

START SAVING OR START PAYING, River Studies Warn



Extensive urbanisation, economic development and industrialisation coupled with water wastage and illegal water use are placing increased pressure on the Vaal River System, recent studies have revealed. Unless users start saving water immediately a new bulk water transfer scheme would have to be implemented as a matter of urgency.

Lani van Vuuren reports.

The Vaal River System is focused around three water management areas (WMAs), namely the Upper Vaal, Middle Vaal and Lower Vaal. It also includes various water resource systems that are linked to the Vaal River WMAs through inter-basin transfers, such as the Thukela-Vaal Water Transfer Scheme and the Lesotho Highlands Water Project.

Running through the economic heartland of the country, this system has long been known as the 'workhorse' of South Africa's water resources, serving major economic activities, such as mining and power generation, agriculture as well as a population of around 12 million people. Due to extensive development in the Vaal River System as well as the Crocodile (West) WMA, which is supplied with water from the Upper Vaal, the local surface water resources in all three of the Vaal WMAs have been fully exploited more than three decades ago.

In 2004, the Department of Water Affairs & Forestry (DWA) initiated the development of a strategy for the Vaal River System that will define management measures to meet the growing water requirements of the industrial and urban sectors served by the system. DWA project leader Seef Rademeyer explains that the series of studies includes the development of a large bulk water supply reconciliation strategy; a water

conservation and water demand management (WC/WDM) potential assessment; and the development of an Integrated Water Quality Management Plan (IWQMP).

Several consulting firms are involved in this integrated and complex process, including WRP, SRK, Golder Associates, DMM Development Consultants, PDNA and Diversity and Transformation Solutions. Zitholele Consulting is driving the stakeholder consultation process.

