WATER AND INDUSTRY

WRC report guides the way to safely irrigating with mine-water

Where there's a will, there's a lawyer. But where there's a WUL expect not so much lawyers as laws and a profusion of red tape. We are referring here, of course, to a Water Use Licence (WUL) and unless you are drawing water from a natural source for something modest and relatively innocuous like domestic use, you will need one. And this comes with a plethora of compliance requirements and plenty of complexity, writes Matthew Hattingh.

Mining is not only one of the largest industrial water users in South Africa but also a significant potential water polluter. Irrigation offers a potential cost-effective reuse option.

What then are the prospects for reusing water impacted by mining activity to irrigate crops? A number of Water Research Commission (WRC) studies over the past two decades in the coalfields of Mpumalanga and the goldfields of the Witwatersrand found that using mine wastewater for agriculture was technically feasible.

We are frequently reminded that South Africa is a water-scarce country. Similarly, we know mines produce a lot of water and dealing with it can be costly. We know too that commercial agriculture is the country's biggest user of water – responsible for about 60% of water withdrawals – including precious potable resources, unnecessarily good for the job.

Reusing mining-impacted water for agriculture could unlock a host of environmental and economic benefits. It could cut waste treatment costs, offsetting the cost of rehabilitating spent mines. It also holds promise for improving the lives of rural poor, providing work after mines have closed, and contributing to the government's goal of building a more equitable society.

It seems a waste not to put mine-water to good use. Why isn't

it happening then? Partly because it's easier to discharge it as treated effluent, even though this may call for high-quality water to dilute the effluent.

"There is a perception that the use of mine-impacted water for irrigation will not be authorised in a WUL application, which is not the case," say Dr Gina Pocock and Leanne Coetzee, specialist consultants at Waterlab, an analytical chemistry and multidisciplinary water services company.

It comes down to the complexity of the WUL process. Water and other resources must be protected from contamination. This involves a number of government departments, both at national and provincial levels. A number of Acts of parliament come into play too, while shoals of regulations, procedures and policies proliferate.

Navigating these is anything but plain sailing. So, to chart the way, Pocock and Coetzee have written a report, ***Guidance for attaining regulatory approval of irrigation as a large-scale, sustainable use of mine-water***. Completed for the Water Research Commission and published earlier this year, the report (**WRC Report No. TT 837/20**) sketches the benefits of putting mine-water to better use and catalogues in detail the rules and procedures that must be followed by mine owners seeking WULs.

Pocock and Coetzee noted that reusing mine-water was not a priority despite it being national economic and agricultural policy to irrigate more fields and pastures.

They cited the second edition of the National Water Resources Strategy, a water policy document drafted by the Department of Water and Sanitation, as well as the Irrigation Strategy of the Department of Agriculture, Land Reform and Rural Development. Among the documents' aims are easing poverty, creating work, developing skills and giving the country's rural poor fairer access to resources.

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As things stand, if you are a small-scale development farmer, it's unlikely the benefits of irrigation are trickling your way. Of the estimated 1.6 million hectares under irrigation in South Africa, only about 50 000 ha are in the former homelands and allocated to smallholder farmers. The irrigation strategy sets big targets for expanding irrigated areas and revitalising smallholder irrigation

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'Excellent yields' have been obtained in a pilot study, irrigating maize with untreated, mine-affected circumneutral (where the pH is near 7) waters at Mafube Colliery in Mpumalanga.

schemes. The problem is, as the water resource strategy points out, "additional water for an increase in irrigation would be very limited".

Mine-water to the rescue then? Not so fast.

Before we rush to throw open the sluices and send the contents of tailings and evaporation dams cascading onto freshly ploughed fields, there are rules and regulations to consider. "The legislation and supporting guidelines relating to water reuse in South Africa exist and are readily accessible. However, they tend to be contradictory and confusing in many cases, which may have had the unintended consequence of negatively affecting the consideration of mine-water as an agricultural resource in the past," say the authors.

The good news is that government is making efforts to improve things. Pocock and Coetzee were encouraged by the draft Mine Water Management Policy, which intended to clarify the responsibilities of officials in the different government departments and to get them to work together better. But they noted that although the policy was gazetted in 2017 it has yet to be promulgated.

Similarly, they welcomed last year's proclamation by President Cyril Ramaphosa that applications for WULs must be finalised within 90 days – down from the 300 days it had previously taken. The move, they said, "Indicates a strong political will to stimulate the economy and remove unnecessary red tape." However, turning good intentions into good deeds will take some doing. And the authors noted that limited capacity in the different departments "makes it difficult to adhere to the timelines as legislated for the adjudication and authorisation of applications".

From a purely rands and cents view, irrigating with mining-impacted water makes sense. Treating it to domestic or even industrial standards before disposal can be expensive, yet previous WRC studies found that when used untreated, or partly treated, for irrigation, big savings were possible for mines. One study put the reduction of capital and running costs at 87% and 78% respectively.

