for repairs. This paper examines the equity considerations of a rural water and sanitation program in a district of Mozambique, and their impact on the achievement of the program's objectives. Our analysis underlines the contradiction between the conceptualization of equity in the design, planning and implementation of the program. Even an explicitly pro-poor strategy can fall short of delivering equity. Our findings stress the fact that overlooking local perception of equity can have a direct impact on the ability of a community to ensure the maintenance of their water points. They call for a careful definition of equity in the design of water programs, as well as closer attention to this criterion as a precondition to achieve the long-term objective of the program.

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1. Introduction

The fact that equity has become a major policy concern is widely reflected in discourse and public policy (Wegerich, 2007, Venot and Clement, 2013, Joy et al., 2014), particularly in the water sector, where access to water is a key lever for poverty alleviation. Although access has improved worldwide in the last two decades, access to services is still characterized by heterogeneity among countries, provinces and districts (Andres et al., 2014, Frank and Martinez-Vazquez, 2014). In discourse and policy, water equity is often reduced to equal access to water infrastructure; the water infrastructure gap is particularly apparent between urban and rural Africa, where most poverty is concentrated. But in rural areas, access is as much constrained by territorial coverage as by the poor conditions of water points. This paper analyses the trade-offs between long-term maintenance of boreholes - i.e., their sustainability - and equity and efficiency during the planning and implementation of a rural water program resulting in a sense of fairness of the overall undertaking.

To ensure better territorial coverage and long-term maintenance of water points (WPs), the approach consisting of isolated water projects has often been replaced by the service-delivery approach (SDA) to rural water and sanitation policies, which aim to set up institutional and management structures able to ensure long-term water supplies (Lockwood and Smits, 2011, Moriarty et al., 2013). The participation of the community in planning, as well as in operation and maintenance (O&M), is expected to ensure ownership and consequently sustainability of the WPs. Decentralization is assumed to facilitate the flows of information and provide incentives to respond to local needs, and thus increase service delivery, and indirectly to positively impact poverty alleviation (De Palencia and Pérez-Foguet, 2011, Andres et al., 2014). These programs are thus advocated as inherently pro-poor.

This paper examines the place and nature of equity considerations in the execution of a water delivery program with explicit pro-poor objectives in the semi-arid district of Mabalane in Mozambique, where a pilot service delivery intervention drilled 30 boreholes and rehabilitated five small water systems (SWS).

The issue of equity in water supply programs in rural areas has been mostly addressed by correcting spatial imbalance (Smith and Hanson, 2003; Zuindeau and Ifresi, 2007), which is usually explained as the result of shortcomings in the planning, and of bias in decision-making (De Palencia and Pérez-Foguet, 2011, Andres et al., 2014). The National Rural Water Supply and Sanitation Program in Mozambique (Portuguese acronym PRONASAR) aimed to improve water coverage and to correct spatial inequality by improved management procedures in both planning and execution, including in O&M of the infrastructures by the community. PRONASAR had an explicit pro-poor dimension in terms of community targets and recommendations for O&M. A framework that differentiates the distributive, procedural and contextual dimensions of equity, as well as the origin of the equity claims developed by McDermott et al. (2013), was used to analyze how fairness issues were being dealt with in a district where water access is restricted by the availability of surface water, the risk of salinity in subterranean water and high drilling costs. Interviews with the main actors in charge of implementing the program at different administrative levels was completed by a qualitative survey conducted in 12 communities and a quantitative survey of water users that tackled water access and equity perceptions. The paper argues that incoherence in the conception of equity and the relationships between actors during these stages led to the disregard of the equity dimension, which, in turn, impacted the maintenance of the boreholes. It highlights the limits of SDA, in which the managerial and efficiency bias jeopardize the long-term objectives of the program.

2. Equity in rural water supply

To analyze equity, we draw on the framework developed by McDermott et al. (2013), which distinguishes four parameters. It includes defining (1) who sets the goals (e.g. who is included and who is excluded in the framing), (2) what aims are included in the framing, (3) who counts in the definition, and finally (4) how it is defined around its three dimensions (distributive, procedural and/or contextual) (Pinto and McDermott, 2013)

The distributive dimension deals with the allocation and distribution of water and its benefits among different users. But water distributive equity can be assessed against different principles, such as equal rights and equal shares, as well as in proportion to inputs or efforts and in proportion to needs or the overall consequences to society. A strong equalitarian norm often prevails in rural Africa (Platteau, 2006, D'Exelle et al., 2012). It applies not only to the distribution of material outputs, but also to their costs, including symbolic ones such as village unity or social prestige (Cochran and Ray, 2009). These principles can be combined, by distinguishing between horizontal and vertical equity: horizontal equity refers to equal treatment of equal - or "universal access" - while vertical equity measures the extent to which individuals or a community with unequal needs are considered (McIntyre and Gilson, 2002, Wegerich, 2007).

Addressing geographic disparities is part of distributive equity. In water service, it has traditionally been dealt with by minimizing the distance between users and WPs (Smith and Hanson, 2003, Zuindeau and Ifresi, 2007) or finding a fair coverage threshold (Giné Garriga et al., 2012). But programs making use of these criteria have often failed to reach the poorest and/or most underdeveloped areas, and often end up targeting the most populated areas (De Palencia and Pérez-Foguet, 2011, Andres et al., 2014). Not only do such programs exclude some of the targeted users without adequate water service, but they may also increase the gap between the poorest and, in rural Africa, generally the least densely populated areas, and the more developed ones. Water point (WP) maintenance is also impacted; in a high WP density context, the existence of alternative solutions may discourage collective mobilization to repair

a failing pump. On the other hand, high density can facilitate access to spare parts (Jiménez and Pérez-Foguet, 2011, Foster, 2013).