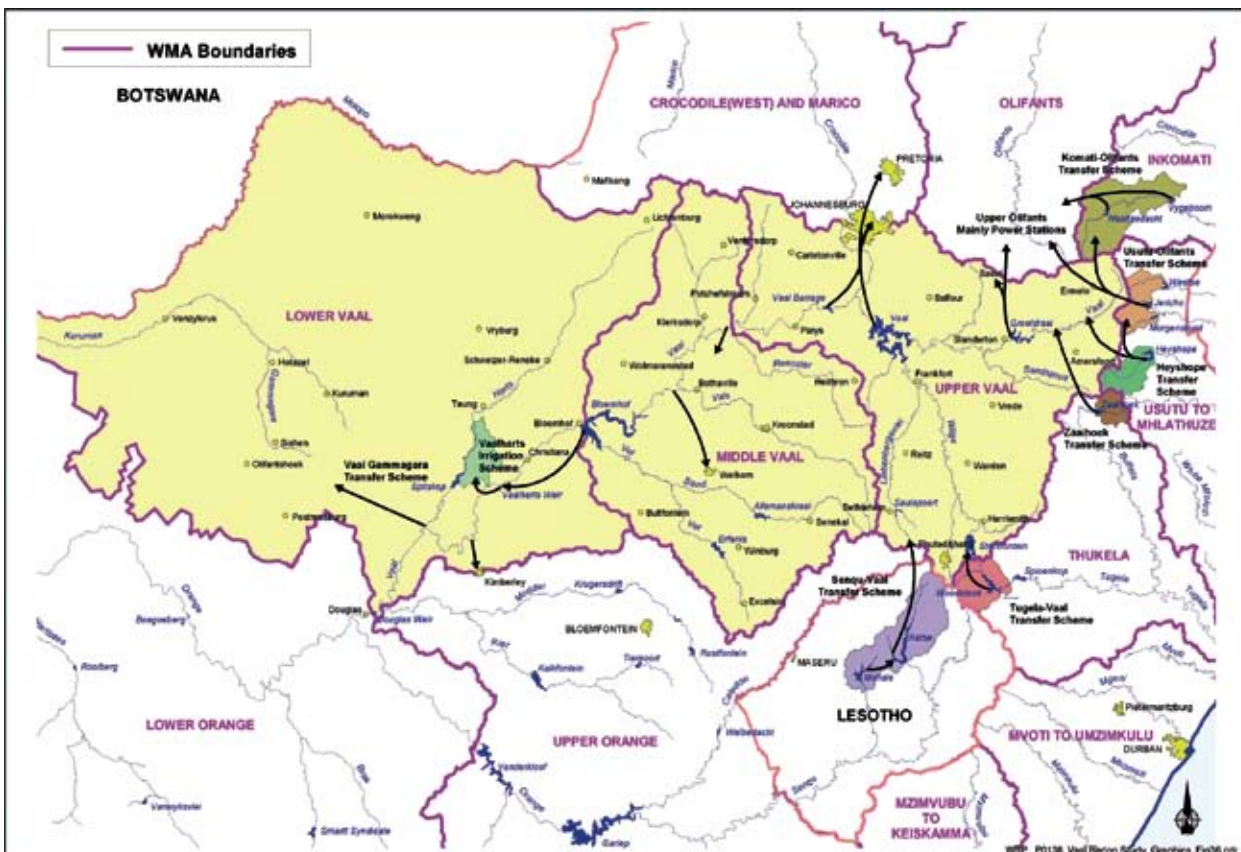
NEGATIVE WATER BALANCE

One of the most important revelations of the studies has been the high level of unlawful water use taking place in the Vaal River System, mainly for irrigation. The studies show that irrigation water use in the Vaal River System has increased by more than 100% between 1998 and 2005 for the area upstream of the Vaal Dam alone. Estimated irrigation water use for 2005 in the three WMAs

was 1 060 million m³/a. Up to 240 million m³/a of irrigation water use in the Upper Vaal WMA is estimated to be unlawful.

It is believed that some farms located along the Ash-Liebenbergsvlei, which receives the water flowing from the Lesotho Highlands Water Project, could be taking much more than their registered share of run-of-river water. "This has been a shocking discovery, and probably the main reason why the Vaal River System is currently in deficit," reports Rademeyer. "This is water that has already been paid for by urban users in the WMA that is not reaching them."

The negative water balance has largely been obscured by the good rainy season South Africa is experiencing at present. However, this could all change if the country were to enter a drought year. "Therefore, curbing this unlawful water use is non-negotiable if we want to avert a potential water crisis in the system," notes Rademeyer.



The Vaal River management areas.



Dirnie van Rensburg

Water leaks have been found to be a serious challenge in several municipalities in the Vaal River System.

ADDITIONAL WATER TRANSFER SCHEMES

The demand for water in the Vaal River System, especially in the Upper Vaal WMA is set to grow in the immediate future as the area experiences further economic development and population growth. The urban sector represents the largest portion of the system's water use. In Gauteng, especially, substantial increases in water use have occurred historically as a result of the increasing urban population and expanding economic activities.

Additional water transfer options are already being investigated. Two schemes are currently being considered, namely a further phase of the Lesotho Highlands Water Project or further water resource development in the Thukela River System. The two proposed dams for further development of the Thukela are one on the Bushman's River (Mielietuin Dam) and the other on the main stem of the Thukela River (Jana Dam). This could provide a nominal transferable yield of 15 m³/s.

In turn South Africa and Lesotho issued a joint feasibility study into the Lesotho Highlands Further Phases in 2005. The proposed Polihali Dam has been sited as

the most preferred option. Both projects are at advanced stages of assessment and either could support growing water requirements in the Vaal River System area, reports Rademeyer.

CURBING WATER WASTAGE

The problem is that both these augmentation options will take more than ten years to implement. With the

Vaal River System already in deficit a decision will have to be taken immediately unless other solutions can be found.

In looking for these solutions the WC/WDM component of the studies focused on the potential of water savings in the main urban areas of Johannesburg, Tshwane, Ekurhuleni, Emfuleni, Rustenburg, Mogale City, Matjabeng, Govan Mbeki and Randfontein.

Some of the municipalities are already implementing successful WC/WDM measures, In general, however, there is a lack of accurate and reliable water balance information which influences the effective implementation and measurement of the various WC/WDM interventions. In fact, says Rademeyer, getting reliable, usable information from the local municipalities in general, especially in lieu of the shortage of technical skills present, has been one of the challenges of the project.

The lack of technical expertise further contributes to inadequate preventative maintenance while insufficient political support to promote consumer billing and cost recovery needs are also evident. Irresponsible water



WRP

The Sebokeng Pressure Management project is one of the successful water demand management projects implemented in the Vaal River System.

use practices have been found in all of the municipal areas, such as garden watering during very hot periods and not tending to leaking taps and toilets. High levels of leakages and wastages occur in some municipalities which have to be managed more effectively.

The coordination of WC/WDM efforts by government departments has been found to be essential. For instance, DWAF's advocacy programme about the disadvantages of hosepipe irrigation must be coordinated with the Department of Agriculture's efforts where hosepipes are provided to consumers as motivation to develop vegetable gardens.

If no WC/WDM measures are implemented, it is projected that Rand Water's supply, the bulk water supplier to most of the urban centres studied, will increase from the present 1 300 million m³/a to almost 1 800 million m³/a in 2030. "The good news is that the impact of even small savings through water conservation and water demand management could result in a substantial postponement of the date an additional bulk water transfer scheme would be required," says Rade-meyer. "A mere 15% water saving would be sufficient to delay the decision to proceed with an infrastructural option to 2012."

GROWING INDUSTRIAL DEMAND

Given the present growth projections for the Vaal River System, even with WC/WDM additional bulk water resources would eventually be required. The Vaal River System supports three of the most important industries in the country, namely electric power generator Eskom, petrochemical company Sasol and Mittal Steel. All of these industries are large water consumers.

