

Determining water management training needs through stakeholder consultation: Building users' capacity to manage their water demand

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Abstract

South Africa is a water-stressed country and the efficient management of the demand for and frugal use of water is a topic that can no longer be avoided. Community-based natural resource management is an alternative approach to government stewardship of natural resources, and in the instance of water management it is a particularly relevant and logical avenue to consider. The Constitution of the Republic of South Africa enshrines the right of the citizens of the country to a healthy environment and to a supply of safe water. These rights are attained through relevant legislation and government action. In this study, the residents of two rural villages in the Steelpoort River basin, South Africa, were interviewed and observed in relation to their water consumption needs and water use practices. The analysis of the research findings resulted in the design of a framework to guide the development of community-based educational programmes related to the management of water demand and water conservation in the Mangabane and Makgemeng communities in the Steelpoort River basin.

Keywords: water conservation, water-demand management, community development, community participation, water use patterns, rural settlements

Introduction

Access to safe water is a fundamental human need and a basic human right (World Health Organization, 2000). Nevertheless, globally 1.1 bn. people are without access to a safe water supply, and of this number 28% is found on the African continent. During the period 1990 to 2000, the global human population expanded by 15% to reach an estimated 6.06 bn. people. Africa's population growth is almost double the global average (World Health Organization, 2000). It has been predicted that by 2015, half the world's population could be facing serious water shortages and could also run out of safe drinking water due to the unprecedented rise in the population and the associated degradation of water sources (Postel, 2002; Barker, 1997; Department of Water Affairs and Forestry, 2001). It is reasonable to deduce that this situation cannot be sustained unless steps are instituted to ensure effective water management.

Moreover, it has recently been reported that rivers on every continent are drying up threatening severe water shortages as river basins are nature's way of collecting and making water available for human consumption (World Wide Fund, 2007). Once natural water sources have been harnessed and water is made available to communities through organised water provisioning systems, it still does not mean that all the water will reach its intended destination. In 2007 the South African Water Research Commission (WRC) completed a study on water loss/wastage in 62 municipalities in South Africa. The loss amounted to approximately 36% of the total amount of water supplied by the municipalities. This loss was of non-revenue

water, i.e. unbilled water and included both physical and commercial losses within the reticulation system (*The Water Wheel*, 2007; WRC, 2007).

South Africa, a water-stressed country, requires careful management of the demand for water, and its judicious use is a topic which can no longer be avoided. The Constitution of the Republic of South Africa 108 of 1996 (Sections 27 (1) b and 27 (2)) enshrines citizens' right of access to water. The Constitutional provisions pertaining to socioeconomic rights, of which water is one, require the state to take 'reasonable legislative and other measures within its available resources to achieve the progressive realisation of these rights (Act 108 of 1996 sections 26(2); 27(2); 29(2)). The National Water Act 36 of 1998 establishes the national government acting through the Minister of Water Affairs and Forestry to be the public trustee of the nation's water resources (South African Human Rights Commission, 2004). The aim of the Water Act is to protect, use, develop, manage and control the country's water resources in a sustainable and equitable manner for the benefit of all the people. Although the provision of water to citizens is a state responsibility, its prudent and efficient use is an individual concern and duty which is made clear by the National Water Act.

Gumbo et al. (2004) agree that one of the major constraints in managing water demand is the absence of well-structured education and training programmes suitably targeted to stakeholders in the water management chain. Furthermore, this training has to move beyond mere transfer of knowledge and skills to actual implementation. This article examines how water-demand management and water conservation training needs were determined in the Mangabane and Makgemeng communities in Steelpoort and were used to design a programme framework for the community's water users – those at the bottom of the water management hierarchy – to manage and conserve water in a sustainable way.

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Figure 1
Location of
Steelport

Context of the study

Steelport falls under the Greater Tubatse Municipality (GTM) which spans both the Limpopo and Mpumalanga Provinces. The town of Steelport is located in Mpumalanga Province south-west of Burgersfort (24°44' S 30° 11.5'E).