Relative universal fairness principles for water management can be identified, but the legitimacy of the process leading to the water allocation decision is often an important component of the perception of fairness itself (Syme et al., 1999). The procedural dimension deals with the fairness of the procedures by which a distributional decision area is defined. It relates to the issues of recognition, inclusion, representation and participation of the different stakeholders impacted by strategic management decisions and conflict resolution (Schlosberg, 2004, Paavola, 2004). Indeed, participation and empowerment concepts now prevail in most water-related guidelines, policies, and programs: for example, community participation in WP management is often presented as a key component of the pro-poor dimension. But community-based management is now being criticized because the implementation process in itself often limits the transformative role of participation (Hickey and Mohan, 2004).

Recent research points out that the link between empowerment and equity goes beyond providing a voice and a fair process; it is also about providing the users the opportunity and capacity to develop their abilities to make use of the allocation (Sen, 1992, McDermott et al., 2013, Venot and Clement, 2013). Environmental justice has thus a contextualized character that deals with the pre-existing conditions and power relations that facilitate or curtail people's access to decision-making, resources and benefits. In other words, contextual equity addresses the structural and relational mechanisms that determine the equity of access to water (Ribot and Peluso, 2003), notably the technological choice and cost recovery mechanisms. In the water delivery sector, fairness must address the development as well as the functionality of the infrastructure needed to collect and distribute water.

In practice, the three dimensions are closely related (Blaber-Wegg et al., 2015), but the perception of fairness varies among the different actors (Corbera et al., 2007). It is therefore necessary to clarify the origin and content of the narrative and discourse concerning equity claims, and the analysis of equity in the program must consider how equity is framed in the design of the program and how program execution handles the different components in practice.

Traditionally, inequitable access to water in rural areas was explained by decision-making processes that favored economic or technical considerations and/or political bias (Yamano and Ohkawara, 2000, Castells and Solé-Ollé, 2005, Albalate et al., 2012), as underlined in the allocation of WPs in Mozambique (Rosário and Guambe, 2015). Although most societies prioritize justice in the water sector (Syme et al., 1999, Roa-García, 2014), the prevailing political economy of water favors efficiency and/or productivity at the expense of equity in interventions and narratives (Venot and Clement, 2013, Roa-García, 2014). Thus, privatizing water services is associated with inequity of access in both social and/or geographical terms (Smith and Hanson, 2003, Castro, 2007, Perreault, 2014). The call for equity in the rural water sector is viewed as a moral injunction, a requirement of international funding organizations and/or a political choice creating constraints for the intervention. In pro-poor rural water interventions, the failure to ensure "fair" spatial coverage has been mostly explained by shortcomings during the planning stage of the infrastructure development cycle, such as political bias (Andres et al., 2014), a disconnection between national and district level planning (De Palencia and Pérez-Foguet, 2011) or lack of data or planning instruments (Giné Garriga et al., 2012). Our paper focuses on the importance of the other stages of the cycle, such its design and infrastructure development.

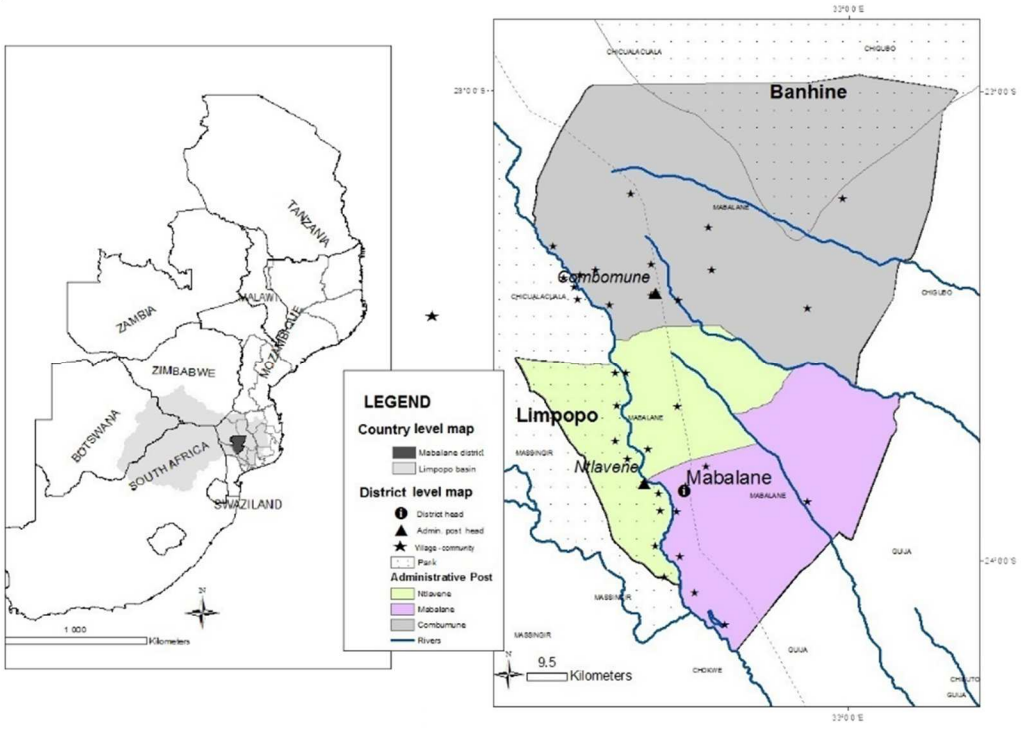
3. Improved management procedures and enhanced participation to improve water coverage

3.1 Water access in Mabalane district

Mabalane is one of the five districts of the Gaza Province selected for the pilot stage of PRONASAR. The district is divided into three administrative posts (AP): Mabalane-Sede (42% of the population), Combumune (30% of the population) and Ntlavene (28% of the population), which are further divided into localities, including different villages (Figure 1). At each of the three levels (District, AP, and Locality), consultative councils (CCs) have to be involved in the process of elaboration and approval of the district plans and in the selection of projects for local government credit schemes. They bring together co-opted members from the state administration, organized civil society, village leaders and local economic elites.

