

INFRASTRUCTURE

Civil engineering fraternity expresses concern over state of South Africa's infrastructure

Despite Government's great strides in enhancing the country's infrastructure over the last 23 years, particularly to the poorest citizens of the country, South Africa's infrastructure is seeing a general deterioration, mainly as a result of a lack of operations and maintenance. This is according to the 2017 Infrastructure Report Card for South Africa, published by the South African Institution of Civil Engineering (SAICE) earlier this year.

Article compiled by Lani van Vuuren.



In its latest Infrastructure Report Card, the third in a series (the previous report cards were published in 2006 and 2011), SAICE awarded South Africa's public infrastructure an overall grade of D+. According to the compilers of the publication, this overall grade indicates that South African infrastructure is generally at risk. "This grade reflect an ongoing and unchanged norm of poor maintenance and insufficient engineering capacity in the public sector, as commented on in both the 2006 and 2011 report cards," note the compilers, which included Malcolm Pautz, Kevin Wall and Sam Amod.

Previous Infrastructure Report Cards discussed the severe impact of South Africa's poor application of systems, maintenance practices and the engineering skills shortage in government.

Unfortunately, these problems remain as serious today. Within this context, the latest report also discusses three interrelated factors that critically affect the condition of infrastructure – the institutions that are tasked with their creation and care, the distribution and effectiveness of skills within these bodies, and the availability and appropriate use of data and information to influence decisions.

The message emerging from these discussions might appear gloomy. Data is the raw material for meaningful policy development, but compared to international best practice, its availability and proper use is dismal in South Africa. Institutional knowledge, memory and leadership have the power to transition a developing nation into a winning one, yet we have

more examples of failure than success in this regard. Innovative procurement and funding processes are possible, but these require even greater capacity embedded within the public sector to control, implement and manage,

Engineering and management skill, capability and collaboration are not efficiently leveraged to overcome the inherent shortages of capacity in South Africa. These factors, separately and in combination play a significant role in the conditions of South African infrastructure.

Yet, as the Infrastructure Report Card points out, there are signs of positive change. South Africa is a developing country with limited resources, but the standards to which much infrastructure is built, and the level of formal commitment as reflected by our Constitution, are certainly world-class. "The engineering profession is finally seeing meaningful rates of gender and racial transformation – a welcome shift that should augment its ability to serve the nation. There are also institutions and data managers showing commitment to excellence, service and competence, which can serve as aspirations for others willing to improve."

