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WATER ALLOCATION CAPACITY AND DROUGHT CONTIGENCY PLANNING IN RUWA

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Abstract

A study was carried out in Ruwa to assess the town's water allocation capacity and drought contingency measures. Structured questionnaires and interviews were used to collect data from 60 residents and selected key respondents. The results showed that Ruwa dormitory town did not have an independent water supply system and was linked to the City of Harare water supply system. Water storage facilities at Ruwa consisted of one, 2,000 m^3 reinforced concrete ground reservoir and the other, 1800m^3 braithwaithe tank on a 12m high stand. Some 16.6 % of the residents (n=60) had unprotected illegal wells dug on their stands to supplement water during needy times. Ruwa Local Board had a total of five boreholes to supplement the piped water system within the town. Water supply rate by the Board has been increasing from 8,671cubic metres in 1987 to a peak of 797,216 cubic metres in 1998. Drought contingency measures in the town included sinking of shallow wells, pressure reduction, restriction of use of hosepipes and water rationing. The Board had to increase the number of boreholes and install an independent water supply as drought contingency measures. It is recommended that the council should employ qualified personnel in the works department, who should put in place water consumption monitoring measures and improve on communication with residence in order to reduce confrontations.

Introduction

The rising concentration of global population in urban centres presents both challenges and opportunities for sustainable urban environments. Rapid urbanisation in the developing world makes it difficult for urban settlements to meet their water demand. The most rapid rates of urbanisation today are experienced in developing nations such as Zimbabwe due to high population growth rates. Although less than 40% of Africa's population is urban, the continent is the world's most rapidly urbanising region with an annual rate of 3.5% (UNEP, 2002). It is projected that 54% of the continent's population will be urban by 2030 (UNCHS, 2001).

Although urban places of the South are potentially centres of economic activity, political and cultural exchange, and enterprise development and innovation, they are experiencing rising poverty levels. This emanates from discriminatory urban policies and practices that perpetuate inequalities in access to opportunities and power. The most pertinent issues in such urban centres today that affect low income groups include problems associated with poor access to basic resources like water, sanitation, waste collection and health care; as well as vulnerability to endemic water and air-borne diseases, fire and natural hazards.

Although water may be within 100m it is often from a public standpipe and is shared by anything from 200 to 500 people (UNCHS, 2001). Furthermore, in most cities of the developing world water is available for only part of the day. Distance and time constraints limit the amount of water available, forcing many low income residents to draw water from unsafe surface sources, such as unprotected wells, and to purchase water from vendors (Hardoy et al., 2001). This situation is compounded by water loss through leakages, illegal connections and illegal practices.

In Africa, low economic growth rate, which today is compounded by the HIV/AIDS pandemic, provision of water and sanitation facilities, and other basic services, remains a major challenge for the continent's burgeoning urban centres. Structural adjustment programmes which require governments to devalue currencies, reduce public sector expenditure on social services, liberalise external trade and cut back on public sector employment strain urban municipal capacity while imposing severe burdens on the poorest and most vulnerable urban dwellers.

The allocation of water should be equitable amongst the various urban users to avoid such problems as disease outbreaks, reduced industrial development, poor sanitation and environmental deterioration. It is estimated that 80% of all sickness and disease globally are related to inadequate water and sanitation services (Elliot, 2006). Inadequacy of water substantially explains the endemic nature of many debilitating and preventable diseases in cities of the developing world. Over 250 million urban residents worldwide, have no access to safe piped water (UNCHS, 2001). Halving this figure by the year 2015 is target 10 of Millennium Development Goal 7 and will be a mammoth task.

Zimbabwe is part of the Southern African Development Community (SADC) region. Water in this region is an essential resource that is both limited in supply and fragile. It is a vulnerable resource in the region due to extreme climate variability, emerging climate change impacts and increasing degradation arising from unsustainable water and land use practices (Hirji, et al 2002). Some parts of this region are dry and are now frequently hit by periodic droughts. Zimbabwe, for example, has experienced more frequent drought in recent years, with the worst recorded occurring in 1981-82 and 1991-92 (Ngara and Rukobo, 1992). Such reduced rainfall amounts have caused a reduction in the amount of water in the major reservoirs that supply major cities. Effective water management in Southern Africa will therefore be a prerequisite for poverty alleviation, improved human health, overall economic development and environmental sustainability.