Seventy-two percent of the 5,400 families in the district subsist below the poverty line (Hussein and Castigo, 2012), but the poverty situation is worse in Combumune and Ntlavene APs (respectively 80% and 88% of the population) compared to Mabalane-Sede (55% of the population) (PEDD Mabalane, 2010). The Shaangana populations traditionally extended along permanent water sources, but were grouped in villages as a result of the civil war and of the "villagization" policy in the post-independence years. Thus, two thirds of the population are now located in riverine villages along the Limpopo River, which also forms the border of the Limpopo National Park (LNP). The villages located west of the river are therefore part of the park buffer zone (Figure 1). Other villages established either during colonial times to support specific activities (animal breeding farms, train stations, etc.) or in recent decades for the exploitation of charcoal, are located more than 10 km from the river. Access to the villages is difficult due to the poor state of the roads, but the district is accessible by train. The two main settlements or *vilas* (Mabalane-Sede, the district center, and Combumune-Estação), which were originally station settlements, host the largest population of the district.

Figure 1: Mabalane district in the Limpopo catchment.



There are no permanent bodies of water in the district; the Limpopo River only flows for 10 months of the year due to upstream abstraction, and its tributaries are intermittent. There are a few small reservoirs mostly along the beds of these tributaries, but they dry up after the rainy season. Information on groundwater resources refers to wells at the time of their construction and to geological information. Reports conclude that large-scale groundwater abstractions are very limited as a consequence of low productivity and poor water quality due to the high mineralization of the aquifers (CSIR, 2003, FAO, 2004). The water table is generally deeper (between 50 m and 100 m) than in other areas of Mozambique (WE Consult, 2006). Most water infrastructure was destroyed during the civil war. Existing boreholes were built after the war and/or as flood or drought relief interventions by non-governmental organizations (NGOs) with the support of donors. Prior to PRONASAR, the district claimed to have 56 boreholes, 15 SWS that pumped groundwater or river water with motor pumps, and 17 small temporary reservoirs (SDPI Mabalane, 2011). Although each NGO had its own strategy for community mobilization and borehole governance, most strategies included the creation of a water committee and the payment of a water fee.

In terms of access to water, three main areas can be distinguished: (1) riverine villages located along the east bank of the river that have access to alluvial and river water; this zone can be subdivided into easily accessible villages in the southern and central part of the district, and more isolated villages in the northern part; (2) western riverine villages in the LNP buffer zone, with no direct access to the district except when the Limpopo River dries up (denoted “Buffer zone villages”); (3) villages located on the plateau that have no access to surface water (denoted “Plateau villages”).

3.2 The pro-poor dimensions of the PRONASAR

The main objective of PRONASAR, which was approved by Ministerial Decree No. 258/2010, was to reduce the spatial imbalance in the coverage of services in the provinces and districts of Mozambique through the implementation of the proposals outlined in the Strategic Plan for Rural Water and Sanitation (PENA-ASR) in the strategic pillars of the water sector defined in the five-year plans and in the action plan for the reduction of absolute poverty (PARPA, 2004, 2011). The program is covered by the framework of other legal instruments such as the National Water Policy of 1995, reviewed and updated in 2007, which emphasized the demand principle, decentralization, poverty alleviation, development of the institutional capacity of the community and integrated management of water and sanitation. The program also has a sanitation component that is not analyzed here.

Concretely, the program focuses on improving the management component of water and sanitation procedures from the planning stage to the monitoring stage, including O&M of infrastructure at the community level. Districts are the focal points for planning, implementing, and monitoring the program, while the province is responsible for drawing up and managing contracts. Although community involvement, capacity-building and institutional development are emphasized, the program also strongly encourages the participation of the private sector. In Mabalane, the program planned to drill 30 boreholes and to restore seven SWS. The national norms that define the quality of service were changed prior to the launching of the program: in rural areas, adequate service is defined as a “protected dug well equipped with a hand pump, serving 300 people within a 500 meter radius (30 minute walking time back and forth including queuing time)”. Previously, the norm was around 500 people per WP. Legally, the electric conductivity of potable water should be limited to between 50 and 2,000 µS/cm (Ministerial Decree 180/2004), although an informal threshold of 2500 µS/cm was tolerated in the program (Pendly and Obiols, 2013).

The program explicitly promotes poverty alleviation, good governance and gender equity. The pro-poor approach includes the prioritization of districts and district areas with low coverage and a high poverty level assessed through indicators such as the incidence of poverty in the village, the percentage of water sources maintained by communities with pro-poor management rules and the percentage of poor areas and households with access to water and sanitation. Participation aims to facilitate the inclusion of the most vulnerable groups and women in decision-making, including in the planning stage. Other recommendations mention the need to use participatory district planning methods and to mobilize the different consultative councils, as well as to make use of traditional systems of social support to reach the most vulnerable groups.

3.3 The functioning of PRONASAR

The program was defined at the national level with the support of international consultants. This included the choice of pilot provinces, the dimensioning of the intervention, the main technical orientations and the indicators to monitor efficiency. Provincial technical services were responsible for the selection of target districts, financial management of the program, procurement, monitoring, and contracts. Implementation relied on contracts between the provincial administration and three private contractors per district (the drilling contractor, the drilling supervisor and the Participation and Community Education contractor (Portuguese acronym PEC). The district technical services (Portuguese acronym SDPI) were in charge of monitoring the progress of the intervention and of local coordination. Drilling contractors are only paid for successful boreholes that actually supply water, leading to higher costs in problematic area like Mabalane. Countrywide, a 100% success rate produces an 8% profit, while a success rate of below 80% may mean the contractor fails to make a profit and may even make a loss (WE Consult, 2006), but no reference exists for specific problematic areas. In Mabalane, the unit cost of a borehole was 77% higher than the Mozambican average (Zita and Naafs, 2012). One drilling contract was cancelled after one year as the first contractor proved to be incompetent. The new contractor therefore only had two years to fulfill the original contract for 30 boreholes. The PEC contract was also delayed for reasons that remain unclear.

