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## **Rural water supply in Namibia: effects on natural resource management and livelihoods**

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## **Cost recovery and decentralization as management solution and poverty trap:**

### **Experiences of rural water supply reform in Namibia**

#### **ABSTRACT**

Calls for new paradigms in water resource management have emerged from a broad range of commentators over the past decade. These calls arose as it became increasingly clear that the pressing problems in water resource management have to be tackled from an integrated polycentric perspective, taking into account interdependent economic, societal, environmental, institutional and technological factors.

Adhering to the calls, Namibia introduced various development and management approaches involving water, land and related resources with the objective of maximizing resultant economic and social welfare in an equitable manner and without compromising the sustainability of vital rural ecosystems. The reforms pursue the democratization of water resources through increased stakeholder participation. However, understanding the barriers to integrated and adaptive management requires a critical reflection on conventional modes of governance. In this regard, Namibia has achieved great strides by shifting from public water management systems and processes towards increased community-based management of water resources.

This paper investigates how newly formed collective action institutions which form part of the recently introduced rural water supply reform impact on natural resource management in three communal areas of Namibia. The analysis takes into account the effects of the historic lack of decision-making powers over the natural resources of rural communities on the management of their newly acquired rights and responsibilities. Moreover, the shift from perceiving water as a free public good to valuing it as an economic good, by means of introducing a full cost-recovery facet, calls for an analysis of reform effects on household livelihoods.

We conclude that while the reform has a positive impact on rural water management it is however in strong conflict with the objectives of the Namibian government to alleviate poverty and inequality. An important aspect is that reform results vary across regions. New water institutions have gradually taken over wider functions in some communities, while they are competing with older local institutions in others. Impacts on livelihoods differ in particular due to socio-economic, environmental and technological factors. Our research shows the need for a regionally adapted implementation of integrated decentralization policies.

#### **KEYWORDS**

community-based water management, decentralization, livelihoods, poverty alleviation, Namibia

## 1. INTRODUCTION

Sufficient, safe, physically accessible and affordable water for personal and domestic uses has become a nationally and internationally recognized human right (Republic of Namibia, 2000c, 2004; UN, 2002). Especially in arid or semi-arid developing countries water users are predicted to face severe cuts in available per capita water (Johansson et al., 2002). In most of the cases it is the rural poor such as subsistence farmers in Namibian communal areas who are most severely affected by the growing water scarcity. Therefore, decisions must be made about allocation mechanisms and conservation of water that are compatible with societal objectives such as economic efficiency, sustainability and the equity imperative (Agudelo, 2001; Bock and Kirk, 2006).

The presented paper analyzes the extent to which the Namibian rural water supply reform meets such high expectations. Reforms became necessary because, historically, Namibian rural water supply was characterised by racially based inequities and strong subsidization. This created a low-quality water sector, making the rural population highly dependent on government handouts and unaware of sustainability considerations (Bock and Kirk, 2006). Currently, a fundamental reform of rural water supply is being implemented in order to change the paradigm of "control and command" by empowering water users and increasing water management efficiency. The main pillars of the reform are decentralization and cost-recovery. Both are meant to increase the natural resource management efficiency.

We will discuss lessons that can be learnt from the Namibian case for a global discussion on the opportunities and limitations of decentralization policies and cost recovery principles. In particular, the cost recovery aspect will be assessed in detail. Is it possible to materialize the positive incentives of water prices for sustainable water management without increasing the risk to drive small-scale farmers deeper into the poverty trap? This might widen the inequality gap in a society that already has one of the highest Gini-coefficients in the world.

Section 2 will give a theoretical background on current discussions on decentralization and cost recovery. An overview of the used methodologies of data collection and analysis is presented in section 3. Section 4 will reflect on the history of rural water supply under the apartheid<sup>1</sup> system and its implications for today. In section 5 the legal framework of the reform is summarized. The empirical analyses of the effects of the reform on the natural resource management are presented in section 6. Section 7 assesses the impact of the reform on poverty and equity. In Sections 8 and 9 a discussion of the results and conclusions will follow.

## 2. THE THEORETICAL FRAMEWORK

For decades policy makers have had ambiguous experiences with the centralized as well as decentralized management of common-pool resources (Anderson and Ostrom, 2008). There is common agreement that fully centralized governance systems are most of the time inefficient because of high transaction costs. Nonetheless, the naive view of tendering full decentralization as the only solution is increasingly challenged (Ostrom, 2005). Box 1 summarizes the advantages and limitations of fully decentralized natural resource management systems. The challenge, then, is to design institutional

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<sup>1</sup> A legal system of racial segregation established by the government of South Africa between 1948 and 1990.

mechanisms<sup>2</sup> that capitalize on the advantages of a decentralized arrangement while relying on back-up systems that can offset imperfections (Anderson and Ostrom, 2008).

In reaction to ongoing challenges in natural resource governance Anderson and Ostrom (2008) propose a polycentric view which considers the relationships among multiple authorities with overlapping jurisdictions. Each unit exercises independence to establish, change and enforce rules within a circumscribed domain of authority for a specified geographical area (Ostrom, 2005; Cleaver, 2000). Polycentric systems give users some but not sole authority to make and enforce rules in order to make efficient use of the advantages of decentralized management without ignoring its limitations. Other governing authorities such as governmental ones can compensate limitations. It is important to note the cooperative attitude of these different stakeholders. In our case studies, we will assess to what extent the Namibian rural water supply reform follows the principles of polycentric governance.

*Box 1: Advantages and limits of fully decentralized natural resource management systems (based on Ostrom, 2005)*

**Advantages:**

- a) accurate mental models of local biophysical and institutional systems;
- b) disaggregated feedback of resource system responses is provided;
- c) reliance on informal institutions reduces the need for costly formal ones;
- d) better adapted rules to local biophysical and institutional systems;
- e) easier monitoring of rules;
- f) self-created rules are seen as being more legitimate and therefore conformance is higher;
- g) competition of parallel autonomous systems;

**Limitations:**

- h) some appropriators will fail to organise;
- i) some self-organisations are undemocratic;
- j) stagnation;
- k) inappropriate discrimination;
- l) limited access to scientific information;
- m) potential conflicts between users;
- n) inability to cope with large scale common pool resources.

In the water sector, decentralization and community participation not only distribute responsibilities but often also externalise maintenance and operation costs to users (Jaglin, 2002; Vavrus, 2003). This fact plays a crucial role in our analysis. The shift from a subsidized water supply to a principle of 'user-pays' and placing a price on water is supposed to provide incentives for the more efficient use of water (Republic of Namibia, 2000c; Cornish and Perry, 2003; Vavrus, 2003; Easter and Lui, 2005). More efficient water use will increase ecological sustainability, which guarantees future reliable water supply and the maintenance of ecosystem functions (Gleick, 1998; Muller, 2007). From this principle follows the logic that one cannot simply compare the water costs and demand of different groups in society but has to work within the existing limitations of local resources (Swatuk, 2002) and regimes to extract them.

In contrast to such an argument is the fact that hardly any water pricing system is based on estimates of ecological externalities but rather on the costs of operation and maintenance of water supply infrastructure (Cornish and Perry, 2003). Water users' main challenge is to service infrastructure reliably and affordably (Muller, 2007). In the best case, cost recovery ensures only financial sustainability.

Compared to a situation where water is free, the pricing of water to cover operational and maintenance expenses provides incentives to save water and to use it more efficiently. Financial sustainability, however, does not guarantee ecological sustainability. Another important aspect which follows out of this indirect link is that the introduction of a painful cost-recovery system for achieving ecological sustainability is dispensable if there are social or customary norms which regulate water consumption (Vavrus, 2003).

<sup>2</sup> Following North (1990) we define institutions broadly as the formal and informal rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction.

Pearce et al. (2007) come to the conclusion that enhancing water management capacity would have a greater conservation effect than introducing user payment systems.

