Future challenges and prospects

INCREASING CHALLENGES

The positive changes (more and longer periods of clear water experienced since 2009, absence of bad odour, etc) recorded within 18 months after the implementation of the Hartbeespoort Dam Integrated Biological Remediation Programme, are a clear indication of the powerful potential available within an integrated approach towards unlocking nature's ability to restore healthy ecosystems through biodiversity. This principle to conserve, protect and manage towards optimum biodiversity is not only a requirement in the National Environmental Management Act (Act 107 of 1998), but is echoed in the National Water Act (Act 73 of 1998) through the requirements of the Reserve to manage towards aquatic ecosystem diversity.

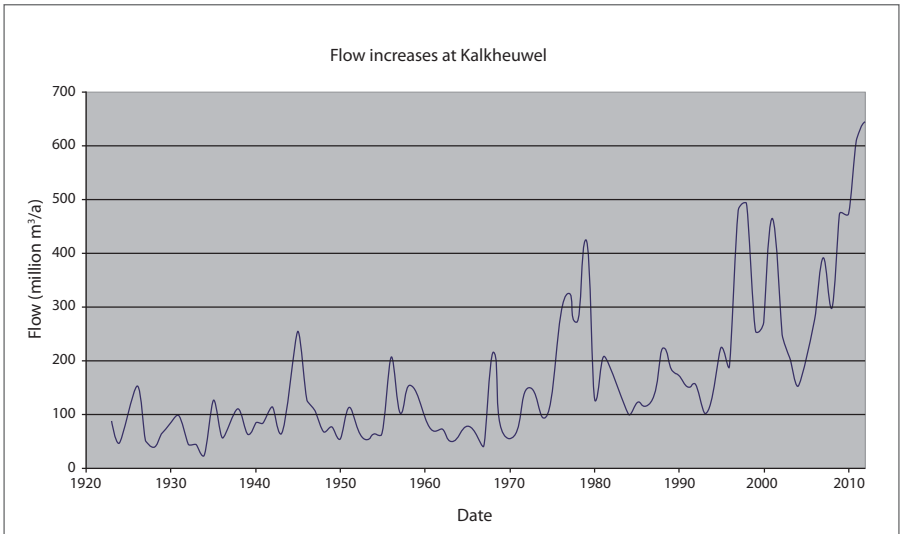


Figure 1: Flow increases in the Crocodile River (1923–2011)

The world has experienced tremendous population growth over the past several decades, a situation that is no different in South Africa. Water is essential for humans in many ways, including water supply and storage, land value enhancements, recreation, aesthetics and even transportation (larger river systems). Communities therefore normally settle and grow near areas where there is a relatively sustainable water resource. However, the increasing population growth is threatening the quality and quantity of both surface and ground water, especially in the highly developed urban