Following emphasis on demand principles, the community selection procedure required the formalization of a demand by the communities that would show the community's willingness and capacity to participate in cash or in kind, the formation of a water and sanitation committee, and payment of full operation and maintenance costs (MPOH/DNA, 2009). Selection was to be made on a "first come first served" basis. The PEC contractor was responsible for organizing community mobilization, formalizing the community requests and organizing the water committee. The community was expected to propose and clear three possible sites of their choice where the technical contractor could explore water availability.

4. Methodology

A three step approach was used. First, the institutional and normative framework of the program was characterized by examining program documents and interviewing key national, provincial, and district actors. At district level, the administrator, the district's permanent secretary, some heads of administrative posts and locality, the heads of District Water, Planning, Social, and Agriculture Services, and some technicians from the District Water and Agriculture Services were interviewed. NGO technicians involved in water who could be traced were also interviewed in the second half of 2012. At the provincial and national level, only the head of technical services and some technicians were contacted.

PRONASAR data concerning WPs and the number of people per village at the district level were used after triangulation with a map of water points drawn by the University Eduardo Mondlane (UEM) in 2012 in two APs (Mabalane and Combumune). This triangulation, combined with our field visits, revealed some inconsistencies in the names of villages, the conditions of WPs, the levels of salinity and the number of inhabitants per village[1]. Whenever possible, the errors concerning village names and inhabitants were corrected using our field data.

Twelve communities (18.4% of all the villages in the area) in the three above-mentioned areas were selected for an investigation of water use, access to water, and community management of WPs. The villages were selected to include different types of Small Water Infrastructures (SWIs), including small-scale irrigation in the seven localities of the district. This village level survey (one day per village) included: (i) an interview with each village leader (traditional and elected leaders), (ii) focus groups with people in charge of the management of WPs (whether a member of a formalized water committee or not), and (iii) a walk to visit all the village SWIs and water sources accompanied by the person/people in charge of their management. In two villages, we held a women's focus group to understand variations in perceptions of the development and in the functioning of boreholes and access to water in general. The aim of this investigation was to clarify the history of the development and management of all water infrastructure (including motor-pumps), the problems encountered, and how the villagers interacted among themselves and with external actors in water interventions and management. Particular attention was paid to related tensions and how they were managed. The different contributions were triangulated to check the real responsibilities, tasks and activities of the actors around WPs. All the discussions were recorded and transcribed. They were held in Portuguese with translation into Shangaana when necessary.

In the third step, we conducted a survey (n=119) in three riverine communities to understand water uses, the perception of borehole functioning and some aspects of equity perception by different wealth groups. Before the interview, the village leader was asked to allocate all the families of the village to four different wealth groups, from which 20% of the families were selected.

5. Results

5.1 Equity program design

The program aims to improve the planning process in order to improve the sustainability of WPs by focusing on managerial aspects such as the cost-efficiency of execution, in order to improve coordination and the exchange of information between actors, to improve management procedures, and to better organize the spare part value chain and training. The equity of the program was framed by the points of view of international organizations and health aspects of the water supply, as well as on universal coverage and correction of the coverage gap (Goff and Crow, 2014). Thus, the program had both distributive and procedural equity content; improvement of the spatial coverage was to be achieved by rationalizing the increase in the number of WPs through a sound choice of districts and villages, and by encouraging the participation of the community in planning and management. Contextual aspects

[1] Two inconsistencies are noted in this study: (1) the names of two different sized villages were inversed in PRONASAR documents. We thus expected village E (Table 3) to be a large village with different SWIs, but it turned out to be the smallest village we visited. (2) Some settlements were not included in the PRONASAR list we used, and consequently the number of inhabitants per locality might be slightly underestimated in Table 1.

were limited to recommending non-motorized small-scale technologies that were perceived as being more appropriate, and letting villages choose their modes of payment.

The program aimed to improve the previous allocation process, which was perceived as unfair by national actors and some provincial and district technicians. Previously, WP allocation resulted from the combination of ease of access and political interference in a context of top-down administrative functioning. The most accessible villages were over-exposed to visits by high level (provincial or national) politicians or representatives of donors who had little time to devote to each area visited. A vicious circle of investments in some communities at the expense of others emerged as the district government strived to fulfil the promises made during these visits. Existing investments justified further visits to "pilot" sites (*source: interviews with the National MPOH agents, provincial INAS agents, provincial DPOH agents, SDPI agents and directors, NGO agents, communities, and mission reports*). In this context, the choice of sites based on merit - in this case their wealth status - was viewed as a fairer process of allocation by national and provincial actors.

The other procedural recommendations fell more within discursive justification given the limited attention paid to their implementation or the training agenda of the program. For example, participation through the mobilization of CCs and village water committees in planning and O&M was supposed to contribute to the empowerment of women and "vulnerable people". The percentage of women in water committees was the only related criterion included in monitoring indicators of the PEC contract. Vulnerability was not defined; in national policies and in the collective understanding of national actors, it referred to people with disabilities or chronic diseases (notably HIV), and households headed by children or old people who are unlikely to be mobilized and interested in villages or district decision-making bodies.

