DEDICATION

For my mentor **Tony Allan**, who has challenged me to think abstractly about water as it flows through the respective Watersheds and Problemsheds around the entire planet.

For my colleague **Leif Ohlsson**, who enabled me to make the necessary paradigm shift to a Second-Order Resource focus, and thereby to start unpacking the intriguing nuances of Social Adaptive Capacity and its relationship to Natural Resource Reconstruction, and consequently to Sustainable Development.

For my colleague **Peter Ashton**, whose scientific integrity I aspire to emulate.

For **Thomas Homer-Dixon**, who is frankly in a class of his own. I respect that.

For the Research Team comprising **John Khupe, Chitaku Mucheleng'anga, Maoto Khudu, Margaret Ng'oma, Walter Moilwa, Esther Mbao, Baosentse Mangope, William Musonda, Phone Itshekeng** and **Liswaniso Mukubesa,** whose unflagging energies enabled this data to be collected in the first place, often under difficult conditions and in remote settings, some of which are not even dots on the map. They inspired me to work just a little harder to solve the many problems that are associated with this type of empirical research. Their spirit makes me truly proud to be African.

For the **Respondents**, many of who are the poorest of the poor, who placed their trust in the Research Team in the belief that we could make a difference to their daily lives.

For **David Brooks and his team (Sarah Wolf & Tilly Shames),** whose constructive criticism has had a significant impact on refining some of the core concepts being used.

For **Ruth Beukman** and **Tertia Uitenweerde**, whose enthusiastic and professional management of Phase II of the IUCN Southern African Water Demand Management Project is stimulating research into possible policy changes throughout the region, thereby making a real difference to the debate on Sustainable Development.

For the **Sceptics**, who spent a lot of energy explaining why the airplane would never be able to take off in the first place, sometimes even rolling boulders onto the runway and occasionally stoning the pilot, to make sure their predictions were correct. My wish is that they may one day experience the thrill of solo flight as well.

For **Melissa Turton**, who dreams of one day being a scientist, whose attention to detail and amazing powers of concentration helped me to process the 124 894 separate bits of information that form the database of this project. May you never be afraid to dream about ever expanding horizons of new knowledge and the challenge of science.

For the **Water Research Fund for Southern Africa** (WARFSA), whose contribution to the development of new knowledge in the Southern African water sector enabled this research to be done in the first place. I thank the Board for having faith in me.

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EXECUTIVE SUMMARY

This study has resulted in the following general findings:

- Botswana can be described as being an example of a country whose economic development and water resource management strategy complies with the generic concept "Structurally Induced Relative Water Abundance" (SIRWA). This means that water scarcity is not impacting negatively on economic growth, social development and political stability. The water management institutions in Botswana are generally well developed and staffed with technically competent people.

- Zambia can best be described as being an example of a country whose economic development and water resource management strategy complies with the generic concept "Structurally Induced Relative Water Scarcity" (SIRWS). This means that the relative water abundance found in Zambia actually manifests as acute localized scarcities, largely as the result of inadequate institutional development in the water sector. Second-order resource availability tends to determine the final outcome.

- The level of communication between water "Suppliers" and water "Users" in both countries is bad, but considerably worse in Zambia than in Botswana. This means that formal water conservation strategies are not being communicated with the public, so consequently there is limited popular support for such strategies.

- Whereas the Suppliers polled generally felt that there was adequate community consultation regarding matters that affected Users directly, the Users did not support this view. In fact a general trend from both countries was that Users felt that the level of consultation was low and needed to be improved. The larger sample size for the Users cohort makes that specific finding more statistically relevant.

- A communication strategy is being recommended for both countries. The research has shown that the "Users" are supportive of such a strategy, and in some areas even feel that the inability of government to develop and communicate such strategies means that government is failing in one of its core functions.

- The recommended communications strategy should comprise an education component as well as a general information component. Both "Suppliers" and "Users" should be targeted for this campaign, as the research indicates a wide gulf between the perceptions of the two groups.

- There is generally a high level of support in the research area for payment of water services. There is also wide support for metering and billing for water consumption. In some less developed areas, there are indications that a water meter may even be a status symbol. Significantly, there is a high correlation between metering, billing and the actual payment of accounts, suggesting that sustainable cash flow is dependent on both metering and billing.