When the settlement was established in the late 1970s, the basic water distribution infrastructure was modern, in good condition and under good management. Unfortunately, water provisioning did not keep up with the increasing demand brought about by the considerable growth in the community. Currently, Steelport comprises 3 residential areas, namely Mangabane Village (established primarily for Eastern Chrome Mines employees), Top Village and Bottom Village. The 3 areas all receive their water-supply and water-borne sewage services from the GTM. An informal settlement, Makgemeng, has recently mushroomed close to Mangabane. GTM also provides water to this area by means of communal standpipes, but several residents collect water from the nearby river claiming that the municipal services are inadequate and unreliable. Many of the residents in Mangabane and Makgemeng are unemployed, yet people continue to flock to the villages in search of work on the mines. These increasing numbers place added strain on the already stressed water services and many feel there is no option but to collect and use polluted river water for cooking, washing and drinking purposes (Ardorino, 2002; Mathipa 2008; Tlhabanelo, 2004). The expansion of the informal settlement also impacts on the environment since land has to be cleared to allow for the construction of housing. This deforestation reduces soil cover, leads to erosion, and the consequent contamination of the water catchment area further exacerbates the problem of water quality. Probably the greatest threat to river water and groundwater quality in the settlement area is negligent sanitation management, careless human waste management and inexpert wastewater return flow practices.

A major feature of the Steelport River basin which is the source of water for the community is that its mean average

rainfall is relatively high but it is also very variable. The major water users in the area are commercial farmers who are supplied through 14 irrigation schemes; 2 towns with their associated industries; and up to 50 mines (Lévíte et al., 2003a). The activities of these users affect the quality of the water as concluded from a Department of Water Affairs and Forestry (DWAF) study in 1995. Both groundwater and surface water are increasingly being threatened by levels of contaminants from agriculture, mining, industry and residential sources. The same study concluded that although surface water could be made potable with nominal treatment by chlorination and filtration, groundwater was not fit to be used as potable water due to high contamination levels (DWAF, 1995 [6]).

The water quality in the Steelport basin decreases in the downstream direction and is worst in the central basin where most of the basin's inhabitants live. Water resources are heavily exploited in the basin and it is anticipated that a future increase in water use will lead to more problems vis-à-vis water quantity, water quality and possibly degradation of the environment (Lévíte et al., 2003b). The quality of contaminated raw water used in agriculture, industry and mining is generally managed through blending – i.e. dilution with cleaner water. It follows that the more contaminated the rivers, the more clean water is required for blending and dilution. In considering water conservation and water demand management, it is important for industry, mining and agriculture to manage return flows judiciously to minimise contamination and to maintain water quality within acceptable levels to minimise the contamination of the relatively cleaner water it comes into contact with. Increasingly, water quality is the greatest threat to water security, not scarcity *per se*, and precautions of this nature will ensure that less water needs to be diverted from freshwater sources for dilution purposes.

Research design

Water-demand management and water conservation practices encompass various factors such as consumer knowledge,

behaviour and attitudes towards water as a resource. The general aim of the study was to – based on research data acquired through field research among regular water users in Mangabane and Makgemeng – design and develop a contextually relevant educational programme framework for the Steelpoort community that would support the sustainable consumption and conservation of water and stimulate positive behaviour and attitudes towards the consumption and conservation of water.

In 2005 permission was granted by the management of Samancor for research to be conducted in the area. The researcher was referred to the Samancor Household Manager who organised a general meeting with community members regarding the water problems experienced in the community and suggestions to address the problem with the help of the researcher.

The field work was conducted between May 2006 and January 2008. Observations were made within the community and its surroundings between May and November 2006. The purpose of these observations was to determine how and for what purpose water was used in the Mangabane and Makgemeng residential areas in various contexts. Observations were also made to determine the general state of the environment particularly in relation to natural water sources and municipal water, as well as how this affects the lives of members of the community and the impact of the community on these resources. The outcomes of these observations were used to compile a questionnaire administered to water users in the community.