Pricing incentives only effectively change behaviour if the water costs make up a significant part of the farmers' income. Cornish and Perry (2003) argue that for fairness reasons a charge should not exceed a 'reasonable' proportion of income. Effective incentives and financial sustainability are therefore in conflict with fairness considerations (Dinar and Subramanian, 1997). In developing countries cost-recovery rates of water supply are low, particularly because of the low income of users (Azizi, 2000; Jaglin, 2002; Cornish and Perry, 2003; Vavrus, 2003; Easter and Lui, 2005; Pearce et al., 2007; Chikozho, 2008).

To decide which distribution of costs for water supply might be fair and equitable is a moral question and the answer depends on the value system of a society. Generally, equity concepts deal with options on how wealth should be distributed among society's members (Dinar and Subramanian, 1997). In many developed and developing countries income support and cross-subsidies are applied for redistributive reasons and, for instance, to provide the poor with affordable water (Muller, 2007; Pearce et al. 2007). In most societies it is culturally unacceptable to restrict access to the quantity of water required for survival (Muller, 2007), which Gleick (1998) estimates to be a minimum of five litres of drinking water per day. Removing such subsidies is often denounced as a source of growing inequality and may require the introduction of new solidarity mechanisms (Jaglin, 2002).

For these reasons, before cost-recovery is introduced, the user's ability to pay must be assessed (Republic of Namibia, 2000c; Easter and Lui, 2005). It is however unclear how this ability can be estimated. The Namibian government assumes that communities are able to pay for their water if the operation and maintenance costs of water infrastructure can be covered by a per capita contribution of five percent of the total income (Republic of Namibia, 2000c). From a theoretical point of view this is a very arbitrary rule.

In order for people to maintain health and their system of production it is necessary to sustain a minimum calorific intake, to have access to minimum amount of water as well as get basic necessities such as clothing and shelter. Van Rooy et al. (2006) calculated the poverty line for Namibia to be approximately US\$25 per capita per month in 2003 which included costs for purchased drinking water. One further needs to consider income which is independent from water prices consumption. The general conclusion is that the minimal precondition for water prices being affordable is that the total income of the water user must be higher than the poverty line. If a person cannot satisfy their most basic needs, any additional burden would push them only deeper into poverty. We will apply this benchmark in our later analysis.

### **3. METHODOLOGY**

The paper draws on both primary and secondary data collected in Namibia between 2001 and 2006. The research process started with desk research on the history of Namibian rural water supply as well as the institutional framework of the currently implemented reform. Between 2001 and 2004, the impact of the rural water supply reform on water management was empirically analyzed in three settlements in three different regions of Namibia. As the investigation was conducted within the framework of the BIOTA Southern Africa research programme, the site selection was carried out in accordance with the BIOTA transect design (see [www.biota-africa.org](http://www.biota-africa.org)). Primary data was collected in Mutompo (18° 18' S, 19° 15' E) in the Kavango region in north-eastern Namibia; Okamboro (22° 01' S, 17° 03' E) in the Ovitoto communal area in central Namibia and Tiervlei (26° 23' S / 17° 59' E) in the Berseba constituency of the Karas region in the south of Namibia. The sites are well suited for our analysis because they allow a

comparison of the impacts of the reform on water users of different ethnic groups in different ecological zones using different water infrastructural technologies.

Primary data collection started with semi-structured interviews with key informants at relevant ministries, non-governmental and community-based organizations. The interviews focussed on regional and national-level issues concerning water policies, processes of policy formulation and implementation, water allocation institutions, infrastructure and technology, as well as water demand and supply patterns. Based on these interviews, semi-structured questionnaires were developed and used for interviews with rural water users. Participatory observations of natural resource use behaviour completed the research at this stage.

Between 2004 and 2006, the analyses were deepened in the Kavango and Karas regions. Data on water management and the reform impact on rural livelihoods was gathered at household level from a total of 18 communal settlements in these regions. Sample villages were selected on the basis of their vicinity to the Mutompo and Nabaos settlements which were part of the study during the first research stage (see above). A total number of 60 households in both the Kavango and the Karas regions were sampled, using a random sampling technique.

Also at this stage of research semi-structured interview techniques were applied. During interviews, household income and expenditures were recorded in order to identify the effects of the water policy on the household livelihoods. Respondents were also interviewed regarding their awareness and perceptions of the water policy and the general organizational framework of natural resource use. Key informants were consulted on a continuous basis throughout the research process in order to maintain an up-to-date information base.

Effects of the water reform policies on water use behaviour could not be reliably determined during interviews with water users. Interviews were therefore supported by participatory observation and key informant discussions. The methods of data analysis for this part of the research were therefore qualitative in nature, through collecting and verbally summarizing observed and stated developments. In contrast, perceptions regarding the organizational framework of the natural resource management were established using ordinal ranking scales. This part of the data was analyzed with descriptive statistics.

In order to assess the impact of the Namibian rural water supply reform on rural livelihoods, a wealth classification of respondents was estimated based on hierarchical cluster analysis. The 'furthest neighbour' method was used based on the Pearson correlation measure. For each of the calculated clusters household characteristics were analyzed by means of descriptive statistics and correlation analysis. All monetary terms were computed in US Dollars based on the exchange rate of January 1, 2006: US\$1 = N\$6.37 (Oanda, 2008). Calculations were done by SPSS version 15.0 for Windows.

#### **4. HISTORY OF RURAL WATER SUPPLY IN NAMIBIA**

Water has always played a central role in natural resource management in Namibia, as water availability determined land use. Up to now parts of Namibia are scarcely used because of insufficient water supply and the settlement of areas was strongly correlated with the development of water infrastructure (Mendelsohn and el Obeid, 2003). Under these natural conditions access to water and access to land are inextricably linked. This is reflected in the water management systems of different ethnic groups prior to the subdivision of land for white and non-white farmers in the early 20<sup>th</sup> century. Although there was no uniform customary law in place, those who settled first were granted privileged property rights among the majority of the groups as they could decide over

modalities of access to and use of water and land. In this context, traditional authorities played a key role in the natural resource management and up to now they are responsible for granting access to water and regulating the use of water and water related resources in many Namibian communities.

Although traditional indigenous knowledge on water management still exists, water rights were fundamentally transformed with the arrival of European settlers. A dual system of natural resource ownership was implemented. On the one hand, the colonial community applied European private tenure to support the commercialized agriculture while on the other hand the local communities had communal ownership of resources based on the control of traditional authorities (Tewari, 2001).

This dual water management system existed throughout the colonial and apartheid period. When South Africa implemented its apartheid regime in Namibia in 1948, this rigid policy was extended to Namibia and lasted until 1989. A critical aspect was that water rights were derived from land tenure (Tewari, 2001). This philosophy is reflected in the South African Water Act of 1956 which was the basis of the legislation on water in Namibia until independence. Because their land was expropriated and land markets discriminated against them, the non-white population were consequently deprived access to their water resources (Tewari, 2001).

Current water supply structures still reflect historical inequalities (Swatuk, 2002; Chikozho, 2008). Under apartheid, water access and availability were seen as important only for one racial group (Tewari, 2001). This is reflected in a discriminating agricultural policy which allowed heavy subsidization of water use in order to encourage racially biased and large-scale agricultural development programmes (Dewdney, 1996). Many water users considered water as a naturally abundant good, available at low cost (Tewari, 2001). During this period, water was not recognized as a scarce resource. While this factor may have contributed to the fast growth of mining and agricultural sectors in the 1970s, the policy has helped to raise ecologically unsustainable expectations among beneficiaries regarding water use. Explicitly, subsidizing water use led to an extreme exploitation of aquifers and surface-level water resources in order to meet the water needs of (white) commercial livestock farmers, and of South African mines (Forrest, 2001).

