

# Characterising cause-and-effect relationships in support of catchment water quality management

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## Abstract

In the late 1980s the Department of Water Affairs and Forestry in South Africa initiated an ongoing process of reassessing its approach to water quality management. Fundamental to this new approach is the recognition of the need for catchment water quality management. Yet, in spite of a wide appreciation of the importance of catchment management few, if any, plans have been implemented. This is at least in part due to the inability, in practice, to reconcile the Department's water quality management policy with the processes which determine water quality in the catchment. Strategies and management practices which address water quality problems must be aimed at these processes. This paper highlights four generic processes which determine water quality in the CATCHMENT. These processes are production, delivery, transport, and use. Management of these four generic processes in sequence support a hierarchy of pollution prevention, impact minimisation, management of the assimilative capacity, and lastly management of the symptoms of pollution. This paper proposes that a management approach based on the characterisation and quantification of each of these processes forms a sound basis for catchment water quality management. This characterisation reconciles water quality management policies with the practices which address water quality problems in the catchment.

## Background

In 1994 the World Bank outlined its "new agenda" for the provision of water and sanitation services to a growing population in developing countries world wide (Serageldin, 1994). Whilst recognising that the provision of safe water and sanitation services is essential to avoid the health risks associated with poor drinking water quality and inadequate sanitation (the "old agenda"), this new agenda also made provision for supplying these services in an environmentally sustainable manner. The new agenda therefore extended to both the quality and quantity of surface and ground water, and addressed protection of the whole of the aquatic environment including the functioning of the aquatic ecosystem. Serageldin (1994) also made the point that, in developing countries water quality is not only worse than in industrial countries, but that the quality of the waters in these countries had declined during the 1980s, at least with respect to the health related indices. This deterioration, he suggested, raised the costs of providing safe drinking water and hampered the ability of governments to meet the growing demands for safe water supplies.

This new agenda for the provision of water and sanitation has also been recognised in the White Paper on water supply and sanitation produced by the Department of Water Affairs and Forestry in South Africa (DWA, 1994). In this policy document this Department outlined its primary objective as the supply of water and sanitation to disadvantaged communities throughout the country, but also recognised that:

"(Water)...sustains the natural environment which is why it is not only the quantity of water available which is critical but also its quality.." (DWA, 1994).

However, the importance of managing water quality is not new to the Department, and as far back as 1986 Water Affairs outlined its mission as:

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"..to ensure the ongoing equitable provision of adequate quantities and qualities of water to all competing users..." (DWA, 1986).

Yet, in spite of nearly 40 years of the implementation of effluent standards, the quality of many of South Africa's surface and groundwaters has continued to deteriorate. Many water sources now present a human health risk associated with direct consumption without treatment, and widespread eutrophication and other water quality problems are increasing the costs of treating the water to potable standards. This is not only a direct threat to human health and to the aquatic ecosystem, but is making the supply of safe drinking water more expensive. Extensive salinisation affects the suitability of many of our surface waters for industrial and irrigation purposes, thereby incurring additional costs. This will frustrate attempts to manage and develop the water resources of the country for the economic and social prosperity of all its inhabitants.

## Purpose of this paper

Recognising that the uniform effluent standards, whilst slowing the rate of the deterioration in water quality, were not sufficient to maintain the quality of our surface waters, the Department of Water Affairs and Forestry initiated an ongoing process of reassessing its approach to water quality management in the late 1980s (DWA, 1991). At present the Department is again in the process of reassessing its water quality management function as part of the review of the South African water law. Fundamental to these recent developments in the Department's policy toward water quality management is the recognition that the catchment must form the basic management unit. The formulation of an approach to Integrated Catchment (Water Resource) Management (ICM), which addresses both the quality and quantity issues, is therefore seen as a priority for the Department. Yet, in spite of the wide appreciation of the importance of catchment management, few if any, plans have been implemented in South Africa.

Development of the water quality component of ICM has been hampered, at least in part, by problems associated with