Much of Southern Africa is partially arid or semi-arid. Therefore, both precipitation and runoff patterns in the region are seasonal. Rainfall is unreliable and drought is endemic to the region, with annual precipitation ranging from 10mm in the Namib Desert to 2800mm in parts of Malawi (Hirji et al., 2002). These trends are a result of climate variability in the region, which influences the temporal and spatial distribution of rainfall and water resources. Climate variability in the region is increasingly influenced by the El Nino/Southern Oscillation (ENSO) phenomenon, which is related to periodic warming of the tropical waters of the Pacific Ocean and resultant changes in atmospheric circulation (Hulme, 1996).

In Zimbabwe, rainfall generally increases from south to north and with increasing altitude. The southeastern low-veld and the Kariba eastern basin in the western side of the country receive less than 400 mm/year, while the eastern highlands of the country receive around 2,000 mm/year. Central watershed areas receive about 1,000 mm/year (Gumbo, 2006).

Mean annual temperature is 15^0C at 1,800 m, 18^0C at about 1,400 m, and 23 ^{0}C at 450 m above sea level. The highest temperatures are experienced in October and November, but when a prolonged dry spell occurs, very high temperatures are recorded in December and January (45^0C has been recorded in low-lying areas). The temperatures are also influenced by soil type. Lowest temperatures are found in very sandy soils that cool more rapidly than clay soils. The areas in the low veld that experience the highest temperatures and the western parts of the country experience high evaporation losses from the water bodies. Evaporation measurements have to be constantly monitored by local authorities and, in turn, use the data in water allocation and drought contingency planning.

The six major catchments in the country, namely the Save, Manyame, Gwayi, Shangaani, Runde and Mzingwane, are lifelines and sources of water for most rural and urban settlements in

Zimbabwe. The fact that some of the rivers in these catchments dry up during the dry season makes it imperative that both rural and urban settlements, especially post-war small towns such as Ruwa, have supplementary water sources and drought contingency measures in place in order to avoid serious water shortages during drought years. As the talk about climate change and global warming becomes louder, the international community as a whole is fast moving towards putting measures in place that reduce its impact on water availability and livelihoods (The Herald, 2007).

Both planners and policy makers have not seriously tackled the provision of water in post 1980 urban settlements. In many instances, settlements were allowed to sprout without the provision of adequate water. The provision of houses to urban dwellers has not been matched with an increase in the number of water reservoirs (Tevera, 2004; Chenje, 1996; Matarira, 1990; Head 1999). Most of the major sources of water in the main cities of Zimbabwe were built during colonial times when the population was far less than half the current number. Mutare, for example, had a population of 69,621 in 1982, but by 2002 the city's population had more than doubled to 170,106 (CSO, 2004). Population data for other major urban centres in Zimbabwe are shown in Table 1.

Table 1. Resident population in major urban areas of Zimbabwe in 1982, 1992 and 2002.

	Population		
City/Town Name	**1982-08-18**	**1992-08-18**	**2002-08-18**
Bindura	18,243	21,167	33,630
Bulawayo	413,814	621,742	676,787
Chegutu	19,606	30,191	42,959
Chinhoyi	24,322	43,054	56,794
Chipinge	6,077	11,582	17,458
Chiredzi	10,257	21,116	26,129
Chitungwiza	172,556	274,912	321,782
Gwanda	4,874	10,565	13,423
Gweru	78,918	128,037	141,260
Harare	656,011	1,189,103	1,444,534
Hwange	39,036	42,581	35,025

Kadoma	44,613	67,750	76,173
Karoi	8,748	14,763	22,293
Kwekwe	47,607	75,425	93,072
Marondera	19,971	39,384	52,283
Masvingo	30,523	51,743	69,993
Mutare	69,621	131,367	170,106
Redcliff	22,109	29,959	32,346
Rusape	*8,216*	*13,920*	25,054
Ruwa	...	...	22,038
Shurugwi	13,255	16,138	16,866
Victoria Falls	8,126	16,826	31,375
Zvishavane	26,597	32,984	35,229

Source: CSO, 2004.

