CAN SOUTH AFRICA MANAGE ITS DAMS? – PART I

South Africans will (or certainly should) be aware that our country is not blessed with abundant rainfall – in fact, quite the opposite. Ours is generally an arid climate – with an average rainfall of only 450 mm per year – compared with the global average of 860 mm per annum. The little rainfall we do get is unevenly distributed and evaporation removes a considerable amount of stored water. Without substantial supplies of underground water, we rely very heavily on water that is stored in dams. Our reliance on stored water is rendered increasingly critical by population growth and industrial expansion, and water resources are dwindling per capita of population. At the same time, pressure on many dams, especially those in the economic heartland of the country (Gauteng), is increasing, with a considerable portion of their inflows made up by wastewater effluents and urban runoff. Ten of the nineteen Water Management Areas have experienced a water deficit since the year 2000.

The Department of Water Affairs and Environment (DWAE) manages some 574 dams, of which 320 are considered to be major dams, each holding more than 1 million cubic meters of water. These dams store a combined 32 billion cubic meters, equivalent to 65% of South Africa’s annual runoff. From this storage, irrigation uses 62%, urban and domestic use equals 27% and mining, industry and power generation absorb a further 8%. Commercial forestry utilizes the remaining 3%.

Dams are, in reality, man-made or artificial lakes. While natural lakes form robust natural ecosystems, dams are semi-natural at best. Both types are prone to pollution and other pressures arising from man’s development of catchment areas, with dams being generally more sensitive and less resilient. Ensuring the healthy functioning of both natural and artificial lakes requires that deliberate lake management practices be applied. The South African National Water Resource Strategy (NWRS) recognizes that “water resource management supports the provision of potable water to all people”, that “water is central to the economy”. Our Constitution enshrines the right to “an environment that is not harmful to life or wellbeing”, while the NWRS further observes that “the deterioration of the quality of surface water resources is one of the major threats to South Africa’s capability to provide sufficient water of appropriate quality to meet its needs and to ensure environmental sustainability”.

In this situation, the obvious conclusion would, surely, be to ensure that both the quality and quantity of the water in our dams is managed in the most optimal manner. Evidence suggests that South Africa is deficient in this role, with the quality of
some 35% of the storable volume already severely impaired – and nearly all of this in
the economic heartland. Water quality is, in fact, poorest in the areas with lowest
runoff and highest contribution to GDP! Insidious and sinister changes are appearing
in some dams, completely unnoticed by routine monitoring programmes.

How should dams be managed? Lake and reservoir (dams) management is a
component of the freshwater aquatic sciences – also known as limnology. Aquatic
sciences encompass rivers, wetlands and dams (South Africa only has one small natural
lake – Lake Fundudzi in the Zoutpansberg). Scientific attention to lakes and dams
became increasingly relevant post-World War II, as global populations and industrial
expansion placed increasing pressure on water supplies. This led to the problem of
eutrophication, i.e. the pollution of surface waters with nutrients, resulting in the
excessive and unwanted growth of plants and algae. Dams require specific and
directed management to ensure that they remain functionally-stable especially when,
as is the case in South Africa, many act as receptacles for urban runoff and wastewater.

From the above it may be reasonably assumed that South Africa would possess
a cohesive, well-developed and academically-supported national programme for
reservoir management. Recent months have seen many reports referring to the so-
called 'Water Crisis' - not least mentioning the extreme levels of pollution that exist in
most Gauteng dams. It will come as a shock to learn that South Africa has no such
programme, none of our academic institutions teach limnology as a career subject and
the Department of Water Affairs, custodian of our water resources, has no Directorate
of Reservoir Management that coordinates appropriate management of our dams.
Curiously, the National Aquatic Ecosystem Health Monitoring Programme does not
mention the word "dams"!

So, what is the condition of South African aquatic sciences (limnology)? "South
African limnology is in disarray. It is poorly-funded, failing to address certain
important environmental problems, lacks a cohesive sense of direction and its
potential contributions to effective water resource management are grossly
underrated".

This statement is, in several ways, almost as true now in 2010 as it was back in
1989 when it was made by one of the world’s most eminent limnologists, the late Dr
Bill Williams. He continued, "Additionally, many of its [South Africa’s] practitioners are
dispirited and disillusioned, there has been significant attrition from their ranks, and
few young South Africans regard limnology as a secure and attractive career. All of
this might be comprehensible in a country with plentiful water of good quality; for this
to be the case in a country wherein water is a basic resource and is in short supply, faced with demographic problems of the magnitude prevailing, seems incomprehensible”.

The ‘Williams Report’ was commissioned by the then Foundation for Research and Development (FRD), a unit that existed within the Council for Scientific and Industrial Research (CSIR). It was compiled at the time when the FRD was terminating its Inland Waters Ecosystem (IWE) research programme, which encompassed a number of projects spanning all aspects of aquatic sciences. The report was the culmination of interviews with 58 scientists – then and since South Africa’s single largest group of limnologists and/or scientists active in this field. Less than 10 of the original group are still active in aquatic science in South Africa – there are only four with a day-to-day career involvement in this field.

The Williams report was kept secret by its initiators, although the findings were circulated to the aforementioned group. Curiously and inexplicably, given the presumed understanding of the importance of limnology to a country such as South Africa, the FRD considered that “it would be counterproductive to enter into open debate on the issues raised by the evaluation”, yet noted that “the future of limnology activity [is] of concern”. Any response or interaction was left up to the individual researchers or organizations – yet I have it on reliable authority that none approached the FRD regarding the future of South African limnology!

Why was this allowed to happen? At best, the lack of a concerted – or indeed any - response to the findings by the then limnological fraternity is without doubt a damning indictment of inaction. At worst, all sorts of possible ulterior motives may be considered – ranging from the elimination of competitors to ensuring security of research funding. Moreover, during the late 1980s the very nature of South African governance was changing – perhaps with very short-sighted awareness of the implications for science in this country.

As with other current South African administrative crises (electricity, health, policing, education) there is no time available for finger-pointing. The problems must simply be assessed, sleeves rolled-up and the issues practically and pragmatically addressed.

The logical question now is, “what is the status of South African aquatic sciences now – twenty-one years later? How many publications have emerged during the past 20 years? How many career graduates have been produced, how many young
scientists have jobs and what is the level of funding and the associated funding trends”? Part II will explore these issues in more detail.

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