The questionnaire was used to collect data on water use needs, consumption patterns, behaviour and attitudes towards the environment in general and water in particular. Questions also required respondents to elaborate on measures currently being taken to support them in understanding the importance of water and managing their water needs and usage. This questionnaire was administered to some 300 members of various sectors of the community representing different socio-economic levels. Respondents were selected from local schools (teaching staff, non-teaching staff and learners) and from the community (housewives, heads of households, business owners, hostel dwellers and unemployed persons) between January and February 2007. In instances where the respondents were illiterate, the researcher assisted in completing the questionnaire.

Interviews were conducted with members of the community (youth and adults) in Mangabane and Makgemeng between March and May 2007 to verify and to further clarify data obtained through the questionnaires.

This study focused on the social aspect of the interconnecting system of water demand and consumption by directing its attention to the way residents in Mangabane and Makgemeng approach the utilisation of water. Generally the public's disposition with respect to demand and conservation practices is determined by surveys and rarely are these attitudes tested directly against manifested behaviour as was undertaken in this study. The analysis of the research findings contributed to the design of a framework to guide the development of community-based educational programmes related to the management of water demand and conservation in the community. Differences between stakeholder needs were noted and accommodated in the specific framework that was proposed in this article.

Findings

The data from the respondents and observation processes were collated. The section below provides a summary of the prime findings.

Understanding of environmental and water management concepts

Generally, respondents were unfamiliar with environmental concepts and those who did attempt to explain the concepts had only a superficial understanding. However, the majority of the respondents understood that water is a scarce resource: they understood the importance of the efficient use of water and its conservation, the importance of the resource, the irresponsibility of misusing water, and the importance of their involvement in protecting and using water sustainably. However, functional knowledge of strategies to manage the demand for and efficient use of water was lacking.

Water provisioning

Water demand is not being met adequately in the villages. Water scarcity is considered to be the consequence of variable rainfall, but some noted that it is predominantly due to inequitable water resource management by the authorities. Water supply to the Makgemeng area is particularly poor. Generally residents are obliged to rely on a single communal standpipe because the rest of the standpipes are frequently broken.

The scarcity of water restricts the ability of households to function optimally. Some residents – mainly those in Makgemeng – collect water from the local stream. This water is polluted and if it is not treated before use it can lead to disease. An inadequate or poorly provided for water supply furthermore compromises individuals' ability to establish basic food gardens. In poverty-stricken areas, subsistence agriculture could mean the difference between starvation and survival. Some residents do try to maintain gardens without using municipal water. These gardens are consequently entirely dependent on rainfall and are susceptible to drought.

Water use and problems

Water is used mainly for domestic purposes such as cooking, washing, personal hygiene, and, in a limited number of instances, for watering gardens.

The primary problems that were identified by water users were the inadequacy of the supply, poor water quality – primarily where residents were collecting water from the local stream – and the lack of maintenance of the water reticulation system. Water piracy was also a serious issue experienced in the community.

Several of the issues mentioned above were also included as activities and practices that compromise the efficient use of water.

Activities and practices that compromise the efficient use of water

A number of actions that prejudice the efficient use of water in the communities were identified by respondents and observed by the researcher. These activities and practices include:

- Inequity in water distribution between poor and rich communities. Only the rich (perceived as residents in the Top and Bottom Village residential areas) are supplied with an adequate supply of water and the poor (Mangabane and Makgemeng) have to make do with what is provided or access water from non-municipal sources.
- Establishment and extension of informal settlements, which places stress on existing water resources. The increased

water demand is further aggravated by the steady influx of people looking for jobs on local mines. These community members claim that their settlements are on mine property and that the mine is thus responsible for providing them with access to water.

