

Domestic water supply, competition for water resources and IWRM in Tanzania: a review and discussion paper

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Abstract

This paper reviews the historical development of domestic water supplies in Tanzania, the consequences of major policy shifts during the last seven decades, and some of the reasons for the failure of water supply systems. It considers the extent to which water resource issues are constraints in meeting the water supply needs of rural and urban populations, and the relevance of integrated water resources management to the WSS sector. Drawing upon case-study material from 2 major river basins, the Pangani and Rufiji, it reviews some of the practical steps being taken to implement IWRM principles in Tanzania.

1 Introduction

Tanzania's main water users are domestic consumers, industry, irrigated agriculture, fisheries and hydro-power generation. With a large and rapidly increasing population of 36 million¹, 80% live in rural areas, there are many and often conflicting pressures on the nation's water resources (URT, 1995a). Although there is a theoretical priority in water resource allocation and development for domestic supply, in reality considerably greater resources are put into irrigation (for food security) and hydropower (for energy security) schemes.

- It is estimated that not only do less than 50% of the whole population currently have access to clean and potable water, but that over the past three decades per capita water availability has actually diminished in urban areas (while improving in rural areas) (White, 1972; IIED, 2001).
- Agricultural policy is to promote self sufficiency and security in food and irrigated agriculture covers about 150,000 hectares, 80% of which are under traditional irrigation schemes.
- About 90% of electricity is generated by hydropower, mainly in the Pangani and Rufiji river basins.

Unfortunately, fragmented planning and management, a lack of integrated approaches and conflicting sectoral policies have contributed to increasing conflicts over water use (URT, 1995a). Conflicts² and inefficiencies make it imperative that available water resources are managed in a comprehensive manner, which takes into consideration the multiple users of water resources, land use impacts, pollution control, environment and public health issues. In line with international trends, this is the background against which Integrated Water Resources Management (IWRM)

¹ *Demographic Data and Estimates for the Countries and Regions of the World*, Population Reference Bureau, World Population Data Sheet, 2001.

² Dylan Hendrickson (1997) defines resource conflicts as "a relationship between two parties who have, or think they have, incompatible interests in the use of natural resources".

has come to the fore in Tanzania, as noted by a number of studies (e.g. URT 1995a & b).

IWRM promotes integration across sectors, applications, groups in society and time and is based upon the Dublin principles agreed in 1992. These recognise the finite and vulnerable nature of water resources, the need for more participatory approaches to development and management, and the economic value of water (Butterworth and Soussan, 2001; Visscher *et al.*, 1999). But what is the relevance of IWRM to the water supply and sanitation (WSS) sector?

It must be realised that there are arguments against the WSS sector getting more involved in water resources management. These include that:

- in many countries, although with notable exceptions where resources are severely stressed (such as groundwater in parts of India), the major constraints to developing rural water supplies continue to be a lack of appropriate investment and poor operation and maintenance of systems, rather than water resource constraints.
- IWRM is increasingly seen as being too complicated: as requiring that a whole list of individually challenging tasks are all completed before anything can be done. IWRM is seen as too long-term incapable of addressing real, current needs, whilst governments and water managers are faced with a whole host of immediate and tangible problems (such as domestic water supply and sanitation) for which practical solutions need to be found (Butterworth and Soussan, 2001).
- IWRM is viewed by some as the domain of basin managers (responsible for areas of thousands of square kilometres) who occupy themselves with managing surface water resources for irrigation (though the same water provides the main domestic supply for many urban centres), hydro-power, and the environment. While in many semi-arid areas (particularly in Africa) it is groundwater that is seen as the main resource for rural water supply (Foster *et al.*, 2000).

However, there are strong counter-arguments for closer involvement of the WSS sector in IWRM initiatives. These include:

- increasing awareness of competition for limited resources impacting upon domestic water supplies. India is perhaps the most severe example, where in many states falling groundwater levels due to over-abstraction for irrigation have led to the failure of traditional drinking water sources, and rural water supply agencies are unable to protect water resources.
- increasing pollution threats to water supplies, and,
- realisation that in practice the supremacy given to domestic water supplies in policy may amount to little when stakeholders are poorly represented in decision-making fora, such as river basin authorities or catchment management agencies.

This paper considers the role of WSS in IWRM in Tanzania, and aims to develop and explore these arguments. It is based on a review of relevant literature, as well as interviews carried out with regional and national actors (WHIRL, 2001). It also draws upon case-study material from 2 major river basins, the Pangani and Rufiji, where water resources management structures are being developed.