The estimated population of Zimbabwe to date is 13 million and the population growth rate is 0.6% per annum for the 2002-2005 period (World Bank, 2007). The country's population growth rate represents a sharp decline from a high of 2.6% per annum in the early 1990s, mainly due to the negative impacts of the HIV/AIDS pandemic. The fertility rate is six children per family, causing a projected doubling of population every 20 years, without HIV/AIDS. Rapid population growth puts intense strain on natural resources. Therefore, planning for adequate water supply to satisfy the demands of all urban consumers, as well as planning for drought mitigatory measures, has become the core business of most municipalities of the world. In this research, water allocation capacity and drought contingency measures for Ruwa Town, a dormitory town almost 30 km east of Harare was investigated. The current population in the dormitory town stands at 22,000 (CSO (2004).

The research was meant to measure the extent to which the Local Authority could promote development in Ruwa without necessarily straining the existing water source and water delivery infrastructure. The study also sought to measure the extent to which Ruwa Local Board was prepared to tackle the impacts of droughts. The study made an inventory and took stock of all the drought contingency measures already in place as well as assessing their adequacy.

Methodology

Two sets of questionnaires were used. The first was distributed to randomly selected heads of households. The second set of questionnaires was distributed to targeted key personnel of the Ruwa Local Board. Both sets of questionnaires were physically administered and collected immediately after having been completed. A total of 60 questionnaires were distributed.

Face-to-face interviews were conducted with the sixty respondents. Fifty-five of them were local residents whilst five were from the Ruwa Local Board. A total of ten (10) preset questions were used to interview all of the respondents. With the local residents, random sampling of households was done within Ruwa and all those sampled were then interviewed by targeting of heads of households. This method ensured a wide coverage and saved time. However, responses tended to be uniform in all of the randomly selected households.

The random sampling method was used to pick up individual subjects within each category of participants. The study made use of the historical survey method in which a retrospective analysis of water allocation capacity and drought contingency measures for Ruwa was made. This was done through an analysis of secondary sources on the subject prior to going into the field. Such sources of information included textbooks, journals, manuals, and articles as well as approved master plan documents and technical reports on the subject.

The questionnaire consisted of both open and closed questions that allowed respondents to timorously complete the questions and give their independent opinion on the subject under study. Those that were randomly sampled included industrialists, local residents and the Council

Managers. This facilitated consistency in questioning as the repetition of questions posed to all respondents enabled the researcher to ask all respondents exactly the same questions throughout.

Results and Discussions

Ruwa Local Board did not have an independent water supply. Ruwa is linked to the City of Harare water supply via the Letombo – Ventersburg and the Letombo – Donnybrook reservoir systems. The Letombo – Ventersburg /Donnybrook link has a maximum supply capacity of approximately $1500m^3$/day. On the other hand, the Ventersburg off take to Ruwa Reservoir was designed to supply $1900m^3$/day on average and $3100m^3$/day when operating at peak capacity. Water storage facilities at Ruwa consisted of a $2000m^3$ reinforced concrete ground reservoir and a $1800m^3$ braithwaithe tank on 12m high stands/ground. However, water systems in Harare are characterised by problems, which include ageing equipment and machinery, excessive load, pump breakdowns, and poor operation and maintenance (UNOCHA, 2005).

Some 16.7 % of the residents had illegal unprotected wells dug on their stands to supplement water during needy times. Similar scenarios have been reported in the past in other major cities of Zimbabwe (UN, 2005). The existence of these unauthorized wells on most residential properties seems to be a pointer to the fact that water was a problem in the area and municipal water supply was not sufficient to meet demand, hence the need to supplement it by use of wells. However, such unprotected wells can be a health hazard to the residents, yet their human health requirements cannot be met without an adequate and safe water supply coupled with basic sanitation services. The unfortunate situation has been compounded by recurrent drought, which leaves many boreholes, family wells, and other sources dry. This in turn has left residents with no option but to get water from whatever source available. The Town Council should stop the digging of illegal wells and increase the number of protected safe boreholes for the residents.

Water supply rate by the Board was 8,671 cubic meters in 1987, which rose to 281,725 cubic meters by 1992, fell to zero between 1993 and 1994 due to a severe drought, and then hit a peak of 797,216 cubic meters in 1998. Although the water supply's historic data only spanned the period from 1987 to 1998, it clearly confirmed the argument that the demand for water in Ruwa was ever increasing and threatened the potential for development. The projected water demand at full development for the whole of Ruwa is approximately 30 Ml/ day. Based on the existing situation, that Ruwa Local Board was buying water from the City of Harare, it would be a dream come true to achieve the projected water demand, but the lack of water explains beyond a doubt why most industries were "dry" industries that were mostly engaged in non-wet activities because of water shortages. It also explains why so many residential developments had been shelved, resulting in acute residential accommodation shortages.