- Negligent use of water by villagers with little regard for the conservation, maintenance or protection of water sources. Generally community members lack a sense of ownership, and there is a feeling of indifference about the state of the water sources/systems, with subsequent abuse and vandalism. This is evidenced by the lack of attention to leaking pipes and taps even when and if reported to the local authorities. Residents acknowledge that they rarely – if ever – attempted to repair leaks or dripping taps as it was perceived to be the responsibility of the authorities. It could be postulated that this situation has as its root cause the lack of clarity regarding the roles, responsibilities and expectations of the municipality and the community in relation to the provision, maintenance and use of water-reticulation services.
- Intermittent or irregular water supply due to illegal water connections; instances of discontinuation of the water supply; and depletion of the water stored in the dam as the water is also used to provide the local mining industry with its required supply of water. Residents believe the mining industry is given priority.
- Water piracy by thieves who steal municipal water from standpipes that have been provided to the community. Water is collected in 5 ℓ and 20 ℓ – or larger – containers and transported by small van to be sold to members of the community who do not have a readily available source of water.
- Generation of pollutants from local mining activities. As a result of the mining processes, chemicals, minerals and nutrient-rich substances are discharged into the freshwater sources. These pollutants (e.g. nitrification from blasting) have the potential to affect groundwater sources and they cannot be extracted by conventional sewage and wastewater processes. This pollution renders the available water sources worthless for further use by the village communities unless treated or used for limited non-potable purposes.
- Irrigation of gardens and plants at inappropriate times, e.g. during the heat of the day or when the wind is blowing.
- General water wastage as evidenced through:
 - Learners who play fun games with water and drink water from cupped hands
 - Educators' disregarding the fact that learners are wasting water at taps and in ablution facilities
 - Excessive watering of lawns during the heat of the day when evaporation is at its highest level and when the wind is blowing
 - Leaking and dripping taps/pipes or pumps; and taps being left running and not closed properly – evidenced in schools, residences, and outside areas
 - People washing cars using hosepipes
 - Cleaners using excessive amounts of water for cleaning floors
 - Housewives using excessive quantities of water for cleaning, rinsing clothes, cooking and flushing
 - Hosing down paved areas instead of sweeping the area
- Lack of weed control in cultivated areas such as food gardens. Weeds are not removed and they use water that could be used by vegetation which was planted intentionally.
- Indifference to taking care of the local wetland due to ignorance regarding its function in the ecosystem. If functional, the local wetland could assist in removing pollutants from

water in a natural and sustainable way and maintain the natural sponge that feeds local springs and watercourses.

- People who bathe and rinse clothes in the river/stream which leads to further contamination and pollution of the water.
- Community members who are unaware of the demands they place on water resources. People could not estimate the amount of water they use per day at homes/schools.
- Community members who are indifferent to conserving water supplies despite the fact that they acknowledge that conserving water is essential. There are no water policy or water usage regulations in the schools or in the community.
- The idea of establishing independent enviro-clubs at the schools to raise environmental awareness and support environmental concerns at local level has not been taken up, despite the fact that the Department of Education launched the National Environmental Education Project for the General Education and Training Band (NEEP-GET) to promote environmental awareness and the integration of environmental education across the curriculum in all schools on a national scale and the Department of Water Affairs and Forestry's and the Department of Environmental Affairs and Tourism's attempts to promote environmental awareness and conservation through programmes presented at the local schools.

The findings point to several shortcomings in the way residents make use of and take into consideration the water they use in their day-to-day lives. Conservation and management of water are learned skills which can be developed and advanced through appropriate educational programmes.

Discussion

Various researchers have sought to identify those variables that correlate with responsible environmental behaviour. Variables found to be significant were: knowledge of issues or problem awareness; knowledge of action strategies; locus of control; attitudes; personal moral norms (Bamberg and Moser, 2007); verbal commitment; and sense of responsibility. Findings have also revealed that much of the effect that attitudes and norms exert on intention and behaviour is associated with information. Information covers intermediary behaviour in which enduring value systems and pro-environmental behavioural patterns are reinforced (Trumbo and O'Keefe, 2005). Gregory and Di Leo (2003) indicate that environmental awareness; reasoned processes (i.e. personal involvement); unreasoned processes (e.g. habits); and situational factors (such as income) influence water consumption behaviour. Interestingly, research conducted by Corral-Verdugo et al. (2002) indicates that the more people perceive others as wasting water, the lower their own conservation motives and behaviour to preserve water.