At present, Eskom operates 12 coal-fired power stations which receive a substantial volume of water from the Vaal River System. Some of these stations were decommissioned decades ago, but are now being reinstated to increase supply in response to the growing demand

CHARACTERISTICS OF VAAL RIVER WATER MANAGEMENT AREAS (WMAs)



SA Tourism

Upper Vaal WMA

Land use in the Upper Vaal is characterised by the sprawling urban and industrial areas in the northern and western parts of the WMA. This WMA is considered economically important, contributing nearly 20% of the GDP of South Africa. There is also extensive coal and gold mining activities in this part of the system. These activities are generating substantial return flow volumes in the form of treated effluent from the urban areas and mine dewatering that are discharged into the river system. These discharges are having significant impacts on the water quality in the main stem of the Vaal River throughout all three the WMAs. The potential for future economic growth in this WMA remains strong. Growth will largely be attracted to the already strong urban and industrial areas in the Johannesburg-Vereeniging-Vanderbijlpark complex.

Middle Vaal WMA

The Middle Vaal WMA is rural in nature, with land use characterised by extensive dry land agriculture. Irrigation is practiced downstream of dams along the main tributaries as well as at locations along the Vaal River. The largest urban areas are Klerksdorp, Welkom and Kroonstad. The economy of the Middle Vaal WMA contributes about 4% of GDP of South Africa, with the most dominant economic activity being the mining sector, generating more than 45% of the GDP in the area. Few of the gold mines in the area have a secure future beyond 2010, although the reserve base could support mining up to the year 2030. As in the Upper Vaal WMA, mine dewatering and the subsequent discharge into the river system impacts on the water quality.

Lower Vaal WMA

The land use in the Lower Vaal WMA is primarily livestock farming, with some dry land cultivation in the northeast. Intensive irrigation is practiced at Vaalharts as well as locations along the Vaal River. Diamond-bearing intrusions near Kimberley (the most important urban area) and alluvial diamonds are found near Bloemhof. Iron ore and other minerals are found in the south-eastern parts of the WMA.

Source: DWAF



Lani van Vuuren

The Sterkfontein Dam, part of the Thukela Water Transfer Scheme.



Lani van Vuuren

The Vaal Dam is one of the main water infrastructure features on the Vaal River.

for electricity to fuel the South African economy.

In addition, there are plans to develop three new power stations, envisaged to receive water from the Vaal River System. This means water requirements from Eskom is due to increase from about 313 million m³/a in 2006 to 397 million m³/a in 2030.

Sasol has two plants receiving water from the Vaal River System. The Sasol Secunda Complex's main source of water is Grootdraai Dam, which will be supported

through the Vaal River Eastern Sub-system Augmentation Project (VRESAP) once it becomes operational later this year. This project involves the construction of a 120 km, 1,9 m-diameter pipeline from the Vaal Dam to the Knoppiesfontein diversion structure and from there into the Bosjesspruit and Trichardsfontein dams near Secunda, Mpumalanga.

In turn, the petroleum giant's Sasolburg complex is supplied from the Vaal Dam. Sasol's total water requirement is expected to increase from 118 million m³/a to 166 million m³/a by 2030.

Only Mittal Steel, which also receives its water from Vaal Dam, has not indicated an increase in water use in its projections. In fact, the company plans to decrease its present water use from 17 million m³/a to 16 million m³/a by 2010, from where onwards it is expected to remain constant.

WATER QUALITY

The water quality study was aimed at developing management measures to maintain and even improve the water quality in the Vaal River System for the planning period up to 2025. The study's water quality status assessment confirmed the major issues of salinity and eutrophication in the Vaal River System.

Dissolved salts from urban effluents, mines and industries in the catchment continue to increase the salt concentration of the Vaal River. The specific catchments contributing to the deteriorating water quality of the system include Waterval, Suikerbosrand, Rietspruit, Klip River, Mooi River, Koekemoerspruit, Schoonspruit, Vierfontein and the Harts River catchment.

The upper part of the catchment's water is of fairly good quality. The areas of concern, however, include the Vaal Barrage, Middle Vaal River, and Lower Vaal River downstream of the Harts River confluence, where total dissolved salt (TDS) levels are high. Of further worry is the impact of high TDS concentrations on downstream water users below the Vaal Barrage and those abstracting water from the barrage.

In addition, a high risk of eutrophic conditions in the Vaal River reach from the Vaal Barrage to Bloemhof Dam has been found. This is mostly due to sewage spills and sewage effluent discharges into the Vaal River and its tributaries. Initial indications are the situation could be improved by releases from the Vaal Dam. However, present assessments point to the need for the removal of nutrients from the system through improved final effluent quality.

In the end it is up to all the water users of the Vaal River System to ensure they can continue to benefit from South Africa's hardest working river. 