Water resources

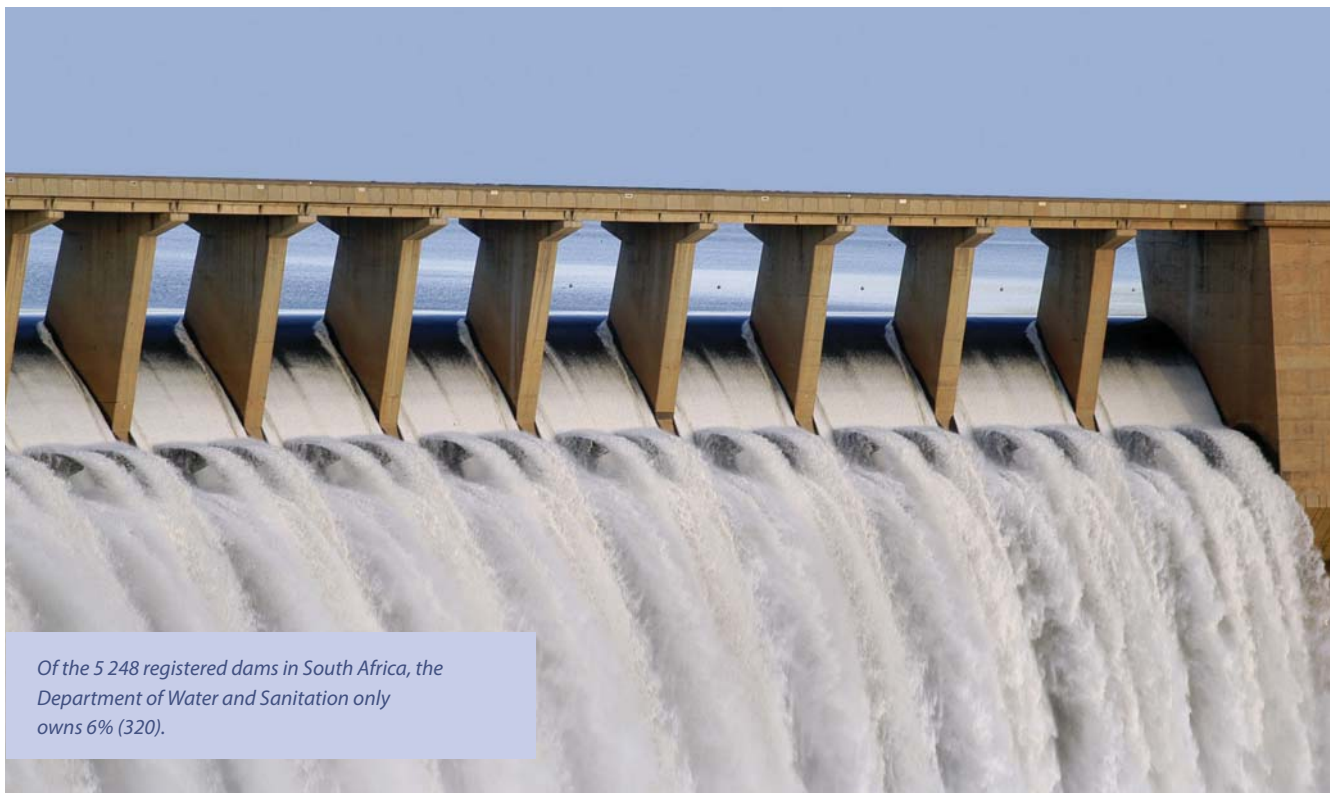
Growth in population has seen increased demand for freshwater resources, which has put a strain on available bulk supplies. This has been exacerbated by the recent drought in different parts of the country. Current water usage already exceeds the reliable yield of existing water infrastructure, and the marginal cost of future expansions is rising rapidly. As a consequence, although South Africa uses less than 40% of the country's total renewable water resources, much of this is not available at the required assurance level, and thus economic and physical water scarcity is a reality, the Infrastructure Report Card points out.

"Growing water shortages mean that alternative sources will have to be considered. Chief among these water reuse, aquifer water resource exploitation and desalination, some of which are energy-intensive and expensive. There is little clarity on who will bear the costs, and whether the charging structures will adequately serve both resource conservation and equity goals.

A number of new schemes, to address future water problems, are in various stages of preparation. The largest of these, the second phase of the Lesotho Highlands Water Project (LHWP), is some five to seven years behind schedule, which will place the urban and industrial heartland of South Africa at risk in the event of further drought. The augmentation of supplies to Cape Town has also been considerably delayed. Similarly challenges are reported from the Umgeni system where the proposed bulk supply from a new uMkhomazi Dam is likely to be late, not least because of the substantial bulk transition requirements. In addition, supplies to Nelson Mandela Bay Metro have been limited due to the multiyear delay in completing the Nooitgedacht pipeline, which would provide additional supplies from the Orange River scheme.

In these and other cases, responsibility is usually shared between the Department of Water and Sanitation (DWS) and other authorities. Funding is a major reason for delays. The DWS has inherited a number of dams from former homelands, many of which require rehabilitation. A number of these dams suffer from inadequate spillway capacities and some from structural instability.

In general, according to the Infrastructure Report Card, the major water resources infrastructure is not only ageing, but there has been further deterioration as a result of insufficient maintenance and inadequate ongoing capital renewal. Management



Of the 5 248 registered dams in South Africa, the Department of Water and Sanitation only owns 6% (320).

failures have also been signalled in budgeting, operations and maintenance, as witnessed in the transmission and transfer systems in the Western Cape, the Vaal River Eastern Subsystem Augmentation Project (VRESAP), and the Thukela-Sterkfontein transfers. In other instances contracts have been awarded in excess of budgets or against the evidence of better cost-effective technical options.