The provision of water supplies to the so-called communal areas – disproportionately small areas of land where the majority of the black population were restricted to live – was overtly neglected. In 1990, it was estimated that only 50 percent of the Namibian rural population had access to a reliable source of safe drinking water (Republic of Namibia, 1996). Basic needs of the majority of its citizens living in these areas were not a high priority at that time (Blackie and Tarr, 1999). Living conditions in the communal areas were characterized by high unemployment and underemployment, low purchasing power, and highly subsidized, low-quality government handouts. As a part of this policy, most rural communities received water at no cost. Investments in infrastructure as well as running costs were provided by the government. The rural water supply subsidization was a clear redistribution of income from wealthier taxpayers to poorer communal farmers. To call this a measure of poverty alleviation is, however, absurd considering the overall discrimination of this group. A resulting pronounced dependency of non-white farmers on the apartheid government was not only a side-effect but an aim of this policy. It further promoted a general perception that water is, and should remain, a free good (Hazelton, 1997; Chikozho, 2008). Rural non-white communities have never over-utilized water to the same extent as the highly subsidized commercial agricultural sector. Nonetheless, considering the ecological limitations of local water resources, communal citizens have also used water unsustainably (Dewdney, 1996).

Under the highly centralized regime water infrastructure was developed in areas which could not be used before due to water shortage. An example is the Mutompo area, one of

our case study sites. Nonetheless, the centralized rural water supply approach did not make use of the potential contributions of other stakeholders. In particular, low incentives and the limited capacities of water users to maintain infrastructure and economize water, as well as high transaction costs and the low capacity of ministerial water supply organs, resulted in an underdeveloped communal water infrastructure, poor operation and maintenance, and declining reliability.

In the past no formalized mechanism existed to exclude people from water use in any of the researched sites. However, geographical closeness and transaction costs determined whether a water point could be used or not. In most of the cases, people living outside of a settlement could not use water from the settlement, as they had to walk long distances with their livestock in order to reach the water point. As a result, those who were granted access to land received access only to the next closest water point. Access to land, in turn, was and is regulated by traditional authorities for all researched settlements. Through this interrelatedness, traditional authorities were, de facto, controlling access to water (Falk, 2008).

## **5. THE POLICY FRAMEWORK OF THE NAMIBIAN RURAL WATER SUPPLY REFORM**

The currently implemented rural water supply reform has the objective to reverse the negative effects of the previous policy. In particular, an equitable access to water resources for every citizen, in support of a healthy and productive life, is the most important principle of the reform. Policy makers are aware that in the long run this objective can be achieved only if water resources are managed in an ecologically sustainable manner. Human needs and environmental ecosystems must be harmonized. This should be achieved by the stronger involvement of different stakeholders through a polycentric decentralization and the resulting empowerment of water users. Resulting incentives to save water and to maintain infrastructure are supposed to improve the ecological and financial sustainability of the water supply. Making better use of the capacities of different stakeholders would decrease the government's burden for water infrastructure operation and maintenance in order to invest the saved funds in more efficient sectors (Republic of Namibia, 1993, 1997a, 2000c, 2004; Hazelton, 1997).

In this section we give an overview of the Namibian rural water supply reform concepts. The analyses are based on desk research on the legal and policy framework of the reform as well as interviews with key informants.

Various laws and policy papers address the water issue (Republic of Namibia, 1990, 1993, 1997b, 1997c, 2000a). In particular the Water Resource Management Act provides the legal framework for the implementation of water reform (Republic of Namibia, 2004). The new legislation has not changed anything regarding the ownership of water resources, which still remains in the hands of the state. In this way the government can control and ensure that water is managed and used to the benefit of all people (Republic of Namibia, 2004). This legal perception is not uncontested, because state ownership is in contradiction to the customary law of at least some ethnic groups which is recognized by the Namibian Constitution (Republic of Namibia, 1990; Hinz, 2000). Perceived overlapping jurisdictions of statutory and traditional authorities are a threat rather than an opportunity for improved water management in this unclear legal situation.

Disregarding this centralized ownership constellation, decentralization, community participation and subsidiarity are key strategies of the Namibian government in order to achieve the objective of economically, environmentally and socially sustainable water management. The Water Supply and Sanitation Sector Policy of 1993 states that "... equitable improvement of services should be a result of the combined efforts of the government and the users based on community involvement, participation and mutual responsibility" (Republic of Namibia, 1993). Reformed rural water supply is now based on

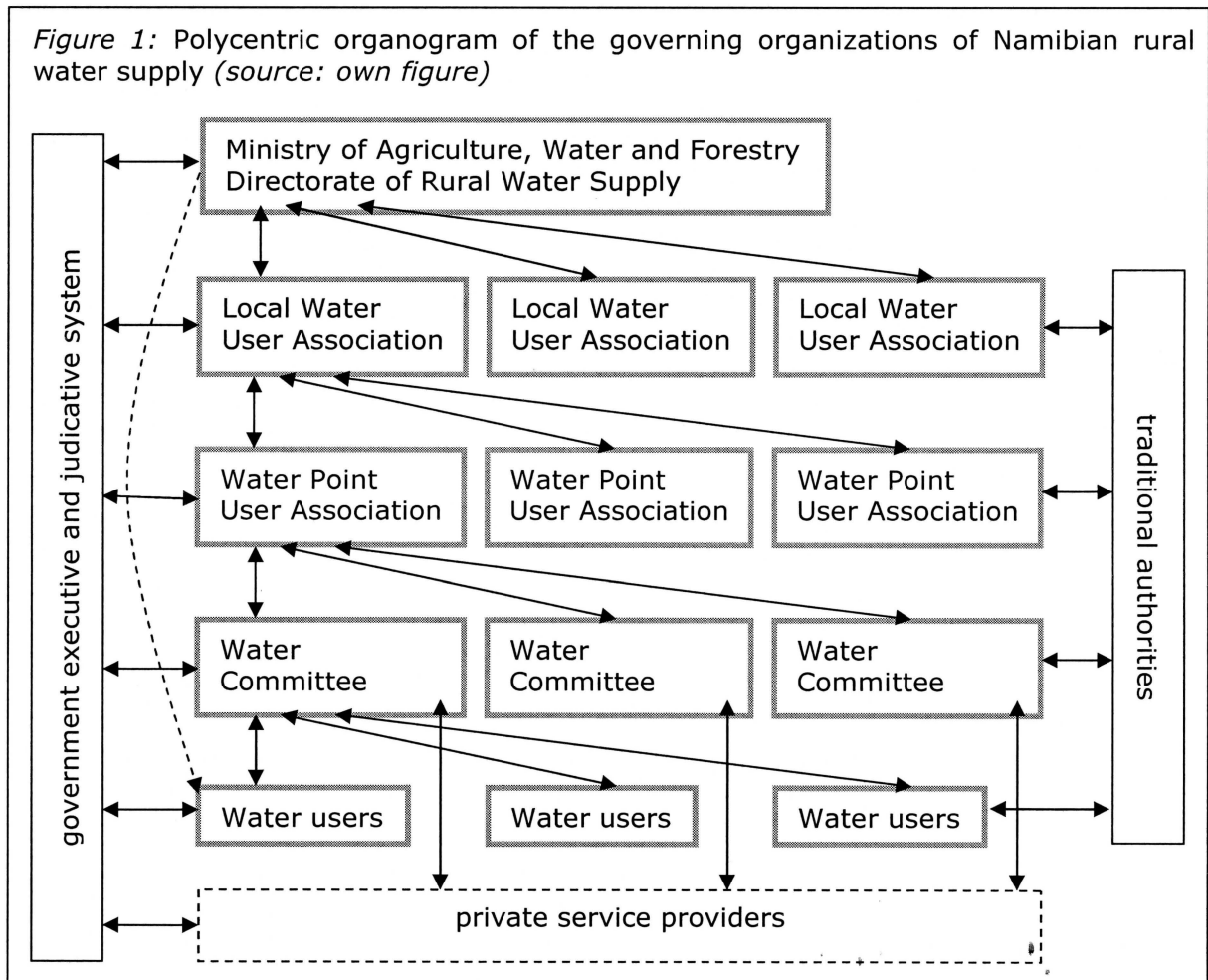


three fundamental principles: a) maximum involvement of users, b) delegation of responsibility to the lowest possible level and c) an environmentally sound utilization of water resources (Republic of Namibia, 1993). In 1997, it was decided that, within ten years, the responsibility for managing and paying for water services should be progressively devolved to community organisations (Republic of Namibia, 2000a).