5.2 Equity considerations during program implementation

5.2.1 Handling district diversity

They were no coherent stories of how the initial selection of districts had been made, but all the narratives emphasized that the initial selection of districts did not include the most distant and challenging districts in the province, and that a new selection was proposed; more challenging districts were then included in the portfolio, but a couple of accessible districts were purposely kept to be able to show results at the end of the pilot phase (source: *interviews with the Provincial DPOH agents*). Technicians explained that to be sure to achieve results of the externally funded projects within the (limited) timeframe specified by the projects, they were used to selecting areas, villages, or populations in which the chances of success were the highest.

5.2.2 At the district level, conflicting perceptions of equity

At the district level, the allocation of sites resulted from tradeoffs between efficiency and equity. The tradeoffs were embedded in the complex relationship between the district technical service, the supervising provincial technical service and the contractors.

Although the overall coverage indicator decreased from an average of 936 to 487 persons per operational WP (Table 1), access to water in the district was still perceived as problematic since the coverage among APs was unequal. Some villages on the plateau and in the buffer zone had no WP, meaning the distance to be covered to access water could be high, even in riverine villages. Moreover, the average electric conductivity of 50% of the new boreholes was above the informal threshold of 2500 µS/cm (with an average of the 30 new WPs of 2,650 µS/cm). The "salinity" problem was particularly acute in two localities (Mabalane-Sede and Ntlavene).

Table 1: Changes in some water access indicators in Mabalane (for operational water points) before and after the project

Administrative Post				WATER POINTS		% OF WATER POINTS		No PERSONS/WPs		WPs/VILLAGE		EC µS/cm (No WP TESTED)	
Locality	zone	Villages	Persons	Before	After	Before	After	Before	After	Before	After	Before*	After**
Mabalane		**24**	**14 927**	**18**	**24**	**43%**	**30%**	**829**	**622**	**0,75**	**1,00**		
Mabalane Sede													
Vila	plateau	1	3 447	1	1	2%	1%	3 447	3 447	1,00	1,00		
Sede	riverine	4	1 825#	0	0	0%	0%	-	-	0,00	0,00		
Nhatimba	*plateau*	*11*	*3 320*	*5*	*6*	*12%*	*7%*	*664*	*553*	*0,45*	*0,55*	*3 200 (1)*	*2 600 (1)*
Tsocate	*riverine*	*8*	*6 335#*	*12*	*17*	*29%*	*21%*	*528*	*373*	*1,50*	*2,13*	*3 600 (4)*	*2 600 (3)*
Combumune		**24**	**11 845**	**14**	**38**	**33%**	**47%**	**846**	**312**	**0,58**	**1,58**		
Estação													
Vila	plateau	1	4 248	1	6	2%	7%	4 248	708	1,00	6,00	4 300 (1)	1 480 (5)
Estação	plateau	9	3040#	6	15	14%	19%	507	203	0,67	1,67		2 356 (9)
Rio													
Rio	riverine	5	2 037	5	10	12%	12%	407	204	1,00	2,00	5 225 (2)	1 600 (1)
Rio (Pnl)	PNL	9	2 520	2	7	5%	9%	1 260	360	0,22	0,78		3 520 (5)
Ntlavene		**16**	**12 676**	**10**	**19**	**24%**	**23%**	**1 268**	**667**	**0,63**	**1,19**		
Chipsompso	*riverine*	*4*	*3 768*	*4*	*9*	*10%*	*11%*	*942*	*419*	*1,00*	*2,25*	*3 543 (2)*	*4 150 (2)*
Ntalavene	*PNL*	*12*	*8 908#*	*6*	*10*	*14%*	*12%*	*1 485*	*891*	*0,50*	*0,83*		*3 250 (4)*
Total District		**64**	**39 448**	**42**	**81**	**100%**	**100%**	**939**	**487**	**0,66**	**1,27**		
	Vila	2	7 695	2	7	5%	9%	3 848	1 099	1,00	3,50		
	Riverine - South	8	6 335	12	17	29%	21%	528	373	1,50	2,13		
	Riverine - Sede	4	1 825	0	0	0%	0%	-	-	0,00	0,00		
	Riverine - North	9	5 805	9	19	21%	23%	645	306	1,00	2,11		
	Plateau area	20	6 360	11	21	26%	26%	578	303	0,55	1,05		
	Buffer Zone	21	11 428	8	17	19%	21%	1 429	672	0,38	0,81		

A couple of communities may have been overlooked in people cou * Measurement UEM (2012) ** Measurement Pronosar (newly built boreholes onl

There were two conflicting distributive equity strategies at the district level. Immediately prior to PRONASAR, the district government strived to promote more balanced development by reallocating interventions by NGOs or external organizations to the underdeveloped areas of the district, notably in the LNP buffer zone (source: *district government interviews and documents*). But administrative allocation of benefits normally followed "equality" rules; for example, the quantity of seeds offered by the government as part of the post-flood relief intervention of 2013 was equally divided in each AP, locality and village. Criteria such as the number of households per village or the impact of the flood were not taken into account.

Originally, the district government decided to allocate an equal number of boreholes (10) to each AP. Consultative councils (CCs) at the AP level were in charge of selecting the village, which was done according to needs (*source: minutes of CC meetings, leaders interviews*). But in many selected villages, electric conductivity was above 2500 µS/cm. First, the technicians decided to increase this threshold to 5000 µS/cm. In interviews, this decision was justified by pressure from the population to get WPs, even if the water was "saline", but other parameters, such as finalizing the contract, may also have interfered. As the end of the contract was approaching, the technicians and district government decided to focus on the plateau area of Combumune AP, where "non-saline" groundwater had proved easier to find. The communities or councils were not consulted in this second stage of the process. It was a desktop decision, and involved SDPI, the district government, and the contractors at the most, that were under pressure because of the drilling contractor's schedule. It is not even clear to what extent the decision was collective; the drilling contractor might have purposely rejected villages with a greater likelihood of failure. In some villages, only one site was explored and the contractor never returned for further investigation as he had promised. While some distant villages received only one visit from the contractor, closer villages were visited several times, sometimes until a satisfactory site was found. On the other hand, the few villages whose leaders had submitted a formal complaint to the district service were more likely to be visited again, thereby highlighting the role of the local government in the decision. Although the contractor was asked to slow down to give the technical services and PEC contractors time to identify communities, the firm, which benefited from high level support, stuck to its own agenda and timing.