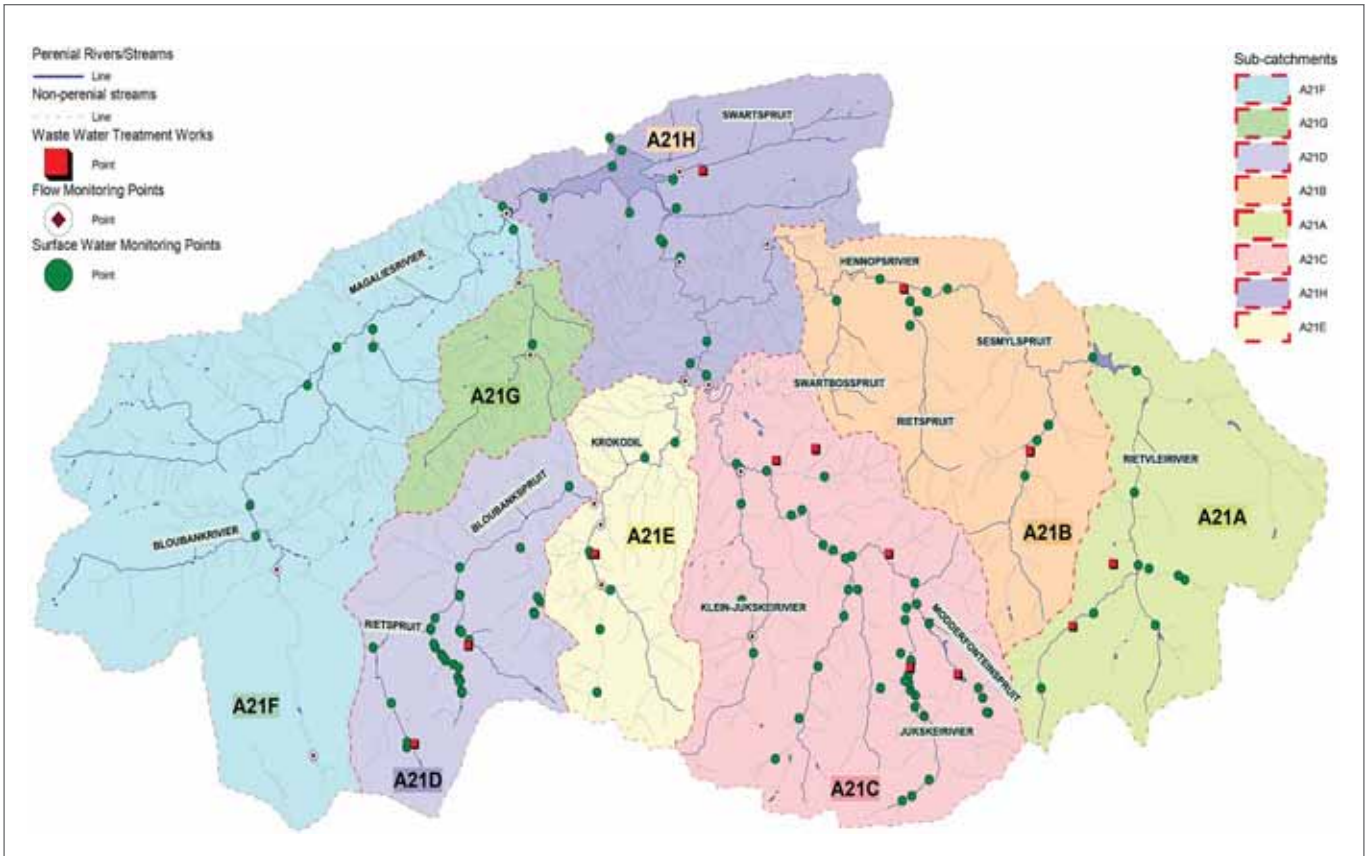


Figure 2: Delineation of the Hartbeespoort Dam catchment

areas, posing significant challenges when it comes to sustainable water resource management, which is only possible if done in an integrated manner.

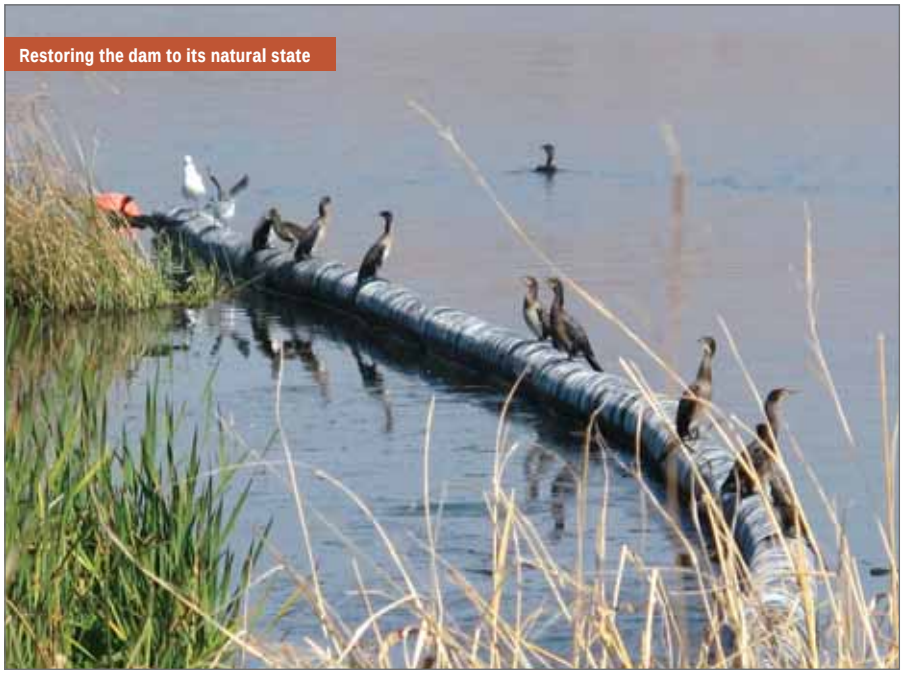
It should be noted that the Gauteng metropolitan area (covering Johannesburg, Ekurhuleni, Mogale and Tshwane) is one of the few large metropolitan areas in the world not based near an ocean port or a major river, and which is therefore entirely, or to a great extent, dependent on imported water.