Figure 1 gives an overview of the management structures of rural water supply. The core of the organizational framework consists of the bodies proposed by the Water Resource Management Act. Following subsidiarity principles, the Act strongly focuses on the establishment of Water Point User Associations (WPA) (Republic of Namibia, 2004). These consist of those community members who permanently use a particular water point. The WPAs have the right and duty to operate and maintain their water points in order to foster a sense of ownership (Republic of Namibia, 2004). Their constitutions contain stipulations on water use regulations and access. They are further given power to adopt measures to prevent the wastage of water and to protect water infrastructure against vandalism and other damages (Republic of Namibia, 2001d, 2004). A backbone of the reform lies in the empowerment of water users through capacity-building in issues related to water supply, operation, maintenance and conservation (Republic of Namibia, 1993).

The WPAs are supposed to elect Water Point Committees for the day-to-day management and financial activities (Republic of Namibia, 2004). Water Point Committees are empowered to monitor and enforce the compliance with regulations. Penalties against violations have to be specified in the Management Plan (Republic of Namibia, 2001c). The ultimate punishment against any offence is the suspension of WPA membership (Republic of Namibia, 2001d), which simply means exclusion from water supply. Generally, the

Figure 1: Polycentric organogram of the governing organizations of Namibian rural water supply (source: own figure)



WPAs can elect their committee independently. This allows the incorporation of various stakeholders, such as traditional authorities, government officials, church leaders, etc. (Republic of Namibia, 2001a) Such an approach can be interpreted as making use of polycentric structures and is intended to allow for efficient management, since an authority is chosen who best represents the interests of the local users and whose decision is accepted. Social and moral-based institutions minimize the need for external enforcement. The list of authorities involved can be extended if one considers that legally recognizing the rights of users creates overlapping responsibilities in a positive subsidiary way. WPAs can in most cases use informal mechanisms to monitor and enforce their rules. When associations are overstrained, they have the power to call, *de jure*, on the government judiciary and executive system which would be obliged to assist in enforcing WPA rules. This is an important claim in terms of institutional sustainability.

In the event that WPAs are not able to deal with more general issues, they can call on the next higher management structures. These are Local Water User Associations (LWA) which are formed by the WPAs of a constituency. The rights and duties of the LWAs are very much the same as the ones of the WPAs (Republic of Namibia 1997a, 2004). Again following the principles of subsidiarity, the LWAs are in particular responsible for the coordination of the water management of a region (Republic of Namibia, 2004) and to solve problems which cannot be solved at local level.

On the top level the Ministry of Agriculture, Water, and Forestry, and in particular the Directorate of Rural Water Supply, mainly has policy making and strategic planning functions. The Minister establishes water management structures and has the power to register or deregister WPAs and LWAs. A national Water Advisory Council advises the Minister on water-related matters. Basin Management Committees are set up to manage water catchments. One of their functions is to promote community participation in the protection, use, development, conservation, management and control of water resources (Republic of Namibia, 2004).

The reform also has the objective to promote the emergence of small-scale enterprises such as local installation contractors, spare part outlets and diesel supply services. Small businesses could lower the transaction costs of the new water supply scheme and help develop the local economy (Republic of Namibia, 1997a; Falk, 2008).

The reduction of transaction costs in particular is important in the context of increasing water costs for water users due to the introduction of cost-recovery principles. Policy makers are aware that water is a scarce and valuable resource. Therefore, it is of high priority to them to place an economic value on water in order to include environmental externalities in the water costs and to encourage efficient and sustainable resource supply (Republic of Namibia, 2000c).

In contrast to this argument there are in fact few *de facto* mechanisms to assess or internalize environmental externalities. Policy making is based on the premise that the sustainability of water supply crucially depends on the ability of suppliers to become financially self-sufficient. Cost-effective water supply is one of the fundamental principles of the Water Resource Management Act (Republic of Namibia, 2004). Self-sufficiency and cost-effectiveness is, however, within the context of the reform, clearly related to operation and maintenance and not to the preservation of, for instance, ecosystem services. For communal farmers, the introduction of cost recovery means stronger self-support and more responsibility for water facilities, as they are supposed to own and operate their installations (Republic of Namibia, 1993).

Decentralizing expenditure responsibility will in the first place increase incentives to manage water infrastructure more carefully and reduce maintenance costs and only in the second place provide incentives to steer water consumption towards most efficient

use. Listening to the cost-recovery rhetoric one should keep in mind that financial sustainability does not guarantee ecological sustainability.

The theoretical background of the Namibian reform is in line with international discussions. However, in the Namibian context, recovery of operation and maintenance costs by water users is provoking controversial discussions. Within the Namibian government, concerns about whether the cost-recovery of rural water supply may not put too high a burden on water users arose. Self-critical policy documents mention that in some regions insufficient attention was paid to the ability of water users to pay. Cost recovery was phased in too rapidly and training was inadequate. Low levels of water usage make it difficult to recover costs without charging excessive amounts to users. This has resulted in poor management and maintenance (Republic of Namibia, 2000b) and is assumed to have, in turn, negative effects on rural livelihoods.

The Water Resource Management Act prescribes that essential water supply services must be available to all Namibians at an affordable price (Republic of Namibia, 2004). The focus on equity aspects is justified by the extreme income inequality in Namibia which is reflected in a very high Gini-coefficient of 74.3 in 2007 (UNDP, 2007a). Hence, the government recognizes the need to adapt the implementation of the rural water supply reform to the capacity of each community to cater for itself, in order to quantify needs for subsidization (Republic of Namibia, 1993, 1997a, 2000a).

In summary, the new rural water supply management system shows clear signs of a polycentric approach. The central government keeps the overall control, but delegates much of the operational management functions. It endeavours to become a 'facilitator' rather than a 'provider' of rural water services (Republic of Namibia, 1994). The users are to play the central role in the provision of rural water supply, which includes increasing financial and institutional responsibilities. Private service providers will accompany the reform in order to obtain economies of scale and to reduce transaction costs. It is important that the legal framework allows the incorporation of any stakeholder in local management structures. In this way it is possible to make effective use of existing structures and to adopt the new institutions and organisations locally. The fact that the government judiciary and executive system has to back the monitoring and enforcement of rural water use rules when requested should not be underestimated.

## **6. THE IMPACT OF THE REFORM: EMPIRICAL RESULTS FROM THREE CASE STUDIES**

The following sections will discuss how the rural water supply reform has been implemented in and around the three settlements of Mutompo, Ovitoto and Tiervlei. We will assess how effective the new water-related institutions are in their role to promote an efficient and sustainable management of water and natural resources. The case studies will give an impression to what extent the Namibian government manages to balance the positive and negative effects of decentralizing the rural water supply.

### **6.1. Mutompo/Kavango region**

The Kavango region is a communal area in north-eastern Namibia. Its dominant vegetation type is woodland of the northern sandplains with medium-to-dense bush and forest (Mendelsohn and el Obeid, 2003). Average rainfalls of more than 500 mm allow for dryland rain-fed cultivation. The whole Kavango region has a population of about 202,700 people, which is 11 percent of Namibia's population, living on 5.5 percent of its land area (Mendelsohn and el Obeid, 2003).