Contextual equity played a limited role; the ability of the leader to connect with the administration interfered in village selection. But district-level actors were also sensitive to the political voice of population; for example, district services claimed the population of Combumune Vila was particularly vocal, which, in the past, had led to bias in their favor when food subsidies were allocated (interviews with the *INAS provincial agents, SDAE agents, district government*). Although the Vila was favored in the program, with the help of the district government they managed to secure a SWS through another source of external funding immediately after the program. Local technicians expressed doubts concerning the appropriateness of boreholes in the hydrogeological context of the district and submitted a request to include small reservoirs associated with SWS in the program; the planning procedure and contractual organization of the program did not permit this change, and the request was denied.

Not surprisingly, equity considerations played no role in the contractors work. Both PEC and drilling contractors' work was late for different reasons, and there was only limited coordination between them - a requirement of the program – as each focused on his own agenda. In particular, the drilling contractor wanted to finish the job as quickly as possible to free up the equipment for other contractual engagements outside Mabalane (source: *provincial and district technical agents, district government*). In any case, many villages were not informed they had been selected, and the community consequently had no time to agree on possible sites. The procedure used for the selection of the villages and sites rendered the demand-driven approach irrelevant. Although communities formalized their involvement with a letter of request, in most cases the letters were only regularized after drilling was completed. The community request, which was considered to be a key condition for sustainability in SDA, turned out to be a mere administrative and bureaucratic step.

Thus, the partial spatial adjustments made between areas were more the result of interactions between the district government and contractors than of a deliberate choice to tackle geographic disparity (Table 1). There was an increase in coverage indicators in the villages located in the northern part of the district (Combomune AP) where 50% of the new boreholes were drilled, but villages in the buffer zone were still less well served than other villages.

Although the 52% increase in the number of functioning WPs was an achievement praised by many actors in the district, the limited consideration given to procedural equity resulted in frustration, misunderstandings, and tensions. These concerned disagreement about the drilling sites, the decision not to equip positive but "saline" boreholes, and the types of equipment used (Table 2).

Table 2: The different types of tensions around water in the Mabalane district mentioned during fieldwork

Not directly related to PRONASAR	Directly related to PRONASAR
Contract failure (for water infrastructure) (1) Choice of technology (1) Water tariffs in Vila (1) Competition over water access in the case of pump failure or of poor yield (3) Competition with animals in access to water in the Plateau area (1) Competition with non-local users of a reservoir (1) Transparency between NGOs and communities in the management of funds for repair (2) Transparency in water fund management – related to leadership conflict (2)	Contract failure (for water infrastructure) (2) Choice of technology (2) PEC contractor's recommendations for a water tariff (1) Disagreement over the location of boreholes (6 mentioned / 4 official complaints reported) Saline boreholes not finalized (2) Lack of communication between the contractor and the leader (3) Access to borehole limited while the boreholes were not fenced (1)

Numbers in parentheses are the number of specific cases mentioned.

5.3 Community level equity

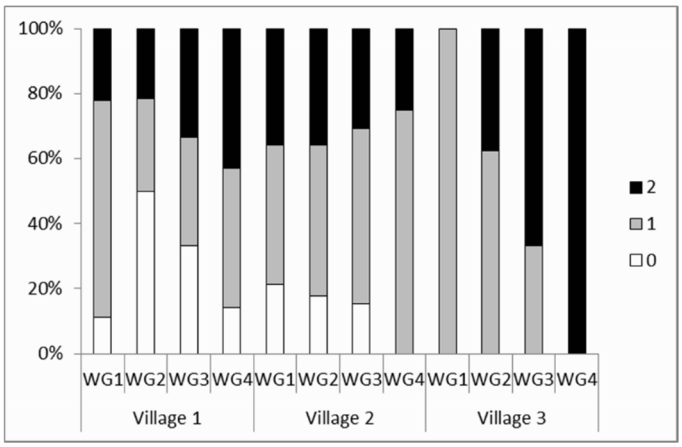
5.3.1 Equity considerations of the program at the community level

Equity considerations directly linked to community functioning were not fully explicit in the program. They were embedded in four elements that were also considered determining factors for borehole maintenance: the need for a water committee to manage the water fees and maintain the hand pump, the participation of women in these committees, the mode of payment defined by the community itself and the creation of a district fund to cover maintenance when it proved to be beyond the community's capacity. In practice, the PEC contractors focused only on the formalization of the water committees, the number of women involved and the definition of a monthly water fee, whose amount was specified by the community.

A strong equality norm prevailed at the village level. Most people rejected technologies or interventions that favored some over others. On a list of 18 options, 39% of our interviewees rejected the option focused on the rehabilitation of small reservoirs, arguing it favored only the (richer) cattle owners. Options that were associated with a limited number of beneficiaries were also more likely to be rejected as being potentially conflictual.

Transparency issues in the allocation of external benefits (whether or not linked to water) were also associated with internal tensions. Leaders often played the role of gatekeeper in the community, controlling community members' access to the benefits of external interventions. Thus, the group with the highest income of the four wealth groups (WG4) in a community was more likely to receive post-flood subsidies than the other groups, although the bias varied among villages (Figure 2). In some villages, information concerning external interventions - especially those that provided direct economic benefits - did not seem to have circulated outside the circle of the leaders' advisors.

Figure 2: Number of subsidies received by families in three villages after the 2013 flood event, in the four wealth groups (WGs).