2 The study area

Tanzania has defined nine river basins for water resources administration (see Map.1) These basins include relatively small ones like the Ruvu/Wami, which flows into the Indian Ocean north of Dar es Salaam, supplying water for domestic and industrial uses; to large ones like the Rufiji basin, which covers eighteen percent of mainland Tanzania. Importantly, most of the existing hydropower plants are located in the lower part of river basins, while significant consumptive uses, mostly

smallholder and large-scale irrigation, are located upstream. Thus, there is considerable potential for flow requirements for power generation to conflict with upstream water uses, particularly in the Pangani and Rufiji basins. With rising water demands for irrigation, and urban and rural water supply, the potential for water use conflicts is increasing and is recognised as such.

2.1 The Pangani river basin

The Pangani river basin has a total area of 42,200 km² (including 2,320 km² in Kenya). The basin carries waters from Mt. Kilimanjaro and the Northern Highlands into the Indian Ocean. It contains a

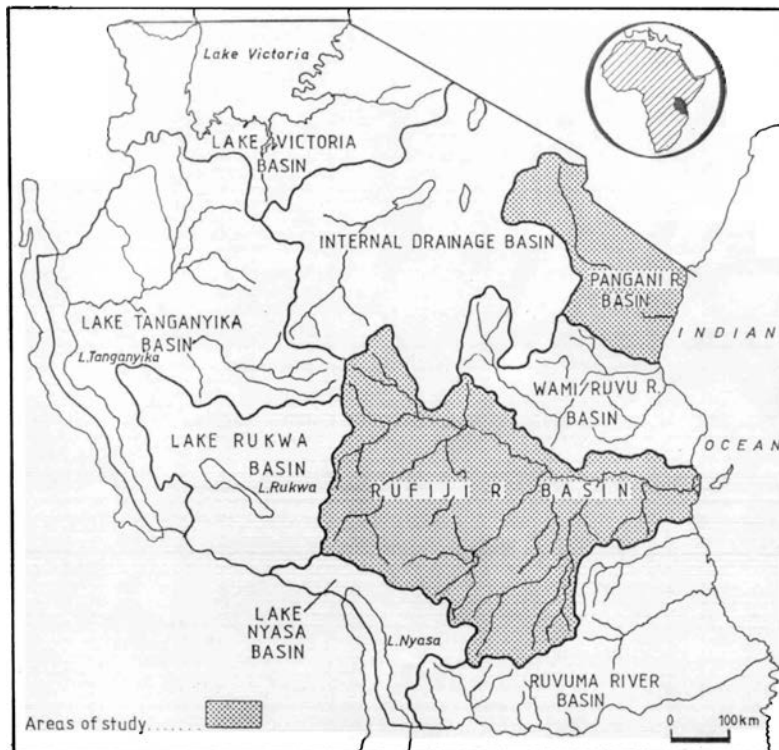


Figure 1. Map of Tanzania and the focus river basins, the Pangani and Rufiji.

big man-made lake called Nyumba ya Mungu, constructed for hydro-power generation. Since the 1930's power production in Tanzania had depended on the Pangani basin. At the moment there are 5 power stations in the basin, including Kikuletwa (not in operation), Nyumba ya Mungu (8 MW), Hale (21 MW), Old Pangani (15 MW) and New Pangani (66 MW). The basin is also within the Northern tourist area, which is one of the most visited areas in Tanzania, and contains the Arusha and Moshi industrial municipalities. A sizable area is also under traditional livestock keeping, which is also an important component in the overall water management in the basin.

According to a number of recent studies (e.g. Burra, (forthcoming) and World Bank (1997), water scarcity in the Pangani basin has resulted in a severe deficit in water

2.2 The Rufiji river basin

available for multiple uses. As a consequence, sectoral water demands are not being met, water levels in storage reservoirs are low, and competition for water between farmers and hydro-power generators and between groups of farmers has intensified.

The Rufiji basin covers an area of about 177,420 km², and drains the Southern Highlands into the Indian Ocean. Various water uses co-exist in the basin, including domestic and livestock water supply; irrigation (mainly in the Great Ruaha and Kilombero valleys); hydro-power generation; fishing and wildlife water supply; and transport. The basin comprises four major rivers: The Great Ruaha, Kilombero, Luwengu and Rufiji.

