

# Cannabis can clean toxic mines

Weed is dubbed the 'mop crop' for its ability to remove or render industrial pollutants harmless

Guy Oliver

Industrial cannabis is under investigation as both a tool to remove toxic heavy metals from Johannesburg's mining and heavy industry wastelands, as well as turn a profit from vast land tracts unsuitable for agriculture or human settlement.

The legacy from more than 130 years of highly-profitable, cavalier and irresponsible mining practices has left the metropolis perched above acid mine drainage contamination, as well as heavy metal concentrations hazardous to human health and wildlife.

There are at least 380 mine residue areas in Gauteng containing "elevated levels of toxic and radioactive metals" that includes high concentrations of arsenic, cadmium, cobalt, copper, zinc, and uranium, says Mariette Liefferink, a leading voice against acid mine drainage pollution and the chief executive of the Federation for a Sustainable Environment.

She cites Randfontein's Robinson Lake uranium levels that are 40 000 times above normally occurring rates.

Tiago Campbell, a University of the Witwatersrand environmental science master's student researching cannabis as an instrument to scrub the country's poisoned industrial heartland, says: "The scale of the toxic environment is not really understood."



Cannabis, dubbed the "mop crop" for its phytoremediation properties — a plant's ability to remove or render industrial pollutants harmless — is aided by a rapid growth rate superseded only by bamboo, a high stress tolerance and a 2.5m root system probing deep into toxic soils. Industrial cannabis (hemp) has less than 0.3 percent of the psychoactive compound THC.

Cannabis also sequesters 22 tons of carbon dioxide per hectare, a feat outpacing any forest or commercial crop.

"It's a weed. It is an opportunistic plant that will take advantage of its environment and that gives it resistance to a contaminated soil source," Campbell said.

As a heavy metal hyper-accumulator — a plant absorbing toxins at higher concentrations than its growing medium — it is set apart from its phytoremediation peers that include Indian mustard, water hyacinth, alfalfa and sunflower, by its potential to create secondary markets, Campbell says.

Campbell cultivated nearly 1 000 mine dump cannabis plants replicated under laboratory conditions that grew unimpeded in soils collected from heavy metal contaminated mining lands.



Polluted land: Slimes dams and gold mine dumps near Snake Park in Soweto (above) and many other areas leach heavy metals into the soil and water. Photo: Delwyn Verasamy

Health concerns for harvested heavy metal cannabis would automatically exclude it from the medical or recreational sectors, but Campbell's research suggests the heavy metal "is pulled out ... in quantities not toxic or dangerous to humans and that give us an opportunity to lock those heavy metals into products made from those plants".

Among cannabis fibre uses are bioplastics, textiles and climate friendly hempcrete used as a construction alternative.

Cannabis's hyper-accumulator reputation was forged cleansing heavy metals from Chernobyl's nuclear fallout zone in the 1990s.

The Ukraine's Institute of Bast Crops that documented the intervention found cannabis had a "very high capability" to suck up heavy metals such as lead, nickel, cadmium, zinc and chromium.

Italian farmers carpeted cannabis around Europe's largest steel plant in Puglia to cleanse dioxins — carcinogenic persistent environmental pollutants — that rendered their produce and livestock unsafe for human consumption.

The technique was adopted in India to neutralise Rawalpindi's textile mills' heavy metal contami-

nation and was considered after Japan's 2011 Fukushima nuclear meltdown, but US-imposed cannabis prohibition laws were too onerous to navigate.

## Traditional methods

DRDGold, a world leader in the recovery of gold from the retreatment of surface tailings, recycles primarily "historic" Gauteng mine dumps for profit using proven water hydraulic methods "with strict water-circuit management protocols".

The slurry is transported through "a network of pipelines lined with high density polyethylene", to tailing dams, said DRDGold's spokesperson, Jane Kamau.

The slime dams contain a "full spectrum of heavy metals" including cobalt, copper, nickel, mercury, gold, zinc, manganese, vanadium, silver and chromium.

Heavy metals in "tailing dams ... are inert" and "mostly" at concentrations subscribing to the minimum standard deemed safe for human consumption according to national water standards, said Kamau.

But, she said, "this situation changes if these metals are allowed to become concentrated through

leaching into the natural environment. It is therefore important that they remain contained."

Campbell says this rehabilitation practice "delays the [heavy metal] problem and does not solve it".

"After a mine is closed, how do we generate the money to keep this maintenance up?"

DRDGold has a Brakpan tailings dam containing about 546 million cubic metres of stored tailings and a 210 hectare dry West Rand Driefontein tailings facility.

The US Environmental Protection Agency says phytoremediation costs range from less than half to 20% when compared with the traditional physical, chemical or thermal techniques for removing hazardous heavy metals.

Campbell's research into growth, genetics and cannabis's biological mechanisms is funded by Wits University to side-step the stiff headwinds from the plant's "stigma".

"As a scientific community we are looking at plants that fulfils most of the criteria needed for a phytoremediation species. *Cannabis sativa* is definitely one of them," he says. "There are a lot of benefits to using the cannabis plant. The issue is getting people on board with it."