A worrying trend is the fact that some divisional DWS organograms still reflect a 50% vacancy rate, particularly of engineering posts. In the past, the presence of experienced professional engineers in senior and top management was a key element in enabling strategic and day-to-day decision-making, facilitating efficient operations. The rapid turnover of Directors-General (DGs) (eight, including Acting DGs since 2009), and other senior staff further contributes to poor performance.

According to the Infrastructure Report Card, the water resources sector now faces a similar crisis to that of the electricity generation sector a decade ago. It is important to recognise that it is also a crisis caused essentially by poor management at both national and local level – poor planning, unnecessary delays in implementation and a concerning decline in institutional competence. Other contributory issues include financial constraints at both national at local level, irresponsible consumption patterns, and wastage directly due to the poor condition of some infrastructure. The recent drought has exacerbate and exposed these weaknesses.

Water-supply services

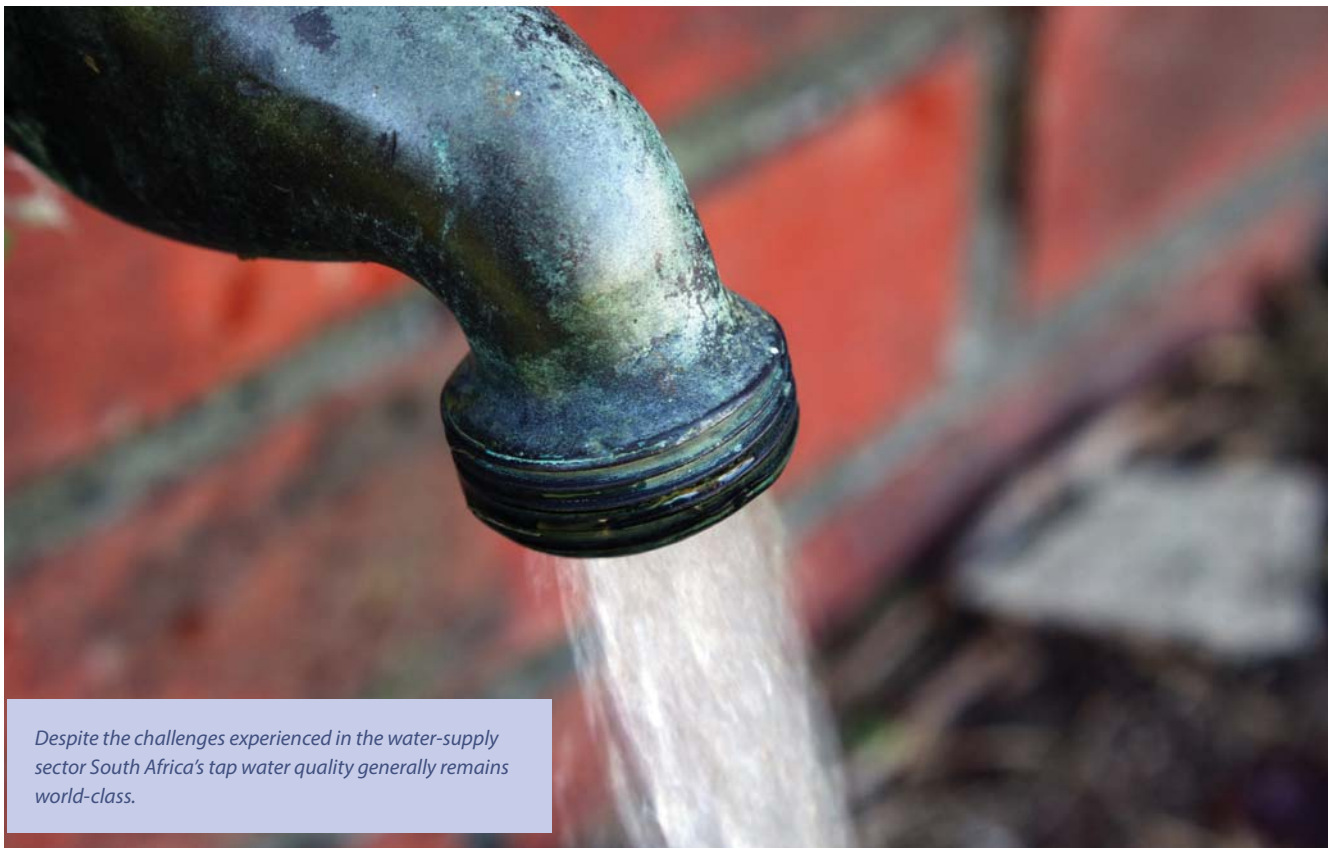
Water-supply services, in the form of water treatment works, pump stations, reservoirs and reticulation, are mainly the