Several studies have highlighted water resource problems facing the Rufiji basin (e.g. Baur *et al* 2000; World Bank, 1997; and URT 1995c). Within the basin, water scarcity is acute in the Great Ruaha basin, and this has resulted in very low water levels at Mtera Reservoir, the main regulatory structure on the Rufiji River. Since 1988, when the Mtera Dam was commissioned, water levels have been declining and have not recovered. Low water levels have had negative impacts on hydro-power generation, resulting in load shedding and rationing of electricity nationwide. According to URT (1995c), a number of factors caused low water levels at Mtera, including drought, increased upstream abstractions for irrigation, and poor operation of the Mtera reservoir.

3 Historical pattern of water development in Tanzania

Although water resource issues are of increasing and long-term importance for water supply, until now the major challenges to the improvement of WSS in Tanzania have been ensuring adequate investment in appropriate infrastructure and ensuring operation and maintenance of systems.

Since colonial times Tanzania has taken several steps aimed at improving water supply and sanitation. This section highlights a number of these, starting with the pre-independence *cost-sharing* approach, the *free water* era and the present return to cost-sharing. Recent major events include the declaration of the 20 -Years Rural Water Supply Programme (1971-1991), the 1995 Water and Sanitation Sector Review, and the 1995 World Bank-inspired Rapid Water Resources Assessment.

3.1 Cost-sharing during the colonial period

Systematic water supply development in Tanzania began around 1930 when the colonial government started to use public funds for the development of water supplies to areas it considered to be of prime interest: townships, mission stations, large estates and trading centres. After construction these water supply schemes were managed on a self-supporting basis and all users were required to pay for the water they used. Active government involvement in the construction of rural water supply started in the 1950s, when local authorities were required to contribute 25% of the capital cost for water development projects, before the government would release the remaining 75%.

Earlier on, in 1945 the Department of Water Development was formed. Later, this department assumed irrigation development activities and became the Water Development and Irrigation Division (W.D.& I.D.). In its operations the W.D. & I.D. was concerned with three types of water supplies. The first was development of domestic water supplies for outstations and minor settlements whose construction was financed with central government funds. These supplies were owned by the central government and all users were required to pay a water rate that was calculated to recover capital, operation and maintenance costs. The second type of supply was constructed for Native Authorities (later known as Rural Local Authorities) to meet rural domestic and livestock needs. The Rural Local Authorities were required to pay a portion of the capital costs but operation and maintenance costs were solely the responsibility of the Local Authorities. People who collected water at the domestic point (kiosk) paid for water at a rate that was fixed by the respective Local Authority. The third type was known as prepayment water supplies. These supplies were constructed by W.D. & I.D. only after the client had prepaid the full capital costs of the water supplies. The client in this case could have been another government department, local authority, mission or even private estates (Warner, 1970).

Some local governments were able to collect enough money to pay for new water supplies and to operate and maintain the existing water supply installations within their jurisdictions while others could not. In particular, under the programme of cost sharing between the central government and Local Authorities, poor local governments could not make much progress in the development of rural water supplies.

3.2 The “free water” era

As noted by Mujwahuzi and Maganga (1998), the First Five-Year Plan for Economic and Social Development and the Arusha Declaration had a significant impact on the management of the rural water supply sector. For example, in 1965 the central government assumed all capital costs of water schemes development. From this date local authorities were left with the responsibility of meeting operational costs, while W.D.& I.D. retained the responsibility for repairs and maintenance provided the Local Authorities made an annual deposit of one percent of the total capital costs of all projects in their areas of jurisdiction (Warner, 1970). Towards the end of 1969 the central government decided to meet the costs of operation and maintenance of all rural water supply

projects. This step made the central government responsible for both capital and recurrent costs of all rural water supplies. From this time water became a free good for a rural dweller. In urban centres, on the other hand, consumers who obtained water from metered public kiosks or those with house connections continued to pay for water. It was later decided that consumers who obtain water from public kiosks should also not pay for water. Consequently, people who continued paying for water in the urban areas were those who had either house connection or a water connection in the yard (Warner, 1970).