In the 1970s the first permanent settlement evolved in the Mutompo area, closely related to first central government investments in water infrastructure. Infrastructure, later improved, consists today of a diesel pump and a water reservoir. Within the frame of the

water reform, the government installed new closed water tanks at many water points. They helped to improve water quality in particular. The improved water infrastructure in inland Kavango attracted people, leading to the rapid growth of inland settlements. Although this reduced pressure on other areas of communal land it promoted the transformation of almost untouched inland forests into farming areas (Falk, 2008).

As a measure of the reform, water point user associations were founded in the late 1990s and water committees elected. Nonetheless, to date, local traditional authorities still organize water supply and decide on water questions in consultation with other residents. The fact that the traditional and newly established local community structures can formally exclude outsiders from water use did not affect their lives very much. This (as mentioned above) already happened in the past through traditional authority structures (Falk, 2008). The relative importance of the water committees in comparison to other organisations can be assessed on the basis of the survey on organizational diversity carried out in Mutompo and neighbouring settlements. The traditional authorities are most trusted, as Tables 1 and 2 show. This does not, however, mean that democratically elected committees or the judiciary and executive government systems are disregarded.

<i>Table 1: How much do you trust the following organizations (in percent: N=60)? (source: own research)</i>				<i>Table 2: How much influence should the following organizations have (in percent: N=60)? (source: own research)</i>		
	Very much	moderate	not at all	very much	moderate	not at all
Water committee	85.0	13.3	1.7	76.7	6.7	16.7
Traditional authorities	91.7	8.3	0	90.0	8.3	1.7
Government officials	68.3	21.7	10.0	65.0	20.0	15.0
Judiciary	83.3	6.7	10.0	76.7	6.7	16.7
Police	90.0	6.7	3.3	86.7	10.0	3.3
Political parties	71.7	20.0	8.3	65.0	18.3	16.7

Under the apartheid water supply system, the government was responsible for maintaining water infrastructure. Until 2007 little has, de facto, changed. The WPA's pumps have been regularly maintained, as records of the Directorate of Rural Water Supply prove. However, as the water points have not yet been officially handed over to the WPA there is much confusion amongst water users over ownership claims and maintenance questions. In the past, diesel to run the pumps was provided and transported to the settlements by the government. Since 2002, villagers had to buy diesel at their own cost (Falk, 2008). It was therefore necessary to develop a system for collecting money from different users. At present users' water payments are regulated in an ad-hoc manner in the researched Kavango settlements. There is no monthly payment system implemented. When the water in the reservoir is depleted and diesel is needed to operate the pump, traditional authorities collect what the households are willing and able to pay in cash or in kind. For this reason, the individual contribution to water supply varies significantly between households. The money collected in Mutompo and the surrounding settlements is hardly enough to buy fuel, thus no funds for future repairs are saved. Transaction costs make up a high percentage of the total costs. Villagers have to travel more than 60 km, often without own transport, to buy fuel.

As an outcome of the reform, incentives to save water and maintain infrastructure have begun to take effect. Water users collectively build fences to protect taps from animals. In order to control water use and waste, the tap is kept locked, except at specific times

of the day. Thorn bushes have been placed around open reservoirs because some residents started to take water directly from there.

The daily amount of household water consumption has been limited. Water is pumped at night in order to avoid the engines getting too hot and damaged. Increasingly, methods are applied to fetch rainwater.

Although such rules are common throughout the world, in the researched area they have been introduced only after the implementation of the rural water supply reform. Our research shows that awareness of the problem has increased. Nevertheless, both the water committee as well as traditional authorities still face enforcement problems regarding the collection of fees.

## **6.2. Tiervlei/Karas region**

Tiervlei and its neighbouring settlements are situated in the Berseba communal area in the Karas region. The vegetation type of the region is Nama Karoo. Average annual rainfall is 142 mm (Huysmans, 2003). The most important natural resource use is small stock farming (Falk, 2008). Tiervlei and its neighbouring farming units do not form a coherent settlement. In the 1960s former commercial farm camps were distributed amongst communal farmers. Since then, some of the camps have been used by the same families, increasing their sense of ownership and control over the plot (Fuller and Turner, 1996).

Besides grazing, water is the most crucial resource for farmers (Fuller and Turner, 1996; Republic of Namibia, 1992). Groundwater in the area is sensitive to over utilization as boreholes regularly dry up in low rainfall years, (Republic of Namibia, 1992). In the late 1990s, water users formed Water Point User Associations. Water committees were elected and water constitutions drawn up. In this area, an important element of water reform is that members of the WPA have the formal right to grant or deny access to their water and subsequently also to other natural resources. Within the community members of the Water Point User Committee in particular were convinced that local residents have the right to stop people from using Tiervlei resources.<sup>3</sup> Two fifths of the respondents believe that the Water Point Committee has a say in granting access to land, which under customary and statutory law is the responsibility of traditional authorities. Water point constitutions are seen as instruments to legally enforce exclusion. This increases the feeling of ownership of many farmers.

In contrast to many other communal areas in Namibia, traditional authorities around Tiervlei are weak at present (Keulder, 1997). The gap of missing local government and traditional authorities is now partly filled by water organizations. Water Point Committees have increasingly become a forum for community discussions on natural resource issues. Tables 3 and 4 show that the Water Committees are more trusted than any other organization and that the vast majority of respondents want the Committee to become the most influential structure in the settlement. The fact that this structure was established only ten years ago on the initiative of the government and is now the most appreciated community organisation is an indication of one of the successes of the reform. One surprising finding in our results is that respondents trust different stakeholders only moderately but wish them to play a much more important role. Firstly, the respondents differentiate between specific persons performing in an organization and the structure in general. Secondly, low trust is also the result of low influence. One can interpret the answers as a general call for the provision of institutional services.

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<sup>3</sup> Non-parametric *Spearman-Rho correlation*: "member of committee" and "can somebody be excluded from resource use"; coefficient: 0.385; significance: 0.057; N = 25.

<i>Table 3: How much do you trust the following organisations (in percent; N=60)? (source: own research)</i>				<i>Table 4: How much influence should the following organisations have (in percent; N=60)? (source: own research)</i>		
	very much	moderate	not at all	very much	moderate	not at all
Water committee	53.3	36.7	8.3	86.7	10.0	3.3
Traditional authorities	28.3	26.7	45.0	76.7	16.7	5.0
Government officials	30.0	48.3	21.7	73.3	13.3	8.3
Judiciary	50.0	23.3	16.7	70.0	16.7	13.3
Police	48.3	23.3	26.7	83.3	13.3	3.3
Political parties	18.3	33.3	46.7	50.0	20.0	21.7

In the Berseba settlements the payment system is transparent. Each household pays approximately US\$1.50 per month. The WPA discussed the development of a more differentiated scheme, with pensioners receiving a discount or being asked to make a payment per head of livestock. Such schemes have not been implemented because the members of the WPA could not agree on a broadly accepted rule. At this site fees are saved to be used for future maintenance work of the water infrastructure. Since the pumps are run by windmills, no diesel has to be purchased. Despite the low fees however, getting all members to pay their contributions remains a challenge.

Water payments and the formulation of a constitution supported the introduction of new rules and have motivated users to save scarce water resources. For instance, one has to stay at least 20 metres away from a water point to wash oneself, ones clothes or cars. Furthermore, the amount of water used for horticulture has been limited.

The reform approach of a decentralized formulation of institutions makes sure that rules are adapted to a particular place. It further reduces monitoring and enforcement costs of water resources. The experimental analyses of Vollan (2008) imply that farmers in the Berseba area are more likely to cooperate under externally set rules if the affected people agree on them. Thus, the impact of the rural water supply reform goes far beyond a mere promotion of sustainable water management. It creates a stronger sense of ownership and provides incentives to invest in natural resource preservation in general. The reform strengthens the rights of residents, particularly when traditional authorities have become weak or are little respected. Although this situation may lead to new conflicts (Bock and Kirk, 2006) it can be stressed that strengthening the rights of local users increases incentives for them to manage natural resources in a more sustainable manner.