The Gauteng municipalities have experienced marked growth and development over the last few decades, resulting in significant quantities of additional water being piped into the region to satisfy water demand. The present supply from Rand Water to these areas amounts to about 2 900 Mℓ/d, of which about 50% is within the Hartbeespoort Dam catchment. The significant increases in return flows from these areas, as measured at the inflow to the Hartbeespoort Dam, can be observed from Figure 1. The total volume of return flows discharged upstream from the dam ranges from 650 to >720 Mℓ/day, with an increasing trend as depicted in Figure 1.

These return flows have become an important source of water supply to the urban and bushveld mining complex (platinum, chrome and base minerals) developments north of the Hartbeespoort Dam, and will in the immediate future become even more important for supply up to Lephalale (Ellisras Municipality) for the extension of the Medupi Power Station.

To integrate and harmonise the various environmental, biological, engineering and socioeconomic aspects to ensure sustainable solutions, requires the involvement of a number of scientific and engineering disciplines. With the world population that has more than tripled over the last century, the per capita green footprint has increased between 9 and 50 times (third-world and first). Environmental impacts are still skyrocketing, with fewer resources available to an ever growing modern civilisation. The ability of eco-engineering to utilise and integrate all disciplines to package the best environmental option, might be seen as the most appropriate way to go ahead.

Society needs to start taking responsibility for the current level of environmental degradation and water pollution. The Waste Discharge Charge System (WDCS) was established to promote waste reduction and water conservation under the National Water Act of 1998 (Act 36 of 1998). In terms of section 56 of the NWA, the WDCS endeavours to introduce financial and economical instruments aimed at sustainable development and utilisation of water resources,



Restoring the dam to its natural state

Floating wetlands form part of the HBPD remediation programme

The state of the Hartbeespoort Dam has improved markedly since the start of the remediation programme

internalisation of environmental costs, and recovery of costs from the water user/polluter. The WDCS forms part of the pricing strategy where charges (incentives and mitigation charges) could be levied from water users, based on the polluter-pays principle.

Therefore, the WDCS is primarily a framework for charging for the discharge of waste into water resources. It aims to use economic instruments to encourage polluters to internalise the social, economic and ecological costs of discharges. The ultimate objective is to reduce the amount of waste that is discharged into the country's scarce water resources.

As part of the strategic development of the system, testing will be done by piloting the WDCS within the Crocodile (West) Marico Water Management Area. It is foreseen that the WDCS will cover for a budgetary shortfall of 50% to meet the required funding for catchment management. An estimated income in excess of R400 million could be generated within this sub-catchment, also providing funds for the HBPD remediation projects.

FUNDNG SCENARIOS

The future of the programme is dependent on seeding funds from National Treasury, and on external funding to be recovered from waste discharge charges, as discussed above. Three funding scenarios have been identified, namely:

1. On-going operation and maintenance (+R25 million/annum)
2. Fast-tracking (present 2012/2013 allocation of +R50 million/annum)
3. Full-scale implementation of the Hartbeespoort Dam Remediation Programme, and extension of acquired knowledge and experience to other dams and catchments (+R120 million/annum over three to five years)

Ongoing operation will include the continuation of tasks that will ensure the maintenance of the current positive state of the dam – biomass management (removal and treatment of algae, hyacinths, litter and debris, the establishment of floating wetlands, and the remediation of the shoreline) and food web restructuring (fish removal) programmes. These programmes (which enhance the biodiversity and the nutrient filtering capacity in the dam) will be the least of the operations required to ensure that the food web cycle within the dam is managed in a manner that will prevent the excessive hypertrophic state that the dam is prone to.

Fast-tracking will include the tasks focused on the reduction of the dam's internal nutrient load (incoming sediment removal and management) as a prerequisite to making a considerable positive impact on its ecosystem health and water quality.

Full-scale implementation will include the continuation of all the identified projects in order to not only alleviate the effects of undesired material reaching the dam, but preventing them from reaching the dam in the first instance. This will entail a complete roll-out of the programme as specified within the business plan, including the long-term pre-impoundment and litter trap projects. In addition it will include providing assistance to the Department of Water Affairs through the licensing of the various water uses around the Hartbeespoort Dam, and the implementation of the Waste Discharge Charge System (WDCS).

LAST WORD

There is no quick, easy and cheap solution to rectify a problem that has developed over more than 80 years. The restoration of the Hartbeespoort Dam cannot be considered a once-off action, but should rather be seen as a series of well-planned, integrated measures within the dam basin and the Crocodile River catchment. These measures, the intensity of which would vary depending on the programme's implementation phase, should be strictly and persistently carried out, now and in the future.

Currently these activities are focused on the dam basin, and on development of an improved catchment management strategy, but future activities will mostly deal with catchment management and maintaining of attained trophic levels in the dam.

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Source:
http://www.saice.org.za/downloads/monthly_publications/2012/2012-Civil-Engineering-August/#/0