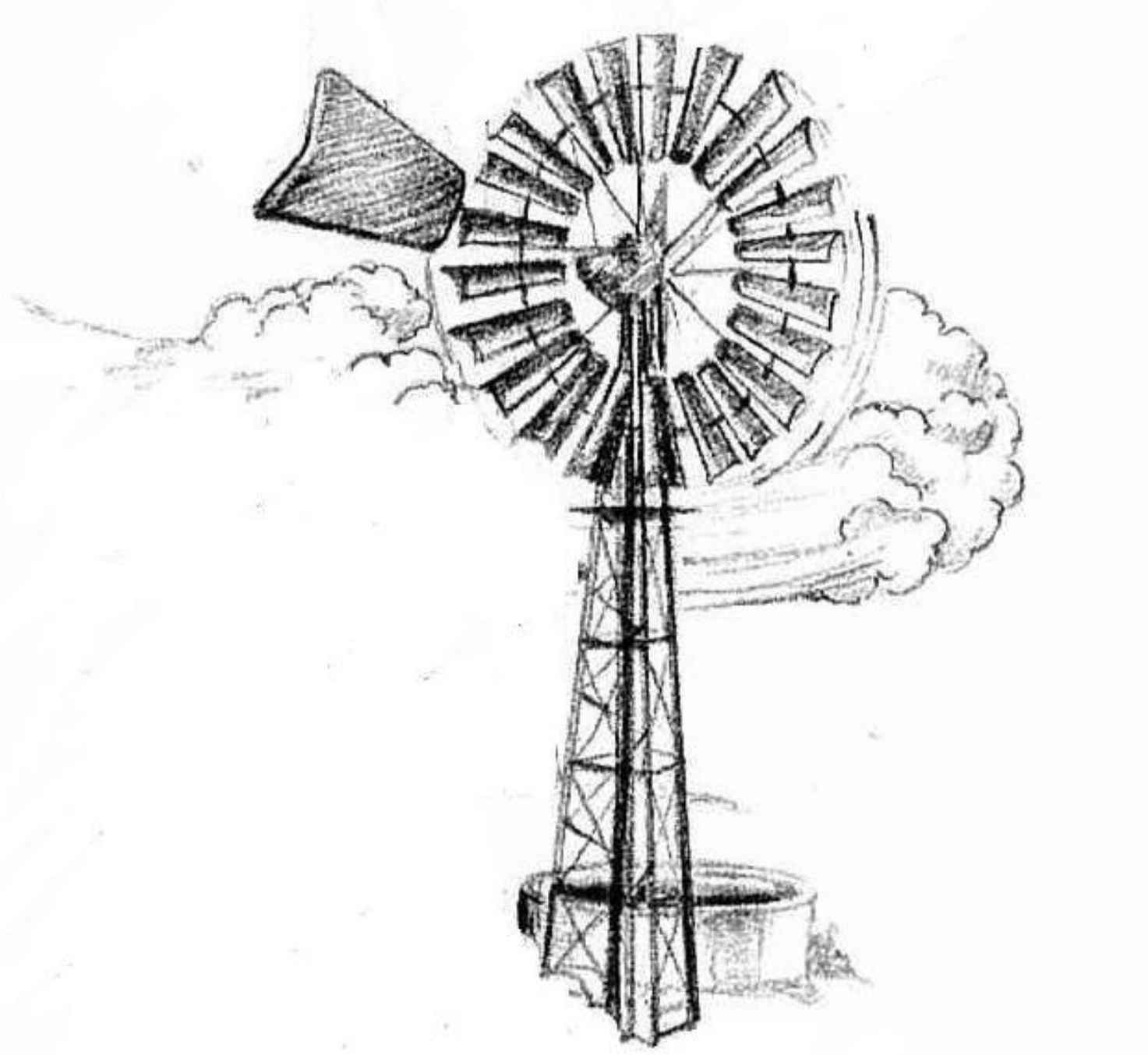
The mighty Orange-Senqu River

Finding Out More

Enviro Fact: Groundwater



Groundwater is the water held in porous sedimentary layers and rock fractures, anywhere from a few metres to hundreds of metres underground.