Pro-environmental skills constitute the capacity to act in an environmentally responsible way, whereas environmental perceptions, beliefs, motives and values constitute environmental conservation requirements. Although skills are necessary elements for a competency, the requirements for conservation should also be present to shape such competency. Therefore, pro-environmental skills and requirements should correlate with each other (Corral-Verdugo et al., 2002).

Knowledge is commonly seen as a necessary precondition for a person's behaviour. Consistent with this, most educational interventions rely on knowledge transfer. However, for the most efficient informational strategies for education, it is essential to identify the types of knowledge that effectively promote

behaviour. In a study by Frick et al. (2004), 3 knowledge forms that affect conservation behaviour were identified: action-related knowledge, effectiveness knowledge and system knowledge. They concluded, however, that the latter is more remote from behaviour, exerting only a mediated influence on it by way of affecting the other 2 knowledge types.

In practice, water conservation and water-demand management relate to the efficient and effective use of water and to the minimisation of loss and wastage of water (DWAF, 2004). The basic elements that would need to be included in a conservation and water-demand management programme would include addressing the shortcomings in the knowledge, awareness and skills that were evidenced during the research.

Recommendations: Capacity-building framework to manage water demand and use in Mangabane and Makgemeng rural communities

Within the framework of prerequisites in developing pro-environmental behaviour as outlined above, it seems that any conservation-directed programme would need to focus on:

- Knowledge (understanding and being aware of the problem; understanding how the problem affects them and how they contribute towards or be part of the solution to the problem)
- Skills (action-related knowledge; reasoned and unreasoned practices/habits)
- Attitudes (personal commitment and verbalisation of intent; acceptance of obligation; internal locus of control; values and motives).

Taking into account the principles and objectives of community-based environmental education and training, the proposed ongoing training programme should be designed in such a way that it:

- Is developed in partnership with the community and stakeholders to ensure community buy-in and a sense of ownership
- Is relevant to the community and promotes civic responsibility and action-taking in line with national and local policy and requirements so as to ensure harmonisation of efforts
- Raises community awareness to enable the community to identify and prevent activities that contribute to the problem
- Leads to a greater awareness of the appropriate attitude and value system that the community should develop
- Promotes pro-environmental actions within the community so as to address, prevent and solve environmental issues
- Is implemented using learning approaches that are participatory and which develop critical thinking skills and lead to informed decision-making and action-taking.

The research findings indicated that all sectors of consumers – learners at schools and residents – need to be educated about the conservation and management of water. The aim of such initiatives would be to enable consumers to:

- Understand the importance of the resource and be knowledgeable about its conservation and management – to have knowledge that leads to informed decision-making
- Become involved in actively managing and conserving water – to acquire functional skills that facilitate taking suitable action
- Be aware of the scarcity of the resource, and to value, appreciate and protect the resource
- Cultivate appropriate attitudes.

More specifically, the framework for the development of an appropriate programme for these communities would need, in the knowledge category, to inform water users about:

- The water cycle, the source of water in their community, and the impact they could have on the water catchment system and the quality of the water – including knowledge about the role of wetlands in the ecological system
- The scarcity of water as a resource in South Africa and the need to conserve water and use it in a sustainable manner
- The costs incurred in providing and maintaining water systems in the communities
- Water-related problems, such as deteriorating water quality, that they face in their particular community and the causes of these problems
- Where water is being used on a daily basis and how to estimate the amount of water being used and wasted (i.e. how to conduct a household water audit) – before you can save water, you need to know where it is being used
- Practices that lead to water wastage in general and specifically in their community
- The reasons that water provisioning needs to be properly managed and the provisioning system maintained
- How they fit into the water management hierarchy and what their responsibilities are regarding the effective functioning of the water provision and use system.

