

# Strategic issues in modelling for integrated water resource management in Southern Africa

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## Abstract

In Southern Africa the practice of the water resource management has moved in step with the societal needs of the regions over the past several decades. These needs have passed through phases which placed most emphasis on “getting more water”, then “using water more efficiently”. Whilst these issues are still important the dominant theme now is “allocating water equitably”. A new era has begun. The need to broaden participation and, thereby, democratise the process of water allocation is fundamental to peaceful and sustainable progress in Southern Africa. This need is urgent in a region beset with conflict and inequalities which exacerbate the already complex situation surrounding the sustainable development of scarce water resources. To meet the challenges of this era, substantial paradigm changes are required from modellers, if they are to fulfil their potential in the region.

This paper commences with a brief examination of the compelling forces acting on water management in Southern Africa. The illumination of these forces provides insights into the processes which are encouraging modellers to now consider the computer science, business science and social science contexts of their work in addition to their traditional domain of focus which was restricted to the science of water.

Of foremost importance in any social process is communication and relationships. The relevance of these for water resource modelling is outlined. The water allocation process and hence modellers are being squeezed by the forces calling for specialisation and integration at the same time. This paper draws lessons from industries which are generically similar to the water resources modelling industry, in the business sense, and offers guidance to modellers in this dilemma.

It is taken as axiomatic that integrated water resource management cannot be founded on a base of dis-integrated science. Simultaneously, the point is made that no single discipline or institution can accomplish integrated water resource management alone. Developing inter-operability between models and systems is, therefore, a key strategic issue which is discussed. The paper also includes strategic thoughts on the issues of model complexity and modelling-led monitoring.

The paper concludes with the view that modellers in Southern Africa face some key paradigm changes. These must be embraced with urgency if water resource simulation modelling is to achieve its potential to make a contribution to the social process of water allocation in Southern Africa.

## Introduction

The practice of water management in Southern Africa has moved in step with the societal needs of the regions over the past several decades. The needs have passed through phases which placed most emphasis on “getting more water” then “using water more efficiently”. These needs are still important. However, the era of “allocating water and equitably” has begun (Turton, 1999) and is now the dominant focus. The need to broaden participation and thereby democratise the process of water allocation is fundamental to peaceful, holistic and equitable progress in southern Africa. This need is important and urgent in a region beset with conflict and inequalities, which exacerbate the already complex situation concerning the sustainable development of scarce water resources. To meet the challenges of this era substantial paradigm changes are required from modellers if they are to fulfil their potential in the region.

Backeberg (1997) states that rational methods of allocation can only be established, *inter alia*, after quantification of the water resource. Allocation is a social process and the modelling systems which assist quantification, must also serve that process. Key issues in this social process are relationships, trust, communication, perceptions, assumptions, values and culture. The role of integrated water resource modelling in these processes is therefore

more complex than is generally assumed. It is, however, critical that water resource modelling research and development does engage this process for as Breen (1991, 1994) ; Di Castri (1994); Walmsley (1992); Roberts (1991); Thorsell (1991) and Butterworth (1985) point out, when research, and this would include water resource modelling, fails to inform public policy it becomes discredited and loses public support.

This is a new era for the water resource modelling industry in Southern Africa. As with any industry which is experiencing large changes in the external forces acting on the industry, the water resource modelling industry must change in response to these forces. It is imperative that business principles are applied to the management of water resources and hence these and other questions are explored by first examining the business context for integrated water resource modelling. A key question is what are the main strategic challenges and how should the industry respond? The exploration of these forces leads on to the understanding that it is imperative for modelling to engage the social process of allocation. Communication and relationships are thus of primary importance.

In addition to the above, the fundamental business question, “*make or buy*” is explored under the heading of horizontal vs. vertical integration. This leads on to the issue of inter-operability standards among model systems. The business terms mentioned here may be unfamiliar to some modellers. These will be explained in the body of the paper.

It is widely acknowledged that the Southern African region has a severe shortage of skilled water scientists. In addition, observed

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