Subsequently, a new Ministry of Water Development and Power was formed and charged with the responsibility of planning and developing water resources in the country. It was made responsible for urban and rural water supply development as well as energy development throughout the country. It was also at this time (1971) that the ruling Party, The Tanganyika African National Union (TANU) made a major policy decision committing the Government to an objective of providing water in all rural areas so that every rural inhabitant could have easy access to a source of adequate and potable water by 1991. In 1980 the government adopted the UN goals for the Water Decade, and mobilised external assistance to prepare regional water master plans and facilitate rapid construction of water supply schemes. Foreign donors responded favourably, and 12 of the country's 20 regions were assigned to various donors. Despite efforts by government and donors, the target of providing every rural dweller with adequate potable water within easy reach was not achieved by 1991. Little attention was given to the ownership of the systems, and local communities looked at the installations as the responsibility of the government.

Thus, the "free water for all" approach did not meet the intended targets. As noted in the World Bank *Water Sector Study* (1997), in many areas the rate of systems failures exceeded the rate of new construction, yielding lower coverage in the face of population increase despite the high capital cost of the investments. Over 90% of piped schemes ceased operating, mainly due to an inability to provide the required fuel for pumping and to keep the motors and pumps in operating condition. Also, most of the hand-pumps on shallow wells stopped operating for lack of timely maintenance or repair. It was estimated that the installed capacity of constructed schemes could serve only 48% of rural people (World Bank, 1997). Regarding sanitation, the situation was also gloomy. According to World Bank figures (World Bank, 1997), around 68% of rural dwellers obtain their water from traditional sources, which are contaminated and pose health risks, as evidenced by incidence of water borne diseases, such as diarrhoea and cholera. Between 1986 and 1992 38,600 people throughout the country contracted cholera, out of which 4,364 died.

3.3 Return to cost sharing

In 1986 a conference was organized to review the experiences of implementing the rural water supply programme; to identify and address the problems encountered during the preceding 20 years; and to provide a framework for the sustainable development of water resources to provide an adequate water supply in the country (URT, 1996). The conference started the process of formulating a New Water Policy, which was approved by Parliament in 1991 (URT, 1991). The policy put an end to the "free water era" by introducing the principles of cost sharing in rural areas and full cost recovery in urban areas. Among its features were that:

- In rural areas, village governments were given the responsibility of running their small water supply systems, while the management of larger systems remained the responsibility of regional and in some cases national authorities
- A limited role was assigned to the private sector, stipulating that it might be involved in the provision of water supply services in areas where the Government was not able to do so.

The discussion on the previous section has highlighted the problems of a supply-driven approach to WSS. These problems can be summarized into three general issues – insufficient coverage, high cost and poor utilization (Kleemeier, 1995). The supply-driven approach was based on three

major premises as to how donors and governments should supply water: (a) *Lowering the costs of implementation*, in order to spread coverage to as many people as possible, choosing the minimum level of service; (b) *Capacity building*: for government agencies to appraise, implement and manage water schemes and (c) *Subsidies*.

In contrast, the approach being promoted by the World Bank and other donors these days is a demand-driven approach, that is based on willingness to pay, and private sector involvement. A number of writers (e.g. Kleemeier, 1995) have expressed reservations about adopting these principles wholesale, because the demand-driven approach tends to be biased towards urban dwellers; also because of the poor capacity of the private sector.

4 Water resources issues and water supply

Although in general water resources issues are not the most pressing problems faced by the WSS sector, WHIRL (2001) identified a range of water resources issues that are increasingly impacting on water supplies. These include:

- *conflicts over water resources*, for example, around the mixed use of irrigation systems. The traditional furrow systems are important sources for domestic supply and animals, as well as for irrigation. While the amounts used for livestock and domestic use are small, this use has important implications for irrigation efficiency because the furrows must be kept flowing to meet a regular demand. Interestingly, professionals working at the 'basin' level in 'resource' management frequently reported no conflict between domestic and other uses (typically concentrating on that between irrigation and hydropower), while those looking at management at the 'local' level (i.e. within irrigation scheme command areas or involved in domestic supply) reported considerable competition and potential for conflict.
- *pollution risks*, for example, the water supply for Dar es Salaam (from the Morogoro mountains) is affected by siltation and chemical pollution associated with commercial agriculture (e.g. sisal processing) in the headwaters. In addition, there is a growing problem of contamination from mercury used in artisanal gold mining.
- *sanitation and development of groundwater in peri-urban and urban areas*. Currently most drinking water is from surface sources, but there is increasing use of groundwater in peri-urban and urban areas. In Dar es Salaam the lack of an efficient distribution network is leading to widespread private development of groundwater, with people resorting to deep and shallow wells, and in some cases selling the water from their wells. The rapid rise in the use of shallow wells is leading to an increased risk of groundwater contamination from pit latrines.