Skills that need to be developed relate to:

- Strategies to conserve water in the home and use it in a responsible, sustainable way such as taking a shower instead of bathing, and using a bucket instead of a hose to wash the car
- Being able to maintain the water supply system by, for example, fixing dripping taps and leaking pipes: water reticulation system management skills should be demonstrated to the community who should be encouraged to contribute to the maintenance of the system
- Reducing, reusing and recycling water in the home
- Where feasible, installing technology aimed at water saving: devices such as dual flush systems for toilets and low-flow shower heads, or placing water bottles in the toilet cistern to reduce the amount of water used when flushing
- Setting up alternative water sources such as harvesting rain-water and using grey water for irrigation purposes
- Practising sustainable irrigation methods such as drip irrigation and mulching, and controlling weeds
- Water-wise gardening strategies by which crops/plants are chosen to suit the available water, soil and climatic conditions
- Protecting the local wetland and controlling alien species.

Attitudes supporting water conservation that need to be encouraged within the community include:

- Accepting responsibility for using water efficiently
- Appreciating the value of water as a life-giving resource
- Supporting conservation efforts
- Being mindful of how conservation efforts relate to contributing to the wellbeing and socioeconomic development of the community and each individual personally
- Taking pride in being part of the solution
- Celebrating the environment and commemorating environmental days.

Water conservation is but a basic component of integrated water resources management, and public awareness campaigns and education are basic tools that can be used to guarantee the participation and involvement of the public in water conservation

(WMO 1992; UN 1993a; b). Bearing in mind that the availability of water will tend to decrease in the years to come, all water users need to embed water conservation as an essential part of their day-to-day life (Khumalo, 2008).

Recommendations: Structures through which water demand and conservation programmes could be negotiated, developed and implemented

The research examined water-demand and consumption patterns at community level encompassing schools and residential areas and identified areas that need to be developed through educational means.

School level

The structures for developing environmental awareness, knowledge and skills at school level are provided for in the Revised National Curriculum Statement (RNCS) which applies to all schools and through the NEEP-GET project which developed curriculum material that focus on environment and environmental issues for all learning areas. The research indicated that there are serious gaps in learners' awareness and knowledge of environmental issues. It would appear that educators are not yet meeting the outcomes of learning area statements in the RNCS in which the principles and practices of respect for the environment as defined in the Constitution are manifested. Furthermore, local schools yet need to establish eco- or enviro-clubs that can work together with DWAF and DEAT to build environmental awareness, skills and pro-environmental behaviour.

The issue of building educator capacity in relation to environmental awareness and in particular to training in sustainable water consumption patterns could be taken up by educators and principals with the provincial Department of Education who have the capacity to provide in-service training and to support practicing educators. Both DWAF and DEAT have assisted schools in environmental projects, competitions and the commemoration of important enviro-days and the existing ties could be strengthened through the schools with the aid of the School Governing Bodies in conjunction with the school management teams. The importance of building capacity among the youth should not be underestimated and it is important for schools to recognise the necessity of providing learners with the opportunity to learn more about the environment and its natural resources and to cultivate pro-environmental behaviour and skills that can be carried through into adulthood.

Community level

The development of community capacity and responsibility in relation to water-demand management or water conservation requires community buy-in and commitment to the underlying principles and ideals (WIN-SA, 2008b). At present both Mangabane and Makgemeng have water committees to whom community members report water-related issues, but both committees appear to lack influence with the local municipal authorities and the Samancor Household Manager to whom they turn for advice and assistance since the research indicates persistent water-demand and conservation obstacles. It is necessary to establish why these committees lack impetus to strengthen the existing local community water committees by increasing their representation – preferably through asking members of the community to volunteer their involvement or alternatively, democratically electing members of the community to represent the community.

Equally important is the need to approach the local authority structures such as the municipality and Samancor's Household Manager for official recognition, acknowledgement of the committee's status, role and purpose and identification of reporting structures, processes and hierarchies. The National Water Act recognises the importance of community participation in water-demand management and conservation issues: a local water committee is one way of ensuring community participation and collaboration in addressing problems and constraints in water management and conservation.

