

Salt menaces coastal water supplies

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Invading seawater threatens to pollute or destroy scores of Australia's coastal water supplies, water scientists have warned.

And in many urban areas, thousands of bore owners pump groundwater unabated, leading to potential "tragedy of the commons" situations.

In a recent report on the risk of seawater intrusion into coastal aquifers, researchers at the National Centre for Groundwater Research and Training (NCGRT) and Geoscience Australia for the National Water Commission have concluded that more than two thirds of the aquifers they examined were at moderate to [high risk](#) of seawater intrusion.

Around Australia's 35,000-km coastline where 18 million people live, hundreds of towns and communities, and thousands of households and farms depend on freshwater drawn from aquifers. Many of these may be taking too much – risking the aquifers destruction by saltwater, says Dr Adrian Werner of NCGRT and Flinders University.

"A myriad of factors influence seawater intrusion: the geology of the aquifer and its basic properties, the behaviour of [groundwater levels](#), the rate at which water is pumped out of it and the construction of wells, changing sea levels and storm surges. It's a complicated issue, which quite a few people are unaware of," he says.

"The trouble is, once your groundwater has turned saline, it can be extremely difficult, costly and in some cases impossible, to make it fresh again. Also, many communities may not realise how close they are to

reaching that point."

However, in a major advance, the NCGRT researchers have come up with a low-cost, easy way to calculate if a coastal aquifer is at risk of seawater intrusion.

"Seawater intrusion is a worldwide issue – and it is getting worse as sea levels rise and coastal communities take more water out of their aquifers," Dr Werner explains. "Essentially, as the pressure of freshwater flowing underground into the ocean declines, the seawater pushes back inland, generally taking over the lower parts of the aquifer first."

"When people withdraw more fresh water from their well or bore, it can pull a 'cone' of saltwater up from the deeper, saline layer – and quite quickly the water can become undrinkable."

Seawater intrusion is difficult and expensive to monitor, due to its complex nature and the expense of constructing groundwater observation networks, the researchers say.

"However, we've found that by drilling observation bores between the freshwater bores and the sea and measuring salinity levels in both, you can reliably obtain early warning that your aquifer is at risk.

These simple methods, as advocated by Dr Werner and his colleagues at NCGRT and Flinders University, can provide a useful first estimate of the extent of seawater intrusion which allow managers to better design monitoring works and approximate the vulnerability of specific coastal aquifers to seawater intrusion issues.

"This information can be used to develop a sustainable pumping regime, which places limits on the amount of water householders or farmers are allowed to take from their bore."

Unfortunately, he adds, despite extraction limits on groundwater in most coastal community, over-pumping is still occurring in many places.

"It is a form of tragedy of the commons which is taking place in Australia's coastal [water supplies](#)," he warns.

"Once saltwater invades a fresh aquifer, it can be hard to get rid of. Even if you flush the aquifer, the salt can linger in the lower levels and in pockets, especially if it is below sea-level. This means that once an aquifer turns saline, it may be lost for good, even if you stop pumping."

Examples of communities whose coastal aquifers were found to be highly vulnerable to salt water intrusion were found in Perth and Adelaide, and in regional centres such as Exmouth, Derby, Bunbury and Esperance in WA, Eyre Peninsula in SA, Port Phillip Bay in Victoria, and the Burdekin and Bowen areas of Queensland.

The level of vulnerability is expected to increase due to the larger sea-level rises now forecast by the Intergovernmental Panel on Climate Change (IPCC), the expected increase in storm surges expected under climate change, and rising demand for groundwater by coastal communities, Dr Werner cautions.

"This could place a risk a number of quite large [coastal communities](#), local agricultural industries and coastal landscapes," he adds.

"However the good news is that it is fairly straightforward to initially assess if your water supply is at risk – to identify whether additional actions are needed to control the use of groundwater."

Provided by National Center for Groundwater Research & Training

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