### **6.3. Okamboro/Otjozondjupa region**

In Okamboro, only exploratory research has been carried out, because the focus of the BIOTA project shifted away from this site after 2004. Nonetheless, the results supplement the more detailed analysis in the Kavango and Berseba areas very well.

The settlement of Okamboro belongs to the Ovitoto communal area in the central Otjozondjupa region. The average annual rainfall of the region is approximately 350 mm. The population density in the Okamboro area is seven times the average of density in the Otjozondjupa region (0.4 persons per sq. km) which results in a high pressure on the natural resources around Okamboro (Falk, 2008).

Also, in Ovitoto, the management and control of water points is a crucial element of the natural resource management. Villages are organized around water points and the village grazing territory is largely determined by the fact that cattle do not walk further than seven kilometres away from the water point. An old borehole exists around the settlement. A new one was drilled in 2002 under the framework of the rural water supply reform. While the government remains responsible for the old pump, the new one was immediately handed over to the community. The community also received a closed water tank which improves the water quality. It is government policy to repair all water points before they are handed over. Even when the new pump broke in 2003 the government still repaired it.

Also, the residents of Okamboro have formed a Water Point User Association (WPA) and elected a Water Point Committee. Under the supervision of the Directorate of Rural Water Supply the WPA formulated a water constitution which defines regulations on water use. Representatives of the Directorate's office in Ovitoto emphasized that rules and punishments had to be formulated by the community itself in order to be adapted to their specific situation. This approach increases the chance that social and moral-based institutions become effective. Should these prove to be inefficient in particular cases, the WPA has the opportunity to ask government authorities for support. The threat of formal punishment supports the enforcement of informal punishment.

In Okamboro, water fees are linked to consumption. Since livestock is a main consumer of water (Bock and Kirk, 2006) payments are dependent on the livestock numbers of a household. By the end of 2002, households were paying approximately US\$0.15 for each head of cattle per month. The collected water fees cover not only the cost of the purchased diesel, but money is also saved in a bank account for future repairs. Quarrels arose with some livestock owners who were not willing to pay their fees. However, they and their workers are under high social pressure to pay. Until 2004, no case of exclusion was reported.

The fact that villagers discuss the pollution and waste of water indicates that the new water policy promotes more sustainable water management. Moreover, one fifth of the households mentioned that they personally helped to repair and maintain the water infrastructure, which reveals an increasing feeling of responsibility amongst the residents for the water point. It can be concluded that the new water policy shows positive effects regarding sustainable resource management in Okamboro.

## **7. IMPACT OF THE NAMIBIAN RURAL WATER SUPPLY REFORM ON RURAL LIVELIHOODS**

Despite the described positive impacts of the reform on water management, the Namibian government is concerned that cost recovery of rural water supply puts too high a burden on water users. The micro-impact of the Namibian rural water supply reform on rural livelihoods will be assessed hereafter in more depth for the Kavango and Berseba areas.

Analyses of the wealth distribution show that wealth is not only within the country as a whole very unequally distributed, but also within communities (see Figures 2 and 3). In addition, correlation analysis proves that in both research areas the less livestock a person owns the lower is her/his income.<sup>4</sup> The poorer segment of water users cannot compensate their low income by livestock sales in order to pay water fees. Even if Figures 2 and 3 show that income and livestock ownership is more unequally distributed in the Kavango region we can assume that the livelihood impact of the reform depends

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<sup>4</sup> *Pearson correlation*: "value of livestock owned per capita" & "annual income from farming and non-farming per capita". Kavango: coefficient: 0.316; significance: 0.014; N = 60, Tiervlei: coefficient: 0.413; significance: 0.001; N = 60.

Figure 2: Distribution of total farming and non-farming income within the communities amongst households (own source)

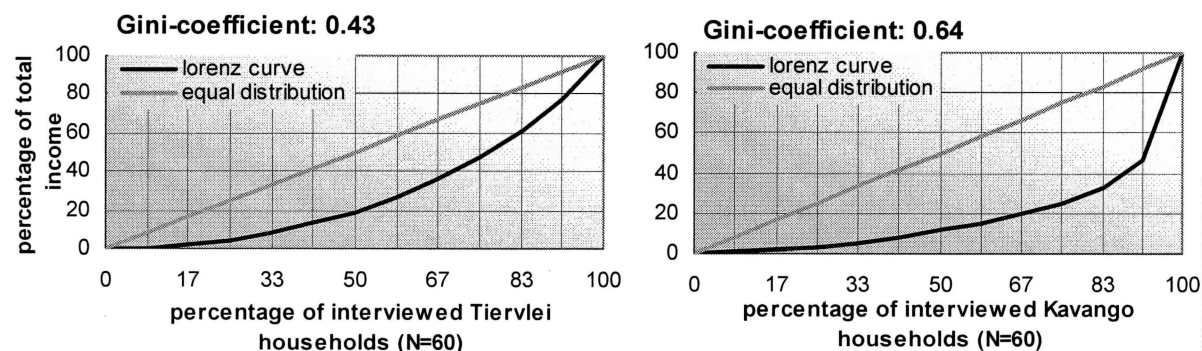
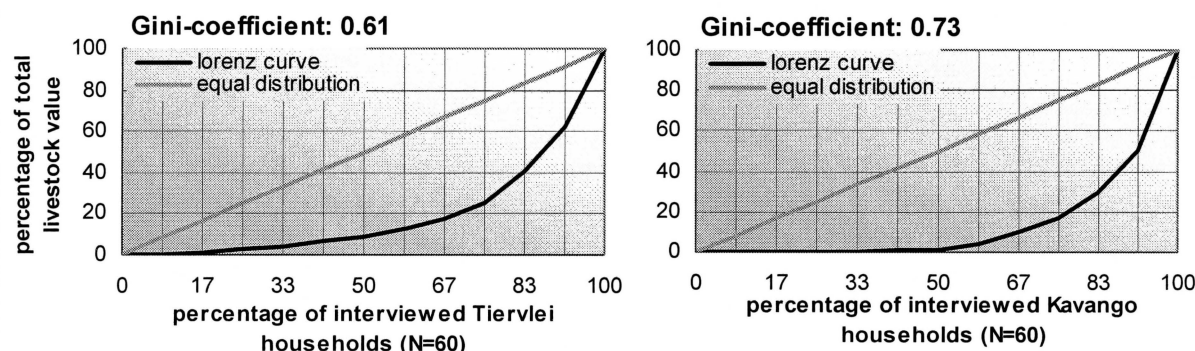


Figure 3: Distribution of total value of livestock within the communities amongst households (own source)



mainly on the wealth status of water users rather than the area of residence. The respondents have therefore been classified into wealth groups. Since wealth is a multidimensional concept, especially in a strongly subsistence economy, cluster analysis has been applied to separate three groups (see Appendix 1). Variables used for the classification are:

- 1) Annual non-farming income per capita;
- 2) Annual farming income per capita;
- 3) Value of livestock per capita.

This section analyzes the livelihood impact, not for each research area, but the three wealth groups, which are called; a) the livestock owners, b) the income diversifiers and c) the poor. The groups are given names according to tendencies in household characteristics without ignoring the fact that, for instance, the poor own livestock and livestock owners also diversify income.

### 7.1. Livestock owners

This group is called the 'livestock owners' as they own large numbers of animals. the average value of livestock per capita in this group is US\$1,676. The average age of the household head (almost 60) is the highest of the three classified groups. This explains the fact that approximately half of the households receive income from pensions, which is the most important cash income. Despite the relatively high livestock numbers the daily total income per capita (including subsistence income) is US\$1.13 and therefore below the poverty line. This can be explained by the low commercial orientation of many farmers, who strive to maximise livestock numbers rather than income. Livestock is for many communal farmers a source of future unemployment benefit, a retirement plan,



health and life insurance, a means of production, a savings account as well as a source of food (Falk, 2008). Livestock possession stabilizes their lives.