5 IWRM in Tanzania and the role of the WSS sector

In previous years, Tanzania's development plans, including the rural water supply programmes, emphasised supply issues in WSS and did not consider water resources management aspects as an integral component. However, as discussed above, water resources management is increasingly becoming an important issue, especially considering the fact that major water users like irrigated agriculture and hydropower generation continue to implement parallel development programmes independent of each other.

In 1995 the World Bank and Danida funded a Rapid Water Resources Assessment (URT, 1995a), as part of a comprehensive Water and Sanitation Sector Review. The assessment highlighted the increasing competition for water resources in the Rufiji and Pangani basins, noting the growing demand for water for irrigation and domestic use. In addition, the assessment noted that there was considerable conflict between upstream irrigators and downstream hydro-power generation. This section considers the problems faced in these two river basins, and initiatives underway to address them.

5.1 IWRM in the Pangani Basin

Within the Pangani basin there are a number of water use-related conflicts. There is a potential pollution problem due to the increase of population and development activities, coupled with decrease of river flows. Sewerage treatment facilities in Arusha and Moshi municipalities are not effective, resulting in pollution of some of the rivers draining into the basin. Deforestation and land degradation resulting from agricultural activities and uncontrolled livestock numbers have resulted in erosion and sedimentation in the catchment. Fishery activities are important in both Nyumba ya Mungu and Pangani river. However, uncontrolled practices have undermined the fishing industry. Another activity taking place in the basin is irrigation. However, the irrigation efficiency in all local furrows is very low, as the furrows are not properly maintained.

Under the provisions of the Water Utilisation (Control and Regulation) Act No. 42 of 1974, the Pangani Basin Water Office and the Pangani Basin Water Board were established in 1991 in order to manage properly the utilization of water resources by different users in the basin, i.e. to allocate water rights; legalise, grant, modify and control water abstractions; protect the existing water rights; monitor the quality of the water and to take to court defaulters of the Act. So far the Board has taken the following key decisions:

- To stop issuing further water rights until the water situation has improved.
- To start a programme of creating awareness, monitoring systems and creating data base for water resources.
- To introduce water user fees.
- To institute enforce bye-laws for source protection and other environmental issues.
- To develop a framework to managing the water resource at appropriate local level, by forming water users associations.
- To rehabilitate/construct 300 control gates.

A number of studies have indicated problems related to water scarcity in Pangani basin (e.g. World Bank, 1997, Burra, forthcoming). Upstream of Nyumba ya Mungu Dam, competition for water for irrigation has intensified, and it will worsen as populations and their water demands grow. The 2300 ha Lower Moshi Irrigation Scheme triggered rapid expansion of rice cultivation, and over 3000 additional hectares were put under cultivation, with the water being abstracted without water rights. As noted in World Bank (1997): "Increased upstream abstractions ... have resulted in acute water shortages in the Weru Weru River, and this has constrained further development of the Lower Moshi Irrigation Scheme in spite of existing water rights. Efforts to address the water rights issue have resulted in violent physical and verbal confrontation".

It is worth noting, in conclusion, that WSS needs have not been a major consideration in the Pangani basin.

5.2 IWRM in the Rufiji basin

Within the Rufiji basin, the greatest water use occurs in the Great Ruaha sub-basin, and already water shortages and water use conflicts are being experienced. Competition is mainly between downstream hydropower generation and upstream irrigation, due mainly to the design of hydropower schemes that did not take increasing irrigation demand into account. The situation is further aggravated by wastage of water as nearly all abstractions by smallholder irrigators are neither controlled, nor have incentives to use water efficiently.

In theory a person or community must have a water right to be allowed to take water from a pump or irrigation 'furrow'. However, in general smallholder irrigators don't hold water rights. Currently efforts are being made to persuade communities to accept them, but there is understandably resistance. Tanzania has a very long history (stretching back into pre-history) of indigenous

irrigation, and people do not understand why they must now pay for a permit for something their ancestors have always seen as a right.

In order to manage water resource in the Rufiji Basin, the Rufiji Basin Water Office was established after the inauguration of the Basin Water Board in 1993. The main objectives of the office are firstly, to act as principal executors of the water Utilisation Act No. 42 of 1974 and its subsequent amendments (namely of 1981, 1989 and 1997) on water allocation and water pollution; and to carry out research pertaining to water resources management in the Rufiji River Basin.

