The issue of water scarcity is hugely important in South Africa, a semi-arid country that, as a result of widespread mining activity over decades, is battling the problems of general pollution, a trade-off of water available for domestic, industrial and mining operations and, in some provinces, acid mine drainage (AMD). By Jenny Lancaster and Donald Gibson

According to a 2010 McKinsey article by Giulio Boccaletti, Martin Stuchtey and Marc van Oost (Confronting South Africa’s water challenge) highlights the balancing act South Africa must play with regard to this scarce resource. They wrote: “Estimated demand for water in South Africa will reach 17.7 billion cubic metres in 2030. Actual supply will equal only 15 billion cubic metres and is severely constrained by low levels of highly seasonal rainfall (about 50% of the world average), insufficient aquifers and a dependence on water transfers between basins and from other countries (South Africa purchases nearly 25% of its total water supply from nearby Lesotho). What’s more, the effects of climate change could exacerbate the problem.”

In South Africa, said the authors, the challenge will involve tough trade-offs between the competing demands of agriculture, key industrial activities, and large and growing urban centres.

It is against this backdrop that South Africa’s coal industry is becoming attuned to the need for water-savvy strategies as well as a broader appreciation for the significant environmental impacts that go hand in hand with the extraction of coal. These include the alteration of landscapes, changing ecology, lowered air quality and deterioration of water resources through extraction of clean water, decant of dirty water and AMD.

Advances in mining techniques have, in some places, reduced many of the negative impacts traditionally associated with coal mining. However, it is the ultimate paradox that the industry’s need for clean water for various processes and power production is in direct conflict with the damage these processes do to sources of clean water. Escalating the problem is the fact that coal-rich areas in South Africa are often either located in water-stressed areas, or where sensitive ecological areas such as wetlands and the associated river courses are already threatened through overutilisation or degradation.

Water-rich Mpumalanga and the arid Waterberg are just two examples on either end
nexus

of the continuum. Without proper upfront management, the development of the Waterberg Coal Corridor has the potential to become contentious as its hills function as catchment areas for the water that exists. Therefore, for projects and mines looking to establish themselves in this region, the maintenance of these ecosystems is extremely important for regional water resources and mining operations.

Over and above the ecological importance of these areas – which provide not only habitats for fauna and flora that are on the International Union for Conservation of Nature’s Red Data List, but are also interlinked and thus form an important corridor for such species – there is a real business case to be made for their protection and maintenance. Why? It’s about costs and benefits; while it takes a significant amount of water to provide an energy resource, both for the acquisition of coal and for power station operation, it also takes a significant amount of energy to treat and move the water to and from these operations. Additionally, the services these habitats, also referred to as ecological infrastructure, provide would be costly to replace with man-made structures.

Thus, mines are increasingly being encouraged to consider the costs of supporting the ecological infrastructure rather than destroying it. In this respect, the Department of Water Affairs (DWA) is becoming more focused on the long-term health of South Africa’s water ecosystems. While the department has been hamstrung by a lack of consistency in the past, it has taken notice of the AMD problem on the reef and know it can’t afford a repeat of this situation.

This necessitates a two-pronged approach for water management within the coal mining industry, which focuses on minimising the amount of water abstracted and discharged into the environment for mining activities through reuse and recycling, and managing water impacts using strong management controls through monitoring, mitigation and offsets.

We are working with our mining clients to improve their water management strategies, aiming to reduce demand through efficiency, technology and the use of lower quality and recycled water. Dirty mine water can then be treated and reused in various ways, depending on the level of treatment; this includes active (water treatment plants) and passive (wetland system) methods. The water coming out of these treatment processes can be used within the mining area for beneficiation and processing plants, dust suppression and fire control, reused as potable water and finally released into the environment to the relevant catchment area standards.

The eMalahleni Water Treatment Plant in Witbank, some 135 km east of Johannesburg, is an example of a successful partnership between Anglo American Thermal Coal and BHP Energy Coal South Africa to treat in excess of 130 million cubic metres of dirty water stored underground. The plant now supplies the municipality and community with potable water and also feeds a local water bottling company, 4Life, and meets DWA requirements, also reducing the risk of AMD.

Treatment plants are a here-and-now solution, but there is also growing enthusiasm over the possibilities of passive wetland systems. These could be harnessed to reinstate ecosystem services or natural wetland benefits such as water purification, flood attenuation, erosion control and water storage – advantages that are usually provided by wetlands that may have been destroyed and/or are no longer functioning at their full capacity due to mining activities. By fulfilling these functions, passive wetlands may be considered a type of offset, especially when wetlands in the surrounding areas are already

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Floating wetland at a mine in South Africa.
heavily impacted. Additionally, as wetlands are notoriously hard – and costly – to recreate, this provides an opportunity for companies to investigate offset projects while managing their water challenges. This is of significance in areas where there are many pans and seeps, such as in the Olfants River catchment in Mpumalanga.

While creating a passive wetland system that is fully functional and maintenance free has had limited success, it is an option that cannot be ignored. However, until concepts like this become a reality, the challenge is to manage and limit the impact of mining on water resources and energy needs while still providing sufficient coal to meet power demands. This can be achieved by integrating water policy, planning and management within the mine planning to encourage conservation, motivate innovation and ensure sustainable use of the water resource.

We see in South Africa and around the world that mining companies consistently fail to collaborate sufficiently within their regions. While a cluster of mines may share the same underlying geology and must go through the same processes, they usually don’t work together to solve problems. But they must. The situation in Witbank necessitated successful collaboration and the Waterberg is most certainly another impending disaster if it’s not managed properly by all stakeholders.

Ultimately, the message is clear: You can’t build a power station or operate mines without having a knock-on effect on water issues, biodiversity issues and social issues. They are all linked. A holistic and integrated view is needed and that requires collaboration between NGOs, governments, companies, mines and local communities.

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