- There is widespread support for a water conservation strategy, if this were to be made known to the general public. This is based on the deeply-held belief that water is a scarce resource in the study area. The core components of such a conservation strategy should be related to both payment of water, and the further education of water users about a range of issues such as tariff structure, basic maintenance, the meaning of sustainability and health-related matters.

- Women should be particularly targeted for communication purposes as they have the closest and most intimate contact with the resource. The research has also shown that women generally educate their children, who are also used for fetching water where water infrastructure is poorly developed.

- The research has shown that there is no truth to the often-quoted belief that water is a free gift from God, at least at the eight study sites. This translates into a low level of fatalism, which is healthy from a water management perspective because it means that people are prepared to pay for water service delivery.

- There is a high willingness to pay (WTP), particularly in areas where water infrastructure is less developed. In this regard, an inverse relationship seems to exist between the relative ease of access and WTP, with the areas reflecting a low WTP being located where water reticulation infrastructure is the most developed.

- There is an inverse relationship between "institutional adaptive capacity" (IAC) and "social adaptive capacity" (SAC). This has been found to lie at the very core of the institutional development dilemma in the Southern Africa water sector, at least within the study areas. In this regard, a higher level of IAC translates into robust water management institutions that are more adaptive to the needs of the consuming public. High levels of IAC also manifest as institutional learning, which is at the very heart of sustainable institutional development in the Southern African water sector. Where IAC is lowest (such as in Zambia) there is a higher degree of SAC found at the level of the individual in society. This is manifest as a wider range of individual survival strategies, largely because the water supply is irregular and unreliable under these conditions. This also results in a larger number of informal water institutions. This translates on the ground into a lower perception of service reliability, a lower level of metering and billing, a higher WTP and a higher awareness of the cost of water. In some places where water service is really a problem, there has been evidence uncovered of increasing levels of discontentment, and the possibility of direct political action cannot be ruled out. There is a correlation between political discontentment, poor service delivery and an erosion of government legitimacy.

- Informal water institutions tend to have a higher level of natural legitimacy, because the decision-making processes are more transparent and the key gate-keeping elites are closest to their respective constituencies, and therefore directly accountable to them. Formal institutions tend to have a lower level of natural legitimacy, because they are furthest from the individual and closest to the level of the state, so they consequently need a higher level of communication in order to generate legitimacy

and get consumer "buy-in" for various policies. It is this communication shortfall that is widely lacking across the entire study area.

- There is no evidence of natural resource reconstruction in either Botswana or Zambia at present. Botswana is the most likely to reach such a condition of sustainable development once it resolves the basic communications bottleneck that has been found to exist, because there is a higher level of institutional development in that country.

- Specific problems have been found at the different study sites. These range from policy-related problems, to infrastructure-related problems and corruption among water officials. Some of these problems are serious, with a high possibility of direct political action if left unaddressed. The serious problems are usually highly localized and therefore should be easier to manage with the insight generated from this project. These have been flagged for management consideration and possible action. The reader is referred to the Final Report, as well as the Country Reports (Appendices "E1" & "E2") for more details.

- Water harvesting has been found to exist at some research sites. This seems to improve household food security, suggesting that a water harvesting programme may be a viable development option, particularly in parts of Zambia where precipitation levels are somewhat higher and more reliable than in Botswana.

- Some naturally occurring adaptive strategies in Zambia include the use of a car tyre to protect a shallow well from contamination. This suggests that a development programme could utilize this culturally acceptable and low cost approach to upgrade service levels, possibly by training women masons who can then go on to use those skills elsewhere in their respective communities.

- From a purely research perspective, various models have been developed and concepts have been refined. In particular, thirty new hypotheses have been developed and can be considered for future refinement and testing at other research sites. While these are primarily of interest to researchers, they do have use for managers as they improve the degree of predictability when policy or institutional development options are being considered.

KEY WORDS

water scarcity; water resource management; water service; water institution; water utility; water service provider; water policy; water conservation; water demand management (WDM); natural resource reconstruction; adaptive capacity; institutional adaptive capacity (IAC); social adaptive capacity (SAC); first-order resource; second-order resource; second-order locus; adaptive institution; ingenuity; social ingenuity; technical ingenuity; social resource scarcity; natural resource scarcity; structurally induced relative water abundance (SIRWA); structurally induced relative water scarcity (SIRWS); willingness to pay (WTP).