The following are among the immediate plans of the Office:

- To update and establish a water rights and water abstractions register as per existing situation.
- To establish and maintain a water resources data bank for water management purposes.
- To carry out awareness creation activities and education to raise the communities' social and political will and commitment towards water resources management problems.
- To involve stakeholders in water resources management issues particularly those related to equitable utilization, allocation and conservation of water resources.
- To establish Water Users Association or Water User Groups as legal institutions linking the Office with stakeholders in all matters related to the management of water resources.
- To continue with water pollution monitoring and control and water apportioning in the basin
- To continue with monitoring, regulation and control of water resources
- In collaboration with other institutions, to facilitate environmental and water resources management issues in the basin.

Just like in the Pangani basin, several studies have shown how water scarcity has resulted in conflicts between different groups in the Rufiji basin (e.g. Baur et al 2000, Maganga and Juma, 2000, World Bank, 1997). In the Usangu Plains, water scarcity has resulted in conflicts between farmers and pastoralists, especially during the dry season. The rising number of cattle has increased the requirement for water and forage during the dry season, while at the same time the expansion of areas under irrigation by farmers has reduced the land area available for grazing. Pastoralists in turn drive their cattle on cultivated fields to access water sources during the dry season, causing damage to crops and cultivated fields.

Farmers in both Pangani and Rufiji basins view basin management suspiciously, and consider it as an effort to safeguard TANESCO's³ interests in reserving sufficient water for hydropower (WORLD BANK, 1997). This negative perception is reinforced by the fact that TANESCO is providing most of the financial and material support for managing water resources in the two basins – creating an impression of inequitable use of water resources and inequitable sharing of benefits derived from using the basin water resources.

Again, domestic water issues are the focus of little consideration or concern, despite the large numbers of people without access to adequate supplies and the important contribution that domestic water makes to livelihoods (promoting economic activities as well as obvious health gains).

5.3 Current initiatives

As an outcome of the Rapid Water Resources Assessment, the World Bank agreed to fund two projects related to IWRM in the country: the River Basin Management (RBM) and Small Scale Irrigation Improvement (SSIP) projects which are in their 4th year of operation. The projects aim to strengthen government capacity to manage water resources using an integrated approach.

³ Tanzania Electric Company, the power generating company

Currently, there is a lack of co-ordination between these projects or with water supply and sanitation efforts such as the World Bank funded rural and small towns water supply and sanitation projects. However, the RBM project is reviewing water policy and institutional frameworks with an aim to improve this in the near future. In addition the projects are helping to rehabilitate the hydrometric networks in the two pilot basins to provide the necessary data to take management decisions.

6 Conclusions

This paper has reviewed the historical development of domestic water supplies in Tanzania, and attempted to account for some of the reasons for failure of water supply systems. It has considered the water resource constraints faced in meeting the water supply needs of rural and urban populations, and the implications for integrated water resources management in the country. The paper has highlighted the problems of supply-driven WSS. These problems include insufficient coverage, high cost and poor utilization.

The major challenges for the improvement of WSS in Tanzania continue to be to ensure adequate investment in appropriate infrastructure and ensuring operation and maintenance of water supply systems. Nonetheless the complete failure to date of so called IWRM projects to deal with WSS, or to try to bring together the different actors in water for food, water for people, and water for the environment is disappointing. This failure risks becoming yet one more factor in the already long list that lead to the failure of domestic water systems. It must be noted that:

- none of the water resources programmes in Tanzania deal explicitly with WSS needs, and the sector must become more actively involved in IWRM fora in order to ensure that its interests, and the livelihoods of the poor in particular, are promoted.
- there are important differences in perceptions between irrigation and water resource professionals on the one hand and WSS professionals on the other. The former tend not see the need to include the 'small' amounts of water needed for WSS in their considerations, as this has 'no impact' on the overall water resources situation and is covered by different departments. WSS professionals however recognise the impacts that other uses have, or have the potential to impact in the future, on the access of people to WSS.
- current water resource programmes take little account of groundwater – seen as the 'drinking resource' and the remit of others. Even where rural people use irrigation furrows for mixed use the attitude is often that they shouldn't, and that once the 'WSS people' have developed groundwater supplies, they would cease to do so.

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