Media release

Maths to measure seawater intrusion vulnerability

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A team of Flinders University researchers has developed a new method for predicting how much seawater will intrude into underground water storage systems in the future.

Led by Associate Professor Adrian Werner, from the School of the Environment, the team has devised a new maths-based approach to estimate the vulnerability of coastal aquifers to seawater intrusion, with the research recently published in the international journal Ground Water.

Seawater intrusion is a major problem that occurs in coastal areas as a result of salt water encroaching from the ocean into freshwater storage systems below the earth's surface, known as aquifers, contaminating the water stores.

"Seawater is denser than freshwater so it pushes into the aquifer in a wedge-like shape," PhD candidate Leanne Morgan, who helped develop the new method, said.

"When you stress the system, predominately by removing too much water, the wedge moves inland and contaminates the freshwater, meaning, for example, bores go salty – it can often be very sudden and unexpected, and sometimes virtually irreversible."

Unlike the existing, subjective methods for rapidly assessing seawater intrusion vulnerability, Ms Morgan said the Flinders approach was theoretically based, employing both maths and physics to estimate the sensitivity of aquifers to different stresses, for example climate change.

"We took an existing mathematical model for estimating the extent of seawater intrusion and extended it using calculus to develop equations that describe the propensity for seawater to move into aquifers under different stresses, including sea level rise, pumping and recharge change."

Meanwhile, Ms Morgan is working on a wider study, funded through the National Water Commission, to identity high-risk aquifers along Australia's coastline.

Results of the National Scale Vulnerability Assessment of Seawater Intrusion study – a collaboration between the National Centre for Groundwater Research and Training and Geoscience Australia – are expected to be released next month.

"More than 85 per cent of Australians live within 50km of the coast and with the population increasing and climate change pressures, it's important to assess the threats to coastal aquifers because they are a major water resource," Ms Morgan said.

"The concern is that with increased extraction, rising sea levels and reduced recharge due to reduced rainfall, our coastal aquifers will become more at risk from seawater intrusion.

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