"In addition, and of particular importance in the post-closure period of a mine, the income generated from the sale of the water could be offset against the running costs. Further benefits include job creation and the protection of water resources." Then there were considerable benefits to agriculture to add to the reckoning. "It was observed that 360 megalitres per day may be generated after closure of the entire Mpumalanga coalfields," said the authors, citing a 2004 WRC study. Estimates of the total area such a volume of water could bring under irrigation were not given, but a figure of 6 000 ha was quoted for the Olifants River catchment alone.

Other benefits include job creation and improving food security, particularly for neighbouring communities as mining regions diversify their economies away from mining. South African mines tend to be in water scarce areas and bringing in water from afar for farming doesn't add up. "However, the treatment of mining-impacted water provides a water source on site or nearby, which then allows agriculture on the mine land to become a realistic opportunity for the surrounding community on a year-round basis," the authors note, again citing an earlier WRC study.

Pocock and Coetzee took a detailed look at the Constitution, common law and legislation that has a bearing on mine water management, mine closure and irrigation. They reviewed the National Environmental Management Act, Mineral, Petroleum Resources Development Amendment Act, Mine Health and Safety Act, and National Water Act.

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The National Water Act comes in for particular attention. It includes regulations that specifically deal with mines, compelling owners to: "Collect, confine and take reasonable measures to prevent water resource contamination, as well as ensure that water used in any process at a mine or activity is recycled as far as is practicable." It spells out duties of care mine personnel must exercise to limit pollution, ensure recycling and look after water resources. And the regulations under the Act detail the obligations that continue even after a mine is closed.

The authors outlined the Department of Water and Sanitation's revised irrigation water quality guidelines, which are site-specific and risk-based. Water conservation and demand management as it is applied to mines and agriculture got a look-in too.

The report dedicated a chapter to aspects mine owners should consider before even starting down the road to applying for a WUL to irrigate with mine-impacted water. The department's best practice guidelines are covered too. These set out an order of priority for mine water and waste management. In order of decreasing priority, mine owners must: prevent or minimise pollution or contamination; but if it happens reuse or reclaim it; treat what cannot be reused or reclaimed; reuse treated water; and discharge or dispose of treated water, as a last resort.

When a mine faces closure, the reuse of excess water falls away leaving three options: treatment and discharge; irrigation; and sustainable development projects. "It is in the best interest of the mine, as well as future users of the water, to aim to use water with the minimum amount of treatment required. Reuse of water must be considered carefully to meet health and environmental requirements, and fitness for purpose to ensure sustainability," say the authors.

They note that it is necessary to determine the suitability of the soil for irrigation and the quality of the water required. Mine-water may contain mineral salts which can be deposited during irrigation. These build up over several seasons making it increasingly difficult for plants to grow. Rainfall can wash away the salts, but only if the soil is well drained.

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Irrigation with mine-water could potentially contribute to job creation and improve food security, particularly in communities neighbouring mines.

If a mine plans to irrigate with its excess water it needs to seek approval of the Department of Agriculture, Land Reform and Rural Development and the Department of Forestry, Fisheries and the Environment. This is likely to involve an environmental impact assessment, including a public participation process, as well as specialist studies such as soil, ecological and heritage assessments, and possibly a geohydrological study. The authors made certain recommendations on the order in which these should be done to help smooth the process.

Only once a mine has established that excess water is available and it cannot be reused internally, may it approach the Department of Water and Sanitation for a licence to discharge, including irrigation. A pre-application enquiry meeting is required to look at whether there was enough water, what it would be used for and the risks involved. At this stage officials advise the applicant on the documentation to be submitted, including: designs and plans; the mine's integrated water and wastewater management plan; mine closure and rehabilitation plan; and water quality results of the water to be used.

The authors developed a number of decision trees to assist applicants when weighing options and putting together submissions. These tools cover a variety of considerations, such as the process to develop a water reuse and reclamation plan and to categorise risks; mapping the different routes that may be followed in the application process; and noting the considerations and consequences involved at each stage. In the course of their research the authors interviewed mine-water managers, environmental consultants, environmental law experts, and mining and agriculture stakeholders to properly understand:

- Which laws apply
- The processes that must be followed by WUL applicants
- The roles and responsibilities of the different parties
- The circumstances under which the regulations permit irrigation with mine water and
- What applications need to be made to which government departments

A workshop was held to refine the guidelines set out in the report. Participants, including government officials, consultants and industry representatives from the water, agriculture and mining sectors, made suggestions on how the process might be improved.

Pocock and Coetzee highlight a number of shortcomings in the legislative framework and the application process. They note that mine-water management is not formally defined and there are no specific guidelines for the use of mining-impacted water, only for disposal of treated effluent. They call for the legislation to be rationalised and aligned to "remove ambiguity and address mine water directly".

Licence conditions should require applicants to produce a water reuse and reclamation plan – which is not the case at present. Irrigation with mining impacted water should be identified as a potential water use when planning new mines for inclusion in the integrated water use licence application, and when developing the mine's environmental management programme and closure plans.