

Ecological infrastructure Case study 3

Restore degraded water catchments and improve farming practices. This reduces erosion, preventing sediment from filling up dams and damaging costly reticulation infrastructure.



The dam busters



MAPOCHS DAM, LIMPOPO PROVINCE

Investing in ecosystem restoration is an investment in built infrastructure, such as dams. Catchment restoration extends the life of existing dams, protects them in various ways, and makes them more efficient. It is also cheaper than building new dams.



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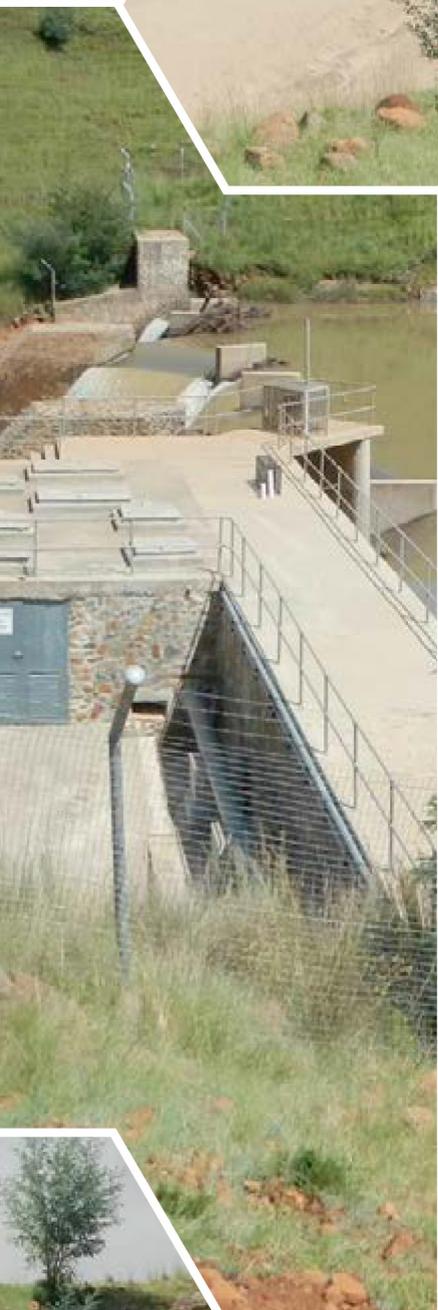
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As the crow flies, the community of Mapochs is just 150 km northeast of the country's economic engine room of Johannesburg.

Here, the Earth's epidermis runs rich with veins of magnetite, platinum, chromium and other metals. These valuable mineral resources are the fuel that stokes the boilers of the country's economy.

Because these minerals are so close to the surface in this region, miners don't need to chase kilometre-long tunnels deep into the crust to extract them. Rather, they simply scoop away soil and rock from the Earth's surface, creating wide, open quarries as they go.

Mapochs open cast magnetite iron ore mine is one such operation where strip-mining shaves off a few metres of rock which the mine then crushes, washes and screens for metals. The problem with disturbing the Earth's crust in this way is that it loosens soil and rock which invariably get picked up by water during the rainy season. This soil and rock then flush down into the nearest water course.

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In this particular case, the sediment washes downstream into Mapochs Dam, a 25 m high reservoir that was built in a tributary of the Steelpoort River in the 1970s to supply water to the Roosenekal Municipality and the mine.

According to independent conservation strategist Mark Botha, this mine-related silt, together with topsoil erosion from poor farming practices, overgrazing, illegal ploughing, and the failure to rehabilitate wetlands in the catchment of the Steelpoort River all contributed to the dam filling up with sediment in just 25 years.

The dam was scooped clean of silt in 2001, but in just 10 years had filled up with silt once again so that by 2011 it had lost its entire water-holding capacity to useless sediment. This shows an increased rate in siltation that may be due to the ongoing expansion of the open cast mine and some catchment degradation, according to the Department of Water Affairs' chief engineer, Kelvin Legge.

If the dam fills with sediment again, with silt already beginning to accumulate in its basin, the sediment could eventually overtop the dam and spill down into the next reservoir in the Steelpoort River, a dam on the De Hoop farm which cost about R3.1 billion to build.

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'The point is what this means in terms of the cost of storage of water to build new infrastructure,' explains Legge.

'The cost of water storage in the De Hoop Dam is about R20 per cubic metre. So the sediment that passes Mapochs Dam now means a loss of storage space in the De Hoop farm dam. When sediment takes up storage space in dams it is not the cost of that storage that should be considered but rather the cost of replacement storage, specifically building new dams.'



This highlights what happens to costly built infrastructure when the water catchments upstream are not managed.