A monthly water fee followed community preference for equal treatment, but leadership interviews underlined that in some villages, a social fee benefited older people without family support. In any case, the poorest wealth group (WG1) paid their water fees later than the other groups, but nonetheless continued to have access to village hand pumps; 40% of the poorest wealth group had paid water fees in the two months preceding the interview, while more than 59% had in the three other wealth groups.

In contrast, the assumption concerning the role of the water committee did not match their real role. In practice, leaders played a strategic role in mobilizing complementary funds above the amount collected by the committee and decided on major repairs, while the "committees" were only used to collect and hold water fees, and occasionally to undertake small local repairs.

5.3.2 The impact of some equity aspects of the program at the village level

"Saline" boreholes as sources of water were the subjects of debate, but actors did not acknowledge the impact of electric conductivity on human health and maintenance costs, as well as its equity dimensions. When they depended on a single saline borehole, users who could afford the cost of transport and who also had the time preferred to fetch drinking water from the river. As poverty in the area is mainly linked to workforce availability (FEWSNET, 2012), 88% and 90% of two lowest wealth groups relied only on boreholes, whereas the percentage was respectively 82% and 73% for WG3 and WG4, the two richer groups, despite the water fees.

The level of salinity also impacted maintenance: when the quality of the water was poor and/or an alternative source of reasonable quality was available within walking distance, a leader might have difficulty mobilizing the community for the necessary complementary funding for maintenance (Table 3). This was all the more difficult when the leader's legitimacy was contested. Occasionally conflicts degenerated and ended in vandalism of the water infrastructure. As water is considered a public good and is a vital need in this semi-arid area, some communities were able to overcome the tensions and carry out the necessary repairs. But in other villages, local tensions directly impacted the ability of the leader to mobilize the community to undertake repairs.

Table 3: Information on access to water in the 12 communities surveyed

Adm. Post		Number	Prior to Pronasar		Pronasar		Comments
	Village	families	WP	Other sources	researched	Drilled	
Combumune	A	1180	1 SWS (!) 1B (X) 1SWS (X)		5	5	Comittees but also administration (AP) and CC involvment in management. SWS built by an NGO was repaired with Pronasar funds but irregular functionning, Tarif (50 MT/month) perceived as externally defined, complaints over the state of the SWS and borehole technology
	B	94	1B	River	1	0	1 person in charge of WP+ leader. 1 positive site refused by the community (flood prone site and private land), water fee of 50 MT annually, no problem reported
	C	91	1B 1SWS (X)		3	3	Management of boreholes strictly controled by leader with strict rules of uses (fee per family and cattle, number of tank per family); non functionnal colonial SWS only for cattle rehabilitated through a partnership with a private firm, district and community.
	D	58	1B (!)	River	(1)		No comittee, no water fees. Difficulty to collect fund for regular repair, tensions over 2 previous agricultural projects with equity issues, some tensions over/between leaderships; Prospection not reported in SDPI Pronasar 2012 under village name.
Ntlavene	E	69	1B	River	1	1	No comittee, a former leader is the mechanic, water fees irregularly paid, no major problem over boreholes reported. Internal tensions in the village could be perceived; Boreholes are located close to one another (less than 200 m).
	F	360	1B	River	2	2	Functionning comittees. Old borehole (1997) in good state and well managed, no specific issues reported, good coordination between leaders, village received many equipment in the last 3 years (showcase village),
	G	165	1B	River	1	1	Important role of leader (and advisors) on borehole management, although restructured by Pronasar, comittee on a minimal composition mainly to keep money, a new tariff 10 MT/month decided.
	H	201	1B (!)	River	0	0	Borehole is saline, remained non functionnal for more than 1 year. Pronasar restructured the comittee and new water tariffs decided, 1 site only assessed by the drilling contractor that did not come back although 3 sites prepared by community
Mabalane	I	252	1SWS (!) 1B (!)	River	1	0	Borehole very saline and poor yield. Management responsability for SWS unclear and transparency issue (with NGO involved in SWS building and population), maintenance of the SWS difficult with frequent problems, various campaigns of unsucessful campain of investigaton, limitation of tanks per family, frequent conflicts between families over access to SWS
	J	142	1B, 1W	Reservoir	(1)		Borehole remained unrepaired for 8 months (saline and with poor yield) then repaired, tariff 20 MT/month; Drilling prospection not reported SDPI Pronasar 2012 document under the village name. No comittee.
	K	112	1SWS (X)	River	1	0	SWS vandalized following transparency issue between leader, population and the NGO involved; conflict with neighbouring village over one pronasar borehole sites. No comittee
	L	492	2B 1B (X)	River + 2 reservoirs	1	1	large village, head of locality. Non functional borehole is more saline than others and with poor yield. Comittees with lists of users for each boreholes, by neigbourhood. Conflict of access over the new borehole (better quality) but solved by locality CC. but this borehole turned saline 6 months afterward.

B = Borehole; W = Well; SWS = Small Water System (!) = with frequent problems; (X) = non functionning

6. Discussion

6.1 Fairness issues have a direct impact on the outcomes of the program

It is now acknowledged that universal access to water has been achieved at the expense of sustainability (Foster, 2013) and project approaches to water access have been accused of bias toward the construction of infrastructure at the expense of its long-term management and maintenance. Yet, there has been little improvement in long-term maintenance with SDA. This failure has been explained by the technical and managerial shortcomings of these programs (De Palencia and Pérez-Foguet, 2011), the availability of an alternative source of access to water (Jiménez and Pérez-Foguet, 2011, Koehler et al., 2015) or the inadequate model of committee-based management imposed on communities (Harvey and Reed, 2007). The maintenance of the new boreholes in the Mabalane district was indeed affected by these different issues. But defective maintenance is also the consequence of (in)equity issues; these issues increased internal tensions in the communities, and ultimately affected the ability for collective action, on which maintenance relies. This risk emerged even in a context in which communities did not question their responsibility for WP management, refuting the premises of SDA, in which explicit community demand and community involvement is supposed to guarantee maintenance. It calls for a carefully crafted entry

strategy in a community that goes beyond favoring local institutions or externally created ones, and takes care to respect the preoccupations of the community fairly to avoid deepening existing tensions and affecting trust.

