It looks as if the Water Wheel has stepped on a real "landmine" with the publication of Prof W Alexander's article on climate change in the previous Viewpoint. (See Letters to the Editor). To present a balanced picture on the important issues of global warming and climate change, a counter-view will be published in the next edition of the Water Wheel. Please note that the ideas and facts presented in the Viewpoint articles are those of the authors. They are aimed at stimulating debate and are by no means a reflection of the official standpoint of the Water Research Commission (Ed.).

New Attitudes Needed on Water Usage Patterns

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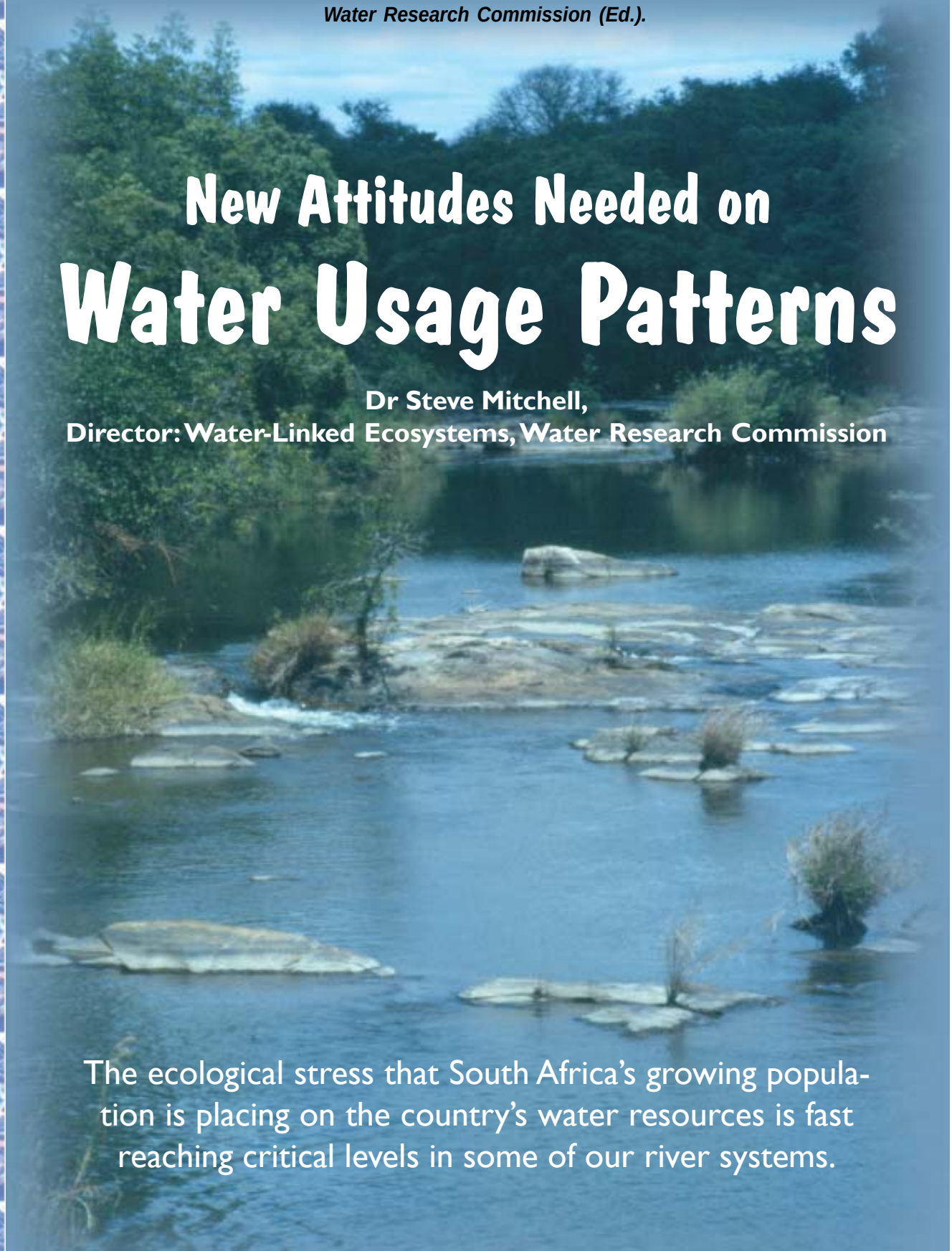

The ecological stress that South Africa's growing population is placing on the country's water resources is fast reaching critical levels in some of our river systems.