responsibility of the local government sphere. South Africa met the 2015 Millennium Development Goal targets. However, the new challenge is to achieve the Sustainable Development Goals, which focus on the reliability and safety of water supplies, and the safe and effective management of human waste.

A recurring theme that hampers achievement of service delivery goals is inadequate capability of service providers to fulfil their responsibilities, according to the Infrastructure Report Card. “Delivering new infrastructure, operating and maintain it, and eventually renewing or replacing it, are complex activities. Appropriately competent and skills persons, however, are in short supply in the public sector, especially in rural areas. This is exacerbated in that infrastructure has been provided in setting where there is no financial capacity to hire the qualified staff needed, nor to provide the requisite levels of operation and maintenance spending.”

Despite these challenges, in all of the metropolitan municipalities and in many towns as well, the water supplied to households is of top quality – not many countries are able to boast that water can be drunk from the tap without treatment.

One of South Africa’s main water management challenges is non-revenue water, which represents the water lost through physical leakage of commercial losses. About 31% of piped water does not reach consumers because of leaks in the network system. If commercial losses are included, then total loss is closer to 40%, much of it due to failed systems and political unwillingness to enforce cost recovery and debt collection.



Despite the challenges experienced in the water-supply sector South Africa’s tap water quality generally remains world-class.



With the exception of mainly metropolitan-managed wastewater treatment works, South Africa's sewage treatment facilities are generally in a worrying state.

Sanitation

In 2014, the DWS took back responsibility for household sanitation provision from the Department of Human Settlements. At the time of writing, an updated delivery status verification process was underway, but provisional figures indicated that, although the percentage unserved is declining, due to population growth the absolute number of the unserved has remained relatively constant since 1994, at about 4 million households.

If the sanitation backlog is to be eradicated, then additional finances, combined with appropriate project management skills and effort, will be required. Political pressure to provide full waterborne sanitation as a basic level of sanitation is severely impacting the cost of service provision in parts of the country, as well as slowing down service delivery, the Infrastructure Report Card notes. "Waterborne sanitation services cannot be provided effectively unless there is adequate and reliable water supply, so further investment in that dimension will often be wasted and the untreated wastewater crisis will simply get worse."

According to the latest results of the DWS Green Drop certification process, 30% of large wastewater treatment works are in a critical condition, implying that millions of litres of untreated or inadequately treated sewage are illegally discharged into rivers and streams each day. Water treatment and wastewater treatment works are generally in poor condition, thus increasing the environmental health risk, with 66% of all wastewater treatment works requiring short- to medium-term interventions, 35% requiring capacity upgrades and 56% requiring additional skilled operating and maintenance staff.

The most common problems experienced at wastewater treatment works are poor design of treatment plant or individual processes, processes not operated according to design criteria, breakdown of equipment, inadequate technical backup, change in raw water quality, poor planning of operations, and insufficient resources.

The skills required to operate and manage sophisticated technologies are often scarce outside major urban centres. Downstream users and ecosystems subsequently bear the consequences in the form of high pathogen loads, eutrophication, and higher treatment costs to achieve potable water standards.

The status of sanitation infrastructure in the country is of grave concern. This is mainly related to communities served with waterborne sewerage systems where maintenance, refurbishment and upgrading of collection and treatment infrastructure have been neglected over the years. An increasing number of sewage failures are occurring within municipalities, which cause blockages in pipelines, overloading of manholes, flooding of community areas and leading to degradation of neighbouring services.

To download the *SAICE Infrastructure Report Card for South Africa*, visit <http://saice.org.za/wp-content/uploads/2017/09/SAICE-IRC-2017.pdf>