The River Basin

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Water Quality: Human Impacts on Water Quality in the Orange-Senqu River Basin:

Microcystines

In dry winters, visitors looking down from bridges over the reaches of the lower Vaal or Orange Rivers might instead of clear water, see a foul-smelling broth coated with a green layer. Algal blooms, the smell of which comes from dying algae, reduce the oxygen levels in the water, often causing fish to die of suffocation.

Hazardous toxins

The most hazardous variety of microcystines are blue-green algae – known also as "cyanobacteria" because in certain conditions some species release cyanotoxins. These algae are toxic. Under suitable conditions they have the ability to make slight changes to their genetics and produce toxins inside the cells. Those toxins are not removed by conventional water treatment works and pose a significant hazard to human health - scientists have found them to cause liver cancer in laboratory animals. It is considered possible that if humans drink water polluted with these toxins, similar symptoms are also possible.

From year to year, there are increasing media reports about cyanotoxins. Examples of such reports include stories of blue-green algae blooms in the Krugersdrift Dam near Bloemfontein, and another where police dogs died after a training programme in the Roodeplaat Dam, which receives sewage effluents from the Tshwane (Pretoria) Metropolitan area. Many cattle have died after drinking polluted water from similarly affected dams; and crocodiles continue to die in the Olifants River catchment in the adjacent Limpopo River basin.

Each year, experts say that the waters of Gauteng and its adjacent regions produce a growing amount of cyanotoxins from blue-green algae. In Europe and the US, 10 – 50 micrograms of cyanotoxins per litre of water are considered a reason to take action. In several of South Africa's dams, experts are measuring 10 000 to 16 000 micrograms per litre; and these numbers are rising.

Danger for the Economy

The circumstances described above have economic consequences. An example from just outside the Orange-Senqu River basin illustrates this point well. Polluted waters from the Hartebeespoort and Loskop Dams on the Olifants River are used to irrigate tens of thousands of hectares of farmland, which produce high-quality vegetables for export to the European Union. However, it has been found that cyanotoxins developing from cyanobacteria found in the water of both dams have accumulated in vegetables. Therefore, in recent years, European food inspectors have strongly criticised the water quality of large areas under irrigation in South Africa. The result of this situation is that agricultural exports from South Africa, worth billions of Rands a year, are at risk; along with the livelihoods of all of those involved in the food production process.

The Need to Reduce Eutrophication

Experts like Dr. Peter Ashton of the parastatal "Council for Scientific and Industrial Research" (CSIR) in South Africa consider it an urgent task to reduce nutrients in the waterbodies of the Orange-Senqu River basin. There are suggestions that the South African government will finally ban phosphates in detergents and lower the current legal limit for phosphate in waste water – from one milligram to a maximum of 0.1 milligram per litre. And of course, farmers and industry need to contribute by releasing fewer nutrients into South Africa's watercourses.

Further measures are considered necessary; they are significantly more expensive than adopting responsible behaviour patterns and updating laws. One of them is refurbishment of the country's sanitation and water treatment infrastructure. All residents of poor neighbourhoods should finally get access to proper sanitation, experts says, and some point to the availability of affordable local solutions. Besides that, many sewage and water treatment plants are in urgent need of repair and modernisation. Right now water treatment can make the problem even worse, suggests a recent CSIR-publication. In this publication alarming news are couched in very scientific terms:

Box: The CSIR Viewpoint on Cyanobacteria and Water Treatment

"The conventional water treatment processes of flocculation (clumping of particles by adding aluminium or iron products), sedimentation and sand filtration, which are commonly used in South Africa, are inadequate to remove cyanobacterial biotoxins from water. In addition, this water treatment method can cause the breakage of cyanobacterial cells and result in the release of cyanobacterial biotoxins. Other cyanobacterial products…are able to chelate iron or aluminium added in water treatment and may thus inhibit flocculation. This also leads to high concentrations of metal ions in the potable water supply. The increase in soluble aluminium concentrations in drinking water supplies presents a health threat to humans as it has been linked with encephalopathy (any disorder or disease of the brain)."

Source: CSIR 2010

The South African Department of Water Affairs regularly reviews the quality of the country's drinking water, as well as the water quality in rivers, dams and

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aquifers. While this should allay fears, it only addresses the concerns of experts to a small degree, as the auditors of course only find those substances for which they are testing. Cyanotoxins are often not on the list required substances measured.

Even more so are a number of particularly toxic contaminants that have been inherited as part of global industrialisation. These substances are discussed on the following pages.

Next: Endocrine disrupting Chemicals (EDCs) and Persistent Organic Pollutants (POPs).