Organised industry is already aware that it needs to clean up its effluent, and most leading manufacturing companies are happy to undertake the recommended remedial actions. However, much remains to be done, and acceptance of some lifestyle changes that many people will regard as radical is also required of domestic water consumers. What is needed, in brief, is awareness that South Africa is a water-scarce country, and a consequential change of attitude on the part of citizens at all social strata regarding their water usage patterns. A focused, ongoing public awareness building programme will be required to achieve this.

A FACT OF LIFE

The plain, inescapable fact of life which needs to be recognized is that unpredictable rainfall patterns are typical of the latitudes just outside the tropics, in which South Africa falls. Water resources such as rivers and groundwater are consequently less assured here than in the more rain-favoured tropical and cool-temperate latitudes.

Human memory is short, and many of us forget the cyclical nature of our region's rainfall. We tend to regard the high rainfall years as the norm, and those years with less than the long-term average as atypical "drought years". Adding to the problem is that our growing population harbours unrealistic expectations of an unlimited supply of clean water for homes, farms and industries. This applies to the urbanised section of the population, which for so long simply had to open a tap to receive water, that they have little experience of a less reliable water supply. It applies equally to rural communities only now being reached by pipelines, to whom this godsend is perceived as promising unlimited benefits.

People also have untenable faith in the ability of the sewerage system to convey wastes "out of our lives" – from phosphate-bearing farm and domestic wastes to harmful and even toxic industrial wastes – oblivious of the fact that we are simply flushing our problems on to downstream water users.

Research indicates a new scenario now emerging in the quality of the water that many of us consume. The EDCs (endocrine disrupting compounds) contained in some domestic water appear to be affecting human, animal and plant hormones, resulting in reduced reproductive capacity. Throughout the industrial world, sperm counts are lower than those of a generation ago, with outright sterility as a frightening ultimate threat.

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Successful ongoing remedial action to ensure hazard-free effluent will carry high costs, for industries and residential and farming communities alike, with unavoidable effects on the economy. Indeed, many industries and communities would not, today, be financially viable if they had to bear the full costs of their water usage and polluting activities. While much effluent is now cleaned at source, compared with a generation ago, and the ingredients thus removed and recycled, there is still a long way to go. Many offenders unknowingly flush toxins and plant nutrients such as phosphates down the drain.

NATURAL WATER SYSTEMS OVERLOADED

We have always expected the environment – perceived as free-flowing rivers bathed in Africa's bountiful sunshine – to undertake the required pollution treatment, free of charge. The problem is that while the environment obliges to a considerable extent, humankind has created a huge overload on the natural water systems of the world, which, increasingly, those systems are unable to bear.

In some instances the natural water systems are able, by means of dilution, to accommodate the phosphates and other materials injected into them. But no longer do they have the diluting capacity that they once had, due to withdrawal of water from the systems for domestic, agricultural and industrial use. This shortfall is aggravated in dry seasons, which in South Africa occur regularly. The result is phosphate and other nutrient build-up, leading to algae blooms with consequent bad smell and water taste, alien plant multiplication (such as water hyacinth) where elements of these plants occur, rotting vegetation, withdrawal of oxygen from the water, toxicity and the death of fish and other aquatic life.

It should be born in mind by those who don't feel concern for "little fishes", that visible fish kills are a symptom of a far bigger and more acute situation than simply the loss of a bunch of fish. The effects extend to humans, not only those living on the river banks, but to people throughout the country, as illustrated below.

The unrestrained multiplication of alga species, including the toxic blue/green algae, doubles the cost

of water treatment. This cost obviously falls on the community and also imposes a significant cost factor on industry – a strong argument indeed for keeping the resource in good condition.

Water authorities – led by the Water Research Commission, Department of Water Affairs and Forestry and Environmental Affairs and Tourism, as well as the provinces – have, in the past decade developed the National Biomonitoring Programme to establish and monitor the impacts of various effluents on the condition of water bodies, and they are further developing this methodology. The know-how thus gained affords industries the opportunity to monitor their own activities.

WATER ACT

The National Water Act of 1998 includes two innovative sections that regard not only water but the whole aquatic environment as a resource. Thus, no longer are fish and other aquatic life perceived as being in competition with domestic users, industry and agriculture for the resource (water) – they been recognised as PART OF the resource itself. The Act looks at the cumulative effect of pollutants that the total resource can cope with, and allows water authorities to put a cap on water usage and injection of effluents where the effects are too damaging.

Stream flow reduction as a result of major dams, irrigation farming and planted forests (of which South Africa has the highest level in the world) is always controversial. The trend now is to work on the "polluter pays" principle. And if the pollution is toxic, the activity concerned can be prohibited.

South Africa's wet-dry cycle in conjunction with ever-growing human usage has created a nutrient imbalance in most rivers. This adversely affects their ecosystems, with some organisms more sensitive than others to change. The all-too-frequent effect is the loss of sensitive species and an increase in "weed" species which will ultimately lead to the loss of ecosystem resilience and sustainability.