It is essential that the established committee and the community it represents have a shared view regarding goals and objectives and the ways to achieve these. Anderson et al (2008) indicate that this type of approach increases the commitment of the committee to carry out the proposed ameliorating strategies and adaptations and increases the level of understanding between the community and the committee which ameliorates the potential for discord and lack of cooperation. Such a team approach enables community participation, but as Chikozho (2005) cautions, while forums for dialogue are often presented as fair and inclusive, when they are designed and controlled by those in positions of power, i.e. by local municipal authorities, they may become artificial – including certain community representatives, and excluding others. The committees need to be selected and sanctioned by the local community it will serve.

Water-demand management and conservation is depicted as a complex, socio-political process that must consider and reconcile a range of interests across sectors and users in the community. A very useful paper by Sherwill et al. (2007) on stakeholder interaction with local community management teams emphasises how important it is to build capacity within local community forums first to ensure that power imbalances are countered, that competencies are built to enable community representatives to recognise and utilise opportunities and to have the confidence to explore and implement strategies for managing water-demand and conservation issues in a participatory way. Capacity building is essential to ensure equitable participation.

Edmunds and Wollenburg (2001) caution that naive approaches to the constitution and functioning of community forums that are usually comprised of previously voiceless individuals can thwart the role and contribution that they could make in a number of respects:

- They can create artificial neutral spaces for negotiation that do not match the reality of interactions between those with different degrees of power and authority
- They can rush towards consensus, patching over real grievances
- They can lead to equal say by all stakeholders irrespective of the individual needs
- They can devalue or undermine traditional forms of negotiation
- They can disempower those with less effective communication skills.

Building on the preceding, it follows that community water committees need to be empowered to actively participate and play a consequential role in working within their communities and during stakeholder consultations (Chikozho, 2005). Community committees will need to establish partnerships with local structures to investigate and develop strategies to meaningfully manage water-demand and conservation issues. Stakeholders could be expected to act both in a collaborative and in a consultative capacity to strengthen the ability of the local water committee to encourage their communities to manage and conserve water

(WIN-SA, 2008c). Stakeholders who could usefully contribute to the process could be drawn from the local municipality, local water reticulation maintenance industries (including plumbing associations), the agricultural sector (specialising in subsistence agriculture), mining, the Department of Water Affairs and Forestry, Department of Environmental Affairs and Tourism, Department of Education, Department of Health, traditional leaders, and lecturers from regional higher educational institutions. These groups could all contribute towards and assist with building consumer awareness, skills training, developing consumer education programmes, increasing the understanding of rights and responsibilities towards water use and conservation and establishing regular channels of communication (WIN-SA, 2008a). The individuals who will represent these sectors need to be familiar with the context within which they will be participating to ensure that the authority and efficiency of the local committee which represents and works within the local community is respected and supported.

As an established and recognised forum, it would be the responsibility of the water committees to undertake community training and raising awareness in relation to water-demand and conservation issues. The identified knowledge, skills and attitudinal change training needs outlined above could be taken as a starting point for developing an on-going series of training programmes suited to the needs of the community. Public workshops, lectures and discussions could be designed and facilitated with the help of stakeholders under the direction of the water committee. The materials that would be developed for these interventions such as leaflets and posters would need to take into consideration that a large proportion of the community is illiterate and the visual element would need to predominate.

Water committees would be an essential component in developing local communities' awareness, knowledge and pro-environmental behaviour. Since water committee members are themselves members of the community and their representation on the committee is sanctioned by the community, they are in an ideal position to empower communities to address the water-demand and conservation issues before them within broader social, political, economic and environmental contexts in a sustainable way.

Conclusions

Community-based natural resource management is an alternative approach to government stewardship of natural resources (Ayoo, 2007) and calls individuals to responsibility and accountability. While the Constitution of the Republic of South Africa enshrines the right of citizens to access to safe water it can be argued that the right to water is regulated by the responsibility of each individual to whom this right refers to be held accountable for the resource being used in a judicious and frugal manner.

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