This water is constantly moving, very slowly through these bodies of rock. Even in dry riverbeds, such as the lower stretches of the Nossob or the Molopo Rivers, shallow groundwater can flow several hundred metres a day. Along the way it sustains a rich variety of plants that tap the sub-surface waters with deep roots.

In the world, 94% of all available freshwater supplies come from groundwater. The SADC region has a population of approximately 250 million people, and groundwater meets 60% of their daily needs, in particular in the rural areas. In the Orange-Senqu River basin the figure is possibly close to 70%. Therefore, in the basin, groundwater constitutes a very important source for water. It is generally considered a cheap and sustainable source of clean water in rural areas. But there are some serious challenges to using and managing the resource, especially in the face of development.

A resource that in many areas cannot be replenished.

It is a major challenge to ensure quality water supplies in many rural areas of the Orange-Senqu River basin. This is especially the case in Botswana, which depends heavily on groundwater for its rural water supply – not just for farmers, but also for city dwellers, who have second or third residences in remote rural areas. Some have a small house with maize fields, where members of the family will live from December to March; some have a house with a kraal for cattle, goats and sheep, where someone will live year-round.

As many of these isolated small settlements in rural areas are many kilometres from government water supplies, they need to be self-sufficient and need access to a deep well or borehole to access groundwater for domestic and agricultural and livestock water supplies.

As Botswana's overall demand for water continues to grow, the country is already tapping into most of its accessible water sources. This includes "fossil groundwater" stored in deep aquifers. In effect, this is water from previous climatic eras (i.e. when rainfall and groundwater recharge were

higher), which are likely not to be replenished. Also non-fossil groundwater reserves are replenished slowly by infiltration of precipitation and surface water that over a period of years or even decades seeps downwards - known as groundwater recharge.

Over exploitation and nitrates – groundwater's biggest enemies

The number of animals held in south-western Botswana cattle posts has increased dramatically over the past few decades. The growing demand for high-quality Botswana beef from the European Union (EU) and elsewhere has led to overstocking. As water comes from boreholes, livestock can be raised in areas that, in the past, were not suitable for cattle. Farmers' livelihoods have improved because they can now use the groundwater. However, this expansion of livestock farming in an area where water is not typically abundant has led to falling groundwater levels and in some cases has reduced the diversity of ecosystems. Boreholes have to be drilled deeper and deeper – which poses a new range of difficulties.

For example, owners of larger herds rely on motorised pumps that naturally break down from time to time. In such situations, some farmers have lost hundreds of animals that perish from lack of water. Apart from these smaller issues, a more significant problem is that most farmers do not know the capacity (quantity) and quality of water in the aquifers they tap into.

About 70% of the Kalahari's groundwater is considered unsuitable due to high salt concentrations in the water, including in many places high levels of naturally occurring nitrate - due to geological factors.

In some areas of the Kalahari, a saline aquifer sits on top of a freshwater aquifer, or vice versa. This means that if one drills without caution, the fresh and saline groundwater mix.

A further threat comes from large herds grazing close to deep wells, where the consequences can be disastrous. Areas that see intensive use quickly become overgrazed, and the excreta close to unprotected wells can enter the groundwater and contaminate it with nitrates from the faeces

and urine of the livestock. Over time, these practices yield the water unusable for livestock watering. Often cattle die because their digestive system converts relatively harmless nitrate into toxic nitrite, which makes their blood incapable of absorbing oxygen. To prevent this, wells should be protected and grazing lands situated at a safe distance. That implies piping water to troughs and erecting suitable fencing – this costs money.

But it isn't only animals that contribute to nitrate pollution of groundwater. There is nitrate effluent from agriculture (fertiliser); and in many settlements of the western Orange-Senqu River basin, one can see rows of pit latrines built uphill from windmills pumping groundwater, often as little as 50 or 100 metres away.

In many areas, nitrates and bacteria from human excreta can render groundwater undrinkable and in some cases toxic.

A distressing example was the groundwater disaster of Ramotswa in Botswana. This small town, situated south-west of

Gaborone, once boasted the country's most productive boreholes. Then, in 1997, the boreholes had to be closed due to dramatically increased nitrate levels in the groundwater. It had been contaminated by waste matter from 3 000 latrines and a small industrial area.

Adapted from the Orange-Senqu River Awareness Kit