The Sabie River - all biological life in the main stream was exterminated in the late 1800s through gold-mining effluents.

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CYANIDE

An early and very telling example of ecosystem destruction was that of the gold mining industry in the Pilgrim's Rest area which poured cyanide-bearing effluents into the Sabie River (Mpumalanga) during the late 1800s. All biological life in the main stream was exterminated. Fortunately, the upper reaches of its tributaries were not affected, and the fish invaded the main stream once injection of the toxins ceased. Today, the Sabie is South Africa's richest river systems.

This illustrates nature's resilience in response to restorative measures. However, loss of the refuge areas that would result from heavy exploitation of the resource will result in the loss of capacity to recover. Ongoing monitoring is thus necessary to maintain biodiversity.

In contrast to the Sabie River, the Olifants and Crocodile Rivers (also in Mpumalanga) which are subject to heavy water withdrawal and industrial effluent discharge, are today degraded and less able to maintain their biodiversity.

BIODIVERSITY

This brings us back to the "little fishes" referred to above. Biodiversity is the basis of any ecosystem. When the system begins to lose its ability to perform the tasks we rely on it to do, as is happening in the two aforementioned rivers, its human users lose more than is often appreciated. For example,

reduction in water flow and water quality is likely to lead to an increase in bilharzia amongst the local human population that draws its drinking and washing water directly from the river. This reduces their quality of life, increases absenteeism among workers of local farms, plantations, sawmills and other industries (people from the economic sector who can least afford this) leading to loss of productivity. The adverse effects of this can extend to the turnover of companies, leading to reduction in the dividends paid to shareholders in distant cities who may never come into contact with the river concerned. Treatment of the bilharzia patients also increases State hospital costs, leading to competition for tax revenues.

Rivers whose flow is curtailed by the withdrawal of water for human use are often reduced to pools of standing water. This provides ideal summer breeding conditions for the mosquito population, which in turn increases the malaria infection rate of the local population – with similar adverse socio-economic effects to those caused by bilharzia infection.

It will thus be appreciated that, in the words of the poet, "no man is an island unto himself". The socio-economic well-being of all in South Africa, not only those who live along the banks of given rivers, is affected by environmental conservation or the lack thereof.

SPORT FISH

Another form of environmental degradation which is not commonly recognized as such but which has irreversible effects, is the practice of introducing sport fish into waters for recreational angling. Predatory trout and kurper reduce the indigenous fish species and thereby impact on the natural ecosystem. In the Olifants River (Western Cape) seven of the eight indigenous species of fish are now either endangered or critically endangered due to competition from alien fish species.

WE HAVE NO CHOICE

In summary, we have allowed our water resource to degenerate. As a result, people living along many river banks are adversely affected, with the ripple socio-economic effects extending throughout South Africa.

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We have reached the point where we have no choice. People's attitudes have to be changed, and we have to accept responsibility for complete water and effluent treatment and the costs thereof.

Industry will have to accept that there are ways to recover all the pollutants from waste water. Recovery of the heavy and other metals in waste water is not only each polluter's environmental responsibility to the rest of society and the economy; recycling can also enable the company to make full use of the raw materials it buys in. Ultimately, this will be to the benefit of the bottom line.

On the domestic side, about 50% of the household effluent that currently goes down the drain could instead be put to use in watering the garden. This will save the householder outlay at present expended on the purchase of drinking-quality water used for purposes where a lower quality of water would suffice. This recycling of "grey water" refers to bath water.

There is further potential for householders to make a contribution, in the form of eco-sanitation – waterless toilets, in which wastes are recycled into valuable fertilisers and which avert the cash outlay required to flush drinking-quality water into the sewerage system. User resistance to this concept will have to be overcome through attitudinal change. Wealthy and environmentally advanced Sweden leads the way in eco-sanitation. Water-scarce countries may have no alternative but to follow its example.

Innovations now taking place in water supply and waste treatment are extremely exciting. They enable industry to produce more cleanly, and they can enhance the bottom line. For example, motor service shops have by and large got over the practice of discharging used motor oil down the drain. There is a thriving industry which collects old oil and purifies it up to new oil standard. Large and small industries which flush toxic wastes down the drain should similarly look to the suppliers of the source materials to take back the wastes, where they can be profitably recycled.

Again, it is a matter of attitude and taking responsibility for environmental conservation at all levels of society.

What is thus needed, as a national priority in increasingly water-scarce South Africa, is a change of attitude on the part of all citizens and decision-makers in industry. We cannot put it off. If we mean business, we must practise what we preach – and put our money where our mouths are.