Although being 'pro-poor' was an explicit dimension of PRONASAR, the improvement of water access was mainly tackled by improving the management of the different stages of the infrastructure development cycle. The contractual basis of the program such as payment based on successful boreholes or contract duration created a bias toward efficiency, which ultimately led to equity issues being ignored. It favored the contractor's agenda since the contracting and/or supervising authority did not have the means to impose its own terms. The efficiency bias might have been reinforced locally by political considerations, although political favoritism was not apparent, probably because the district as a whole strongly supported the party in power. It would account for why the district government was so willing to complete the contract despite the hydrogeological constraints. But pragmatic considerations might also have played a role, since the central design of the program and the contractual dimension of implementation provided little scope for adaptation to local specificities.

6.2 The ambiguity of equity in rural water and sanitation programs

Calling for better integration of equity in this program implies getting rid of the ambiguities associated with its definition. Different criteria of distributive and procedural justice were mobilized in both discourse and in practice during the design, planning and execution of the program. They reflect the points of view of the different actors engaged in the different stages, and highlight the ambiguities and incoherence of pro-poor policies. The program recommendation focused on allocation according to merit – in this case the poorest – selected by technicians according to previously (and externally) defined indicators. Yet, it has already been shown that selecting communities using poverty indicators is not very effective because the necessary information is not available or because of coordination issues between planning cycles (De Palencia and Pérez-Foguet, 2011, Giné Garriga et al., 2012). While the district government originally aimed to correct existing spatial inequalities – a distributive dimension – it finally combined equal allocation and took care of procedural justice by mobilizing the legitimate instance of consultation for decision-making for the specific allocation.

All the actors involved had a sense of fairness, but they defined it differently. It is well known that the concept of "fairness" can be applied differently at the universal and situational levels (Perreault, 2014, Joy et al., 2014, Syme et al., 1999) but in this particular case, there was also a difference due to the different perceptions of fairness at the different stages of the program, among national executives, district authorities and communities. Even if a community favored equal sharing of cost or outputs between families, they could mobilize mechanisms in favor of the most vulnerable individuals, according to their definition of vulnerability. This argues for the development of a method that would enable the different perceptions of justice to be comprehended and incorporated at the beginning of the program, including possible conflict between general principles and the principles actually applied. In such an approach, the involvement of CCs in the definition of the program should not have been used as a means of appropriation, but rather as a pre-condition to clarify the different perspectives around equity and to find ways to conciliate and/or negotiate them.

6.3 Overcoming the challenges of equitable access to water in the local context

Procedural justice is all the more important when distributive spatial equity, i.e., equal access to water at the territorial level, is difficult to achieve. This is the case in many rural African areas because of the

distribution of the population, the environmental constraints or the different criteria on which distributive equity can be assessed. The preferred criteria of equal access per village (or leader) do not guarantee equal access per family given the variability of village size, but are coherent with the way local politics and governance function.

In the local hydrogeological context, equal access could only be achieved by using different technologies such as motorized SWS pumps in small reservoirs or expanded use of rainwater harvesting. But these technologies are associated with contextual equity issues; costs, possible multiple uses, or access rights might favor some users at the expense of others. These biases are rarely acknowledged as such; multiple-use water supply systems are often presented as inherently pro-poor (Renwick et al., 2007). In SDA, contextual equity is often restricted to the recommendations concerning the choice of technology, but the concept of appropriate technology overlooks other aspects such as heterogeneity of rural communities. Vertical equity, i.e. the conditions of access to water services depending on the capabilities of users, was not taken into consideration, but there are indications that it is being taken into account in the villages. The different equity issues raised by technologies need to be tackled openly with the community and decision makers to find local solutions or compensation to minimize frustrations.

7. Conclusion

The program explicitly claimed to take equity into account. In practice, it focused on one aspect of distributive equity (spatial coverage) and limited aspects of procedural equity (women's participation in O&M and the involvement of representatives of water users in minor aspects of planning). By focusing on management and planning, it assumed that the failure of previous approaches in achieving its objectives, including good spatial coverage and long-term maintenance of SWI, was due to managerial deficiencies; yet, our analysis underlines the fact that achieving equitable water access goes beyond improving decision-making and planning. In particular, the managerial focus did not accommodate the need to negotiate the perceptions of equity in water access of the different actors who interacted during the implementation process. Moreover, even if managers and water users' representatives shared a preoccupation for distributive equity, this dimension proved difficult to achieve in the contextualized situation of the district. Technical or managerial improvement such as systematic hydrogeological investigation or better coordination between contractors could have minimized some of the problems encountered. But correcting the spatial disparities in water access requires going beyond the managerial and technical focus of SDA. It calls for a careful definition of equity during the design of a water program, taking into account its different dimensions, the local perceptions of how water justice can be achieved and aligning the equity recommendations in the different stages of the program cycle. With this objective in mind, the early mobilization of participatory bodies is not only a way to tackle procedural justice, but is also a precondition to better negotiate the conflicting equity considerations. This is all the more important since decision makers tend to consider equity as a political injunction to be weighed against efficiency objectives. There were indications that issues of unfairness could directly impact the engagement of local actors in O&M, which remains the main challenge in rural water access. The relationships between these two aspects should be more systematically explored to overcome the perceived tensions and to fully integrate the equity issue in managerial concerns.

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