Table 5: Household characteristics of the cluster 'the livestock owners' (N = 73)

Average annual income from non-farming activities (per capita)	US\$255.4
Average annual income from farming activities (including subsistence) (per capita)	US\$157.3
Average total daily income - including subsistence (per capita)	US\$1.13
Households below the poverty line (US\$1,23 per day) <sup>5</sup>	65.8 percent
Households owning livestock	98.6 percent
Average value of livestock/animals per capita (including chicken)	US\$1675.7
Average age of household head	59.2 years
Average school grade of household head	4.1
Average annual water payments per household	US\$26.6
Share of total household budget spent on water payments	1.7 percent
Average water payment per LSU	US\$0.99
Ratio Kavango / Berseba	37 / 63

Livestock owners pay on average the largest amount for water supply. Currently approximately 1.7 percent of their total budget is spent on water fees. The payment of US\$26.6 per month is affordable, considering the opportunity to sell livestock. However, intra-community fairness becomes an issue, as livestock consumes the biggest share of available water (Bock and Kirk, 2006). The amount of water consumed correlates significantly with the number of livestock owned as well as the income earned from livestock production.<sup>6</sup> Despite these facts, with US\$0.99 paid per Livestock Unit (LSU) this group pays by far the lowest amount in proportion to their consumption.

## 7.2. Income diversifiers

'Income diversifiers' are less dependent on farming but rely rather on income from both farm and non-farm employment, small business and pensions. They are on average younger than the 'livestock owners' and better educated. This group has the highest total income compared to the other groups. Nonetheless, a daily average income (including subsistence) of US\$1.56 indicates that businesses are really small and employments are in most cases unqualified ones. The 'income diversifiers' own few livestock. Their livelihood security depends on their daily work. This makes them more vulnerable to risks such as unemployment or disease. In 2002, the prevalence of HIV in the Karas region was 16 percent, and in the Kavango region 22 percent (Republic of Namibia, 2002a). Presently, for this income group hardly any attractive savings and insurance mechanisms exist (Falk, 2008).

<sup>5</sup> We argued in section two that a measure of affordability of water pricing is the poverty line. We calculate the poverty line on the basis of the calculations of Van Rooy et al. (2006). Considering the annual average change in consumer prices in Namibia (2003: 7.2%; 2004: 4.1%; 2005: 2.3% (IMF, 2008)) we set the benchmark for the poverty line for 2006 at US\$1,23 per day per capita.

<sup>6</sup> *Pearson correlation*: "number of livestock owned by household" & "annual water consumption of household"; coefficient: 0.295; significance: 0.001; N = 116; "annual household income from farming" & "annual water consumption of household"; coefficient: 0.271; significance: 0.003; N = 116.

Table 6: Household characteristics of the cluster 'the income diversifiers' (N = 33)

Average annual income from non-farming activities (per capita)	US\$528.5
Average annual income from farming activities (including subsistence) (per capita)	US\$41.3
Average total daily income (per capita)	US\$1.56
Households below the poverty line (US\$1,23 per day)	57.6 percent
Households owning livestock	57.6 percent
Average value of livestock/animals per capita (including chicken)	US\$131.1
Average age of household head	48 years
Average school grade of household head	4.8
Average annual water payments per household	US\$21.1
Share of total household budget spend on water payments	0.8 percent
Average water payment per LSU	US\$6.8
Ratio Kavango / Berseba	58 / 42

'Income diversifiers' pay on average less than 'livestock owners' for water, but slightly more than 'the poor'. This group spends on average less than one percent of its total income for water, which seems to be affordable. One needs to express concern about this group because their sources of income are relatively insecure and especially the younger part of this group quickly runs risk to shift to the group of 'the poor' as soon as they become sick, are unemployed or when their businesses collapse.

### 7.3. The poor

This group includes only 14 out of the 120 households. All are living in the Kavango region. This means that almost one fourth of the Kavango households fall within this group. Group members are rather young and have a very low level of education. Their main source of income is crop cultivation supplemented by casual work. The daily income,

Table 7: Household characteristics of the cluster 'the poor' (N = 14)

Average annual income from non-farming activities (per capita)	US\$15.5
Average annual income from farming activities (including subsistence) (per capita)	US\$73.1
Average total daily income (per capita)	US\$0.24
Households below the poverty line (US\$ 1,23 per day)	100 percent
Households owning livestock	7.1 percent
Average value of livestock/animals per capita (including chicken)	US\$8.4
Average age of household head	39.8
Average school grade of household head	3.9
Average annual water payments per household	US\$17.7
Share of total household budget spend on water payments	3.5 percent
Average water payment per LSU	US\$212.0
Ratio Kavango / Berseba	100* / 0

including subsistence, of US\$0.24 is far below the poverty line. The poor pay the lowest total amount but the highest share of their budget (3.5 percent) for water. This proportion is, according to government criteria, still affordable. Nonetheless, for somebody who lives so far below the poverty line no additional burdens are socially acceptable. According to our analysis and based on the poverty line benchmark the group of the poor cannot afford to pay for their water.

#### **7.4. What are the likely future implications?**

It can be concluded that in 2007 only for a relatively small group of the Kavango households (23 percent) water payments are objectively not affordable. One has to consider, however, that the reform is not yet fully implemented. The majority of water points are still to be repaired by the government. What would happen if, as planned, the water users have to cover the full costs of water infrastructure maintenance? Exemplary calculations for two WPAs shall demonstrate likely future impacts.

The Tiervlei WPA is controlling five wind pumps. The average maintenance costs per wind-driven water system amount to approximately US\$750 per annum. The Tiervlei WPA would thus have to cover approximately US\$3,750 per year. At the moment the WPA members pay approximately US\$350 per year. If the Tiervlei farmers would be fully responsible for the infrastructure maintenance they would have to pay on average seven percent of their total budget for water. If the total water costs of the WPA were distributed proportionally to the livestock numbers, as implemented in Okaboro, some of the Tiervlei 'livestock owners' would have to pay more than their current total farming and non-farming income for water.

The Mutompo WPA currently receives approximately US\$400 in fees per year. This amount however only covers the costs for buying diesel. The average maintenance cost per diesel-driven water system amounts to approximately US\$2,350 per annum, which means that the total annual water supply costs of the Mutompo WPA would be approximately US\$2,850. This amount is 14 percent of the total income that all Mutompo households receive (including subsistence income). There are already reports of people selling crops and livestock in order to cover costs for water. This has multiple impacts on their livelihoods (Falk, 2008) and affects food security in a region where 28 percent of the children under the age of five were severely underweight in 2000 (Mendelsohn and el Obeid, 2003).

The two examples show that under full cost-recovery even according to the government's arbitrary five percent of income criterion for the ability to pay, few water users are able to cover the operation and maintenance costs of their infrastructure (Republic of Namibia, 2000c). New payment schemes would have to be developed which take the households' water consumption into account. Considering the low income of 'income diversifiers' in particular, this would mean that higher water payments would push more people directly below the poverty line.

### **8. DISCUSSION**

Even if the potentials of the polycentric, subsidiary and participatory rural water reform approach are not yet fully explored, it can make use of the strength of different stakeholders without neglecting their limitations (see Section 5). It saves transaction costs and encourages water users to manage water resources more sustainably.

This is necessary due to ecological limitations of local water resources (see Section 4). New regulations have been introduced and the ownership perception amongst water users improved. Water users' investments in maintenance and management show that incentives are effective, and new community-based decision making organizations have

emerged. These fill in critical institutional gaps in some communities. The rural water supply reform therefore empowers communities even beyond the water management (see Section 6).

The reform is flexible enough to allow customary law and traditional authorities to be incorporated. This enables a site-specific formalization and recognition of existing informal water management rules. Unfortunately, due to the long enduring discriminative and paternalistic policy prior to independence, many customary water management rules are lost (see Section 4).