Money invested in keeping catchments healthy is an investment in supporting costly built infrastructure like dams, keeping them efficient and extending their lives. But this case study also reinforces the importance of appropriate land use management decisions, as well as the need to impose compliance with regulations governing ploughing, planning permissions and catchment management.

'If you look at the cost of de-silting a dam or building new ones, you can see that there's an opportunity cost here for us. If we spend a portion of that money upstream of the catchment, and prevent the silt from getting into the dam in the first place,' says Botha. 'This is money spent on employing people to do non-destructive work on the land, rather than using large earth-moving machinery to move useless silt which has to be dumped somewhere else, bringing its own environmental cost.'

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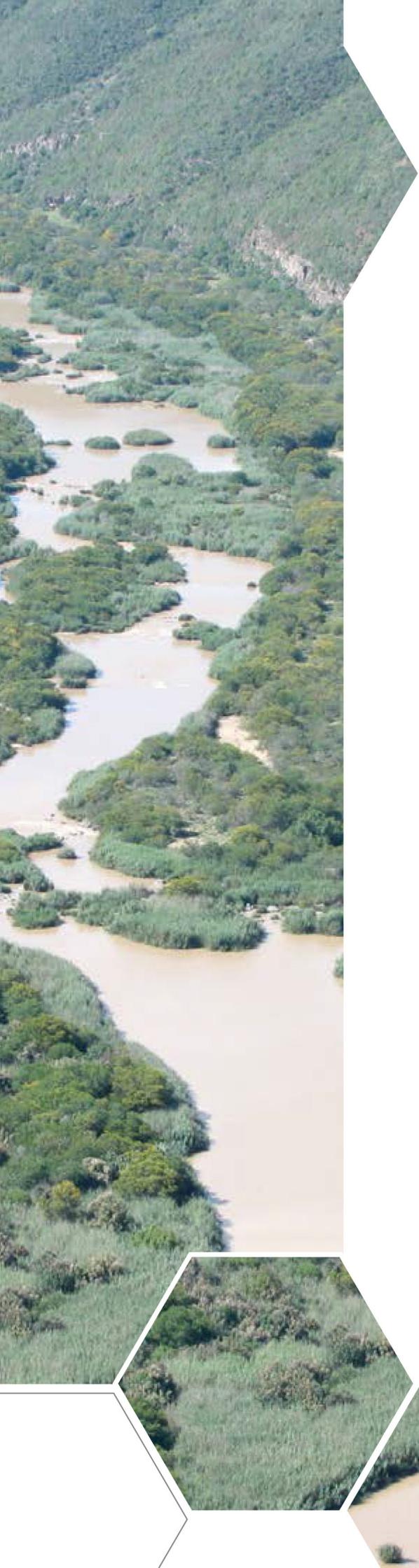
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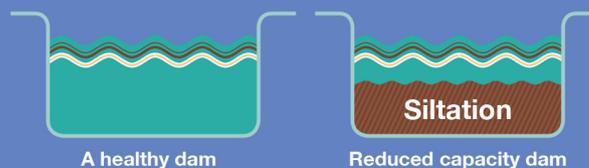
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Sedimentation of river systems due to poorly managed catchments has many other consequences: rivers that are flushed with sediment turn muddy and murky as particles are suspended in the water, damaging the ecosystem functioning by killing fish and crustaceans.

The sediment deposit can also 'blind' or 'smother' sand beds and rapids which are the habitat for larger insects that are critical to the lower end of the food chain and help to clean river water of certain biological contaminants.

If these polluted rivers spill out in the sea, the sediment can also disrupt river mouths which are often important nurseries for different ocean fish species. According to the Department of Environmental Affairs, when the Orange River flooded in 1988, 'over 3.6 million tons of sediment were deposited at sea within a few kilometres of the river mouth'. If this sediment is topsoil, the loss to agriculture is vast.

Siltation reduces dam capacity



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Investing in erosion control and wetland rehabilitation would be an investment in the functioning of the dam itself.

Small dams are also at risk. The case of the Mount Fletcher Dam in the Eastern Cape demonstrates how this valuable and costly infrastructure can be compromised at a small scale, with very local consequences.

Just four years after this dam was finished, 70% of its storage capacity was lost to silt. According to the South African National Biodiversity Institute this was because of overgrazing in nearby mountain grasslands and accumulation of silt from where roads had cut through and damaged wetlands and rivers. Better planning could have avoided this costly clean-up operation in the first place.

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Running out of storage space

‘South Africa doesn’t have many more dam-site options. This means it’s critical that we take care of the dams that we have, extending their lives as long as possible, and keeping them operating efficiently.’

This highlights the importance of preserving ecosystem services of systems that feed into rivers and dams, both for water conservation and in particular water quality,’ explains Legge.

‘The return in investing in ecosystems, compared to the costs of new dams’ water supply per cubic metre should be fairly conclusive.’

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