

# Drought management as an alternative to new water schemes - Theory

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## Abstract

Instead of planning water resource projects to yield a constant maximum rate, it is advocated that reservoirs be operated on a variable draft basis. That is, when water levels drop to predefined levels the supply rate is decreased accordingly. This will increase the yield of the reservoirs and reduce the necessity to build *additional* dams.

The level of water restrictions during drought should be sensitive to the economic consequences. If possible the tariff should be adjusted to reduce consumption to the desirable level of supply. Other uses of water tariffs are presented, including for repayments of costs, subsidisation, tiered, punitive tariffs, maximum use of resources and conservation.

## Introduction

In the urban areas of South Africa we have been accustomed to receiving all the water we require. Historically the cost has been relatively low by international standards due largely to bulk supplies. The quality has been good and the reliability acceptable. As the cost of tapping additional sources increases (Stephenson, 1995) due to greater distances and pumping lifts and increasing costs of purifying, we need to re-examine our standards, it may become more economical to suffer restrictions during drought because the yield of surface reservoirs can then be increased. The cost of suffering due to limited restriction can be less than the increased cost of new reliable sources (see e.g. Riley and Scherer, 1979).

Similarly in the future the quality we expect may not always be warranted. Herold (1980) indicated that over 75% of urban water is returned to water courses. Waste water is biologically and physically purified in municipal waste-water works before being discharged to streams although mineral concentrations increase during the cycle because they are more expensive to eradicate. Instead of tapping fresh surface water resources further away it may be economical to recycle and tolerate lower quality for the bulk of our supply. In the extreme, potable water (which accounts for only 10% of the supply by Rand Water) could be supplied in a separate system or in containers.

This paper concentrates on restricting water usage during drought as an alternative to providing high reliability in our surface water tapping projects.

The bulk of our water is supplied from rivers, which are notoriously erratic over seasons and cycles in South Africa. Therefore the cost of storage is high. Alternatively water must be piped from distant more abundant surface sources. The alternatives of groundwater have proved limited and recycled water is expensive to purify.

It was customary to ensure safety of supply during the worst recorded drought. Then the concept of recurrence interval, e.g. 50 years average between failure, became fashionable. More recently Basson et al. (1994) proposed risk methods. By analysing the

stochastic nature of river flow records long-term simulations could be performed and the frequency of the necessity to reduce supply (ration) could be calculated. This varied depending on the target draft and level at which rationing commenced.

The optimum level at which rationing should commence and to what level to ration is addressed here, bearing in mind the economics. That is the cost of reliable supplies is balanced against the economic cost of rationing water. *One* way of rationing water is by means of water tariffs.

## The use and basis of water tariffs

Organisations managing the supply of water have used and possibly misused water tariffs in many ways. There are alternative types of water tariffs and designations for different methods of charging for water have not always been consistent. A classification of *tariffs* is therefore given below.

In the past water tariffs have been imposed by the authorities responsible for supplying us with water. This is designated supply-managed tariffs as opposed to user-managed tariffs where the community is able to control to some extent the cost as well as the allocation of the cost of water. Whereas a supply-managed tariff results in a common standard being set by the supplier in the case of user-based schemes the standards may vary to suit the community. The funding and methods of funding may vary. Supply management is now regarded as autocratic although it is the simplest and perhaps most economic at face value. The scope and cost are, however, limited by the technocrats planning water schemes. It is also difficult to separate the supply organisation's objectives from the user's objectives. For example, the bureaucrats of a supply organisation will understandably have pride in the system and therefore may attempt to reach higher standards although this is not necessary in all cases. Also for simplifying work, major schemes may receive preference over minor schemes. For example, rural disconnected supply schemes may require a high professional input compared with the yield and capital cost.

The components which make up the supply cost of water include:

- Payment for capital or financial repayments for capital loans
- Operating costs including maintenance, power and management

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