In cases where new rules are needed the government, as one of the polycentric players, should support the communities in a participatory way. The training component of the reform is insufficiently implemented. Where traditional authorities are strong and accepted they also should play an important role in the new system. There are still some contradistinctions between the different laws that have to be sorted out by the Namibian policy makers because they can lead to confusion and conflicts. According to the Communal Land Reform Act, no person may be prevented from drawing water from any water point on a commonage except with written permission of traditional authorities and ratification of the land board (Republic of Namibia, 2002b: 29(4)(d)). This law thus undermines the power of the Water Point Committee. An efficient enforcement back-up of WPA regulations by statutory and customary enforcement instruments will be crucial for the success of the reform. The reform framework makes use of each stakeholder's opportunities and compensates them for their shortcomings. Water users must be sure that they can rely on traditional, as well as government, judiciary and executive mechanisms if they are unable to solve conflicts within the group.

In a situation where informal water institutions have been historically largely corrupted, a solely institutional decentralization policy would not have had the dramatic effects on resource management that the introduction of water fees has.

The impact of the fees on rural livelihoods is, however, ambiguous. At least some of the water users cannot afford to cover full costs of water supply. The Ministry of Agriculture, Water and Rural development is aware of this problem and proposes intra-community cross-subsidies to satisfy the basic needs of low income users (Republic of Namibia 1997a, 2001b) without specifying how such subsidization could be implemented. A study conducted for the Ministry concluded that most communities would not be able to cover water costs on a per-household basis but only on a per-head-of-livestock basis.

Much depends therefore on the willingness of farmers who are relatively richer in terms of livestock to pay the higher charges. The observed fee systems in the Kavango and Berseba WPAs favour owners of large livestock numbers. Compared to their water consumption and total income, poorer community members are rather overtaxed. This is in contrast to the objectives of the Namibian government to equitably distribute resources in support of a healthy and productive life (Republic of Namibia, 2004).

Payment schemes such as the one implemented in the Okamboro WPA should be encouraged in order to avoid growing inequity in a country with one of the highest Gini-coefficients in the world (UNDP 2007a). Nonetheless, encouraging redistribution within the communities (Republic of Namibia, 2000c) means that equity is not attempted to be reached by redistribution from wealthier to poorer segments in society, but rather by redistribution within the poorer of its segments.

Comparing the situation of past subsidized water supply with the user-pays practice, the reform clearly means wealth redistribution from communal farmers to the wealthier tax payers. The government's expected annual net savings realized with the reform range between US\$1.4 and 2.6million (Republic of Namibia, 1997a, 2000c). Redistributing government expenditures towards the most efficient activities for achieving society's

main objectives (Azizi, 2000) is a strong argument for cutting water subsidies. Hutton et al. (2006) estimate that the investment of one dollar (U.S.) in water supply would, in Sub-Saharan Africa contribute US\$2.8 to meet the Millennium Development Goals. Recognizing limited state budgets, a cut of investment in water would be reasonable if the government knows alternative investment options with a higher benefit-cost-ratio to meet MDGs.

However, it is questionable how this fits together with the government's recognition that the lack of water supply is a primary constraint to development and poverty alleviation in Namibia (Republic of Namibia, 2000c).

It must be also seen against this background that it is one of the MDGs to halve the proportion of people who are unable to reach or to afford safe drinking water (UN, 2000). Sufficient, safe, physically accessible and affordable water for personal and domestic use has become an internationally recognized human right. An adequate amount of safe water is necessary to prevent death from dehydration, to reduce the risk of water-related disease and to provide for consumption, cooking, personal and domestic hygiene requirements. The direct and indirect costs and charges associated with water, as well as water facilities and services, must be affordable for all (UN, 2002).

## **9. CONCLUSION**

The Namibian government is in an unenviable position. On the one hand it is aware of the negative effects of water subsidies and has been encouraged by international organisations to reform the system. On the other it faces challenges such as high regional institutional diversity and extreme wealth inequality within the country as a whole as well as individual communities.

Some of the challenges are being progressively addressed with the subsidiary, participatory and polycentric reform approach. Institutional innovations and the introduction of water costs have improved management. The incentive of water fees to use water more efficiently is positive, but the user-pays principle has also compounded inequality and poverty. The Namibian government should therefore be encouraged in its current strategy to slow down the implementation process.

Also, from a polycentric perspective, it is necessary that the government still plays a role in rural water supply (Republic of Namibia, 2000c). This should not be understood as a call to stop or even reverse the reform. However, a further implementation must consider the danger of aggravating poverty, at least for a portion of the affected farmers. As a measure to achieve its equity objectives, the Namibian government could, for example, identify ways to provide financial incentives for a sustainable natural resource management in contrast to the past subsidization of unsustainable resource use.

Appendix 1: Agglomeration schedule of hierarchical cluster analysis (cluster method: Furthest Neighbours; measure: Interval Pearson Correlation)

Stage	Cluster combined		Coefficients	Stage	cluster combined		Coefficients
	Cluster 1	Cluster 2			Cluster 1	Cluster 2	
1	72	113	1,000	61	95	97	,999
2	78	104	1,000	62	9	12	,999
3	70	78	1,000	63	7	24	,999
4	60	72	1,000	64	67	107	,999
5	36	84	1,000	65	1	4	,999
6	37	61	1,000	66	49	86	,999
7	39	102	1,000	67	37	114	,999
8	24	55	1,000	68	32	92	,999
9	32	87	1,000	69	33	81	,999
10	36	110	1,000	70	10	21	,999
11	28	42	1,000	71	38	77	,999
12	50	64	1,000	72	3	19	,999
13	49	100	1,000	73	88	91	,999
14	53	74	1,000	74	2	48	,998
15	22	52	1,000	75	15	27	,998
16	92	115	1,000	76	13	40	,998
17	80	119	1,000	77	43	79	,998
18	54	68	1,000	78	58	98	,998
19	34	85	1,000	79	31	46	,997
20	43	73	1,000	80	50	54	,997
21	35	70	1,000	81	7	35	,997
22	59	60	1,000	82	6	18	,997
23	39	93	1,000	83	26	44	,997
24	7	105	1,000	84	28	29	,997
25	8	111	1,000	85	11	20	,996
26	27	30	1,000	86	33	94	,996
27	88	103	1,000	87	65	66	,996
28	53	109	1,000	88	10	22	,996
29	32	62	1,000	89	17	47	,996
30	36	69	1,000	90	8	32	,995
31	24	118	1,000	91	13	45	,993
32	77	116	1,000	92	7	23	,993
33	4	16	1,000	93	88	95	,992
34	99	101	1,000	94	38	49	,990
35	26	41	1,000	95	43	67	,988
36	54	76	1,000	96	33	37	,984
37	56	57	1,000	97	15	28	,983
38	50	83	1,000	98	1	31	,982
39	92	96	1,000	99	58	99	,982
40	65	71	1,000	100	8	50	,981
41	2	5	1,000	101	7	10	,971
42	21	51	1,000	102	13	26	,967
43	8	120	1,000	103	2	6	,965
44	13	90	1,000	104	3	17	,963
45	94	106	1,000	105	43	65	,957
46	33	82	1,000	106	33	88	,941
47	22	25	1,000	107	9	11	,925
48	40	59	1,000	108	8	38	,899
49	50	117	1,000	109	14	15	,895
50	38	112	1,000	110	43	58	,829
51	32	63	1,000	111	1	2	,820
52	37	89	1,000	112	7	8	,754
53	7	53	1,000	113	13	14	,679
54	23	39	1,000	114	1	3	,418
55	10	34	1,000	115	7	33	,402
56	35	36	1,000	116	13	43	,046
57	65	108	1,000	117	7	9	-,127
58	8	80	1,000	118	1	13	-,999
59	27	56	1,000	119	1	7	-1,000
60	54	75	,999				

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