Slime dams and toxic cocktails

Most communities in the Witwatersrand Mining Basin, which includes the Far East Basin, Central Rand Basin, Western Basin, Far Western Basin, Klerksdorp-Orkney-Stilfontein-Hartebeestfontein and the Free State gold mines, live next to slime dams that pose a serious health hazard. The dams also expose communities to flooding, writes **Tshidi Makhathini**.

On the mines they are called slime dams, at international conferences they are tailing impoundments, and the Chamber of Mines classifies them as residue deposits.

Whatever they may be called, slime dams dominate the landscape and are the most visible and long-lasting consequence of South African mining.

New impoundments are being built, existing ones reprocessed, while old silted dams are an ever present source of dust and seepage.

However, the new demands brought by environmental awareness on the need to prevent water pollution, changing technologies of engineering and strict economics have influenced many changes and developments in the methods of tailing disposal.

According to a presentation to the Parliamentary Portfolio Committee by Marriette Liefferink from the Federation of Sustainable Environment, acid mine drainage (AMD) in South Africa is a serious problem. Therefore, South Africa needs to take the issue seriously like countries such as the United States.

For example, the US Environmental Protection Agency argued as early as 1987 that: 'problems related to mining waste may be rated as second only to global warming and stratospheric ozone depletion in terms of ecological risk. The release to the environment of mining waste can result in profound, generally irreversible destruction of ecosystems.'

Liefferink says the Witwatersrand gold mining area of South Africa is at serious risk. For instance, AMD for the Witwatersrand goldfields alone is 'estimated 350ML/day (1ML = 1,000m^3). This represents 10% of the potable water supplied daily by Rand Water to municipal authorities for urban distribution in Gauteng Province and surrounding areas, at a cost of R3,000/ML.'

ACID MINE DRAINAGE

Waste from gold mines constitutes the largest single source of waste and pollution in South Africa. AMD is responsible for the most costly environmental and socioeconomic impacts. It is also responsible for surface and groundwater pollution, degradation of soil quality, harming aquatic sediments and fauna, as well as allowing heavy metals to contaminate the environment.

To make matters worse this may continue for many years even after the closure of the mines and decommissioning of tailing dams.

Long-term exposure to AMD polluted drinking water may lead to increased rates of cancer, decreased cognitive function and appearance of skin lesions.

Mining activities are a major contributor to uranium and uranium series radionuclides within the catchment. Heavy metals in drinking water compromise the development of the foetus during pregnancy and can result in mental retardation when the child is born.

Acidic mine water from an old ventilation shaft is believed to have caused the death over 60 carp in the Vaal Dam, after environmental experts found the dead fish in an irrigation dam.

Mine residue deposits (tailing dams and sand dump) situated within the catchment area of the Vaal Barrage discharged about 50,000 tonnes of salt into the near surface environment in 1985 alone. However, the proportion of the pollutants that found their way to surface streams and groundwater into the Vaal Barrage is unknown.

HAZARDS TO COMMUNITY

Small particles of uranium can be carried by the inhaled air stream all the way into the alveoli (little cavities found in the lungs that help with breathing). Here the particles can remain for periods from weeks up to years depending on the rate at which they dissolve.

Highly insoluble uranium compounds may remain in the alveoli, whereas soluble uranium compounds may dissolve and pass across the alveolar membranes into the bloodstream, where they may cause toxic effects to the body.

In some cases, insoluble particles are absorbed into the body from the alveoli into the lymph nodes.

'Insoluble' particles may reside in the lungs for years, causing chronic radio-toxicity in the alveoli.

The use of contaminated material and mine residues in construction has also been identified as a means by which radio-active materials are spread into the environment.

The measured uranium content of many of the fluvial sediments in the Wonderfonteinspruit, including those off mine properties and therefore outside the boundaries of licensed sites, exceeds the exclusion limit for regulation by the National Nuclear Regulator.

The radioactive contamination of surface water bodies in the Wonderfonteinspruit catchment area is caused by the long-lasting mine water discharges and seepage as well as runoff from slime dams. This poses radiological risks to the public who live in the nearby communities.

Radioactive contamination also happens when people eat crops and plants that would have been exposed to polluted soil and dust. Plants can become poisoned when radioactive material enters the soil and is taken up by root systems or when radioactive particles in the air settle on food crops when they are still growing.

Milk and meat can become contaminated when animals eat grass and other radioactive plants. However, radioactivity cannot contaminate food that is packaged or sealed.

'The most important lesson learnt from the studies in the Wonderfonteinspruit is that no short-cuts exist which would allow certain pathways to be ignored in a study of radioactive contamination within these mining areas,' remarks Liefferink.

Slime dams cause AMD, acid rain, drying out of the sediment and influx of water, dredging operations, and tailing spillages. Turbulence caused by cattle drinking the water or children playing in the water uranium to move along the Mooi River.

POLLUTED DAMS

Polluted dams are found at Driefontein gold mine, Blyvooruitzicht in Merriespruit and Sishen Mine currently has four tailings dams and one plant waste. Although slime dams are a health hazard and dangerous, it is difficult for children not to play near them because they are situated close to where they live. The dams are located about 300m from where communities live.

In February 1994, a tailing dam failed and flooded the suburb of Merriespruit, killing 17 people who were drowned by a wave of water and slime with a height of 2,5m.

The Witwatersrand basin, covering an area of 1,600km^2 and with more than 120 mines, has been mined for more than a century and is the world's largest gold and uranium mining basin. The mines have produced 43,500 tonnes of gold in one century and 73,000 tonnes of uranium between 1953 and 1995. However, its legacy of pollution is astonishing: some 400km^2 of mine tailings dams and six billion tonnes of pyrite tailings containing low-grade uranium.

Waste from gold mines constitutes the largest single source of waste and pollution in South Africa and there is wide acceptance AMD is responsible for the most costly environmental and socio-economic impacts.

The Department of Water Affairs (DWAF) says that as at 1997, South Africa produced an estimated 468-million tonnes of mineral waste per annum.

DWAF says gold mining waste was estimated to account for 221-million tonnes or 47 % of all mineral waste produced in South Africa, making it the largest, single source of waste and pollution.

There are more than 270 tailings dams in the Witwatersrand Basin, covering approximately 400km^2 in surface area.

Anglo Gold Ashanti says most of these dams are unlined and many are not covered by vegetation, providing a source of extensive dust, as well as soil and water (surface and groundwater) pollution. Dams are lined by clay bottoms which are at least one foot thick layer of heavy clay for every ten feet of planned water depth. Covering-rock, sand and other porous areas are also covered with clay. The planting of grass and shrubs on dam walls stops soil erosion. LB

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