Sourcing of water from the City of Harare to supply Ruwa was a major challenge that also culminated in a chain of other numerous challenges. The challenges included inadequate water supply, numerous water cuts and low water pressure during droughts, all a result of inconsistent water allocation to Ruwa. Due to the prevailing economic challenges, Ruwa Local Board was finding it very difficult to timorously pay its hefty water bill to Harare City Council, forcing the City of Harare to cut water supply to Ruwa. Such water allocation challenges could be attributed to failure to implement the planned short- and long-term water master plans as a result of insufficient budgetary provisions.

A population boom in the town also caused an increased demand for water, making it difficult to satisfy the water requirements. The massive population boom was blamed on massive rural-urban migration, which also resulted in massive urbanisation, which in turn resulted in increased water demand.

Ruwa residents blamed lack of qualified personnel within Council for some of their water problems. The lack of qualified personnel was attributed to the numerous staff resignations due to poor working conditions within Council. This problem of brain drain is, however, a common one in almost all institutions in Zimbabwe due to extremely high levels of dissatisfaction with the cost of living, taxation, availability of goods, and salaries and declining economic performance (Crush, 2001).

The Council mostly relied on the use of boreholes as a way of supplementing water allocation, especially during the dry season, as well as in cases where there are water cuts due to **a** mechanical breakdown in the supply system or cases where water is cut due to non-payment of water bills to the City of Harare. In fact the Ruwa Local Board had a total of five boreholes to supplement the piped water allocation within Ruwa. All of them, except for one that is electrically powered, were manually operated. Out of five boreholes, only two were functional and three were within one high-density area. The sinking of additional boreholes became important as the existing ones could not suffice for the estimated 22,000 residents in the town. Other water crisis management strategies such as pressure reduction to consumers, restrictions on the use of hosepipes for watering gardens as well as scheduled water rationing in all areas were also used (Table 2).

Table 2. Drought contingency measures and their effectiveness

No.	**Drought contingency measure**	**Popularity rank**
1	Sinking of boreholes	5
2	Sinking of shallow wells	4
3	Pressure reduction	3
4	Restriction on use of hosepipes	2
5	Water rationing	1

To complement some of the water crisis management strategies, the Council used strong communication links with its water consumers. Fliers, posters, print and electronic media were used to communicate information on water rationing, pressure reduction as well as restrictions on the use of hosepipes.

The attitudes of all the respondents to the persistent water woes ranged from frustration and anger, hopelessness, unwillingness to pay water bills, as well as an intention to move out of Ruwa to other towns (Table 3).

Table 3. Perception of respondents.

Attitude	**Reasons given**	**Period in Ruwa (Years)**	**No. of respondents in the category**
Frustration and Anger	inadequate water	2 – 5 years	8
Hopelessness	water cuts and rationing	5 – 10 years	13
Unwillingness to pay water bills	inadequate water water cuts and rationing dirty and smelly water	Above 10 years	29
Desire to move out of Ruwa	All of the above reasons	Above 10 years	10
Total respondents			**60**

The attitude of all the respondents as shown on the table seems to suggest that the water allocation capacity of Ruwa and its drought contingency measures falls short of the consumer expectations, as no positive response were noted.

Conclusions and Recommendations

Ruwa town does not have an independent water supply system and there are no concrete plans to match water allocation with increasing population. In addition, the presence of illegal boreholes and wells in the residential area could be a hazard to the residence. The Council could sink more boreholes as a drought contingency measure, but with proper safety measures to ensure that they do not pose a hazard to the residence. The residents' ratings of the Council's ability to provide water were not pleasing.

The town council should formulate a water master plan through public-private investment programmes. This should incorporate the establishment of an independent source of water for the population and increase water allocation capacity in line with increasing population. The town council should also make a draft of a drought contingency plan the consultation and active participation of stakeholders and relevant specialists. Such a document should set threshold reservoir levels beyond which contingency measures can be taken. This is necessary to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection. In addition, such measures should protect and preserve public health, welfare, safety and minimise the adverse impacts of water supply shortage or other water supply emergency conditions.

The town council should also periodically provide the public with information about the plan, including information about the conditions under which each stage of the plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information can be provided through the press (local news papers and radio station) and by publication at town hall or any other central place.

The town has to monitor water supply and/or demand conditions on a daily basis and should determine when conditions warrant initiation or termination of each stage of the plan. Public notification of the initiation or termination of drought response stages should be by publication in the local newspapers, announcements on local radio stations, and publication at town hall.

There should be well-stipulated conditions for initiation when reservoirs have gone below certain threshold levels. Residents could be requested to voluntarily conserve water and reduce non-essential use of water. Such initiation criteria could include a weather and climate monitoring system that records temperature and rainfall data and sets the initiation process accordingly, if records are showing deviation from long-term averages. Finally, a monitoring system should be put in place to check on adherence to the plan.

The Ruwa Board should also facilitate Council-community partnerships, which promote adoption of better water harvesting techniques like household roof and runoff water collection in drums and tanks. Apart from water harvesting measures, the Council could minimise wastage through the use of low-flush or no flush toilets and toilet tank displacement devices; using low-flow shower heads and pressure reduction devices, as well as dual water systems to facilitate the use of grey water on vegetable and ornamental gardens. It should also establish and promote a sustainable, full cost-recovery water pricing system, which would discourage misuse of water. Perhaps the overall objective of the Town Board should be to promote and enhance the protection, conservation and sustainable utilisation of water in the town, based on community needs and priorities.

References

Chenje, M (1996) "**Water in Southern Africa**, SADC / IUCN, SARDC, Maseru / Harare 1996"

CSO (2004) **Population Census 2002**, Central Statistical Office, Harare

Crush, J. 2001. The New Brain Drain from Zimbabwe. Southern African Migration Project. **Migration Policy Series No. 29.** http://www.queensu.ca/samp/samp resources/samp publications/policyseries/policy29.htm

Elliot, J. (2006) **Introduction to Sustainable Development**, Routledge, Taylor and Francis, London

Gumbo, D. (2006). Zimbabwe Country Case Study on Domestic Policy Frameworks for Adaptation in the Water Sector. Background information for presentation to be given by Davison Gumbo at the **Annex I Expert Group Seminar in Conjunction with the OECD Global Forum on Sustainable Development** on 28 March, 2006

Hardoy, J. E., Mitlin, D. and Satterthwaite, D. (2001) **Environmental Problems in an Urbanising World**. Earthscan, London.

Hirji, R., Johnson, P., Maro, P. and Matiza-Chiuta, T. (eds) (2002) Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa, SADC, World Bank, Sida, IUCN and SARDC, Harare

Hulme, M. (ed) (1996) **Climate Change and Southern Africa**, UEA, Norwich

Matarira, C. H (990) - "Drought over Zimbabwe in a Regional and Global context. **International Journal of climatic change.** Volume 10".

Ngara T and. Rukobo, A 1992. **Environmental Impacts of the 1991-92 Drought in Zimbabwe. An Extreme Event**. Radix Consultant. Pvt. Ltd. Harare

Head, K. (1999) "Planning with nature and managing drought in Mozambique. **The Land: Journal of the International Land Use Society**, Volume 3 Number 2,

Tevera, D. S (2004) - "**Regional Geography of Southern Africa, Module GED 402**, Zimbabwe Open University"

The Herald, 14 September 2007. Zimpapers, Harare.

Unknown (2004) **Zimbabwe - City Population - Cities, Towns & Provinces**. http://www.citypopulation.de/Zimbabwe.html

United Nations, 18 July 2005, Report of the Fact-Finding Mission to Zimbabwe to assess the Scope and Impact of Operation Murambatsvina

UNEP (2002) **Africa Environmental Outlook**, United Nations Environment Programme, Nairobi

UN Office for the Coordination of Humanitarian Affairs (UN OCHA), 30 November 2005, UN Consolidated Appeal for Zimbabwe 2006

UNCHS (2001) **Cities in A Globalising World: Global Report on Human Settlements, 2001**, UNCHS (HABITAT), Earthscan, London

World Bank (2007) **World Development Report 2007**, World Bank, Washington D.C.