ECOS
SCIENCE FOR SUSTAINABILITY

www.ecosmagazine.com

Published: 23 April 2014

How much water do big rivers deposit in underground 'banks'?

An Australian-based water scientist is testing a new technology to help save imperilled underground water resources in Australia and around the world as climate change tightens its grip on the global food supply.

Credit: Paul Hermans/ Wikimedia Commons under CC BY-SA 3.0

Dr Margaret Shanafield of the National Centre for Groundwater Research and Training at Flinders University, South Australia, has developed an innovative way to measure how much water is stored underground when big rivers are allowed to flood.

The technology is being put through its paces on the Colorado River, where it runs through Mexico, following initial trials in a canal flowing into the Coorong, at the mouth of the Murray-Darling system.

Overuse of groundwater to meet the demands of a burgeoning world population, is threatening landscapes, food production and even some cities around the world, Dr Shanafield says.

'Groundwater makes up 95 per cent of the available fresh water on the planet,' she explains. 'It provides water for drinking, for food production and industry – but it also waters forests and savannahs and keeps lakes and rivers filled. When it runs short, all of these suffer.'

A key to avoiding future water crises is being able to predict how water in a big river soaks into underground aquifers – when, where and how much, she says. 'Groundwater is the world's water bank – and we need to understand how much is being deposited and withdrawn if we are to manage it wisely.'

Dr Shanafield has developed a complex mathematical model which describes what goes on when ephemeral rivers – those that flow only part of the year – flood.

It uses complex calculations involving the speed of a flood-wave or advancing streamflow and the rate at which water can flow through the subsurface material. This can reveal which sections of a riverbed will allow water to seep through the ground and estimate how much water escapes downstream and how much soaks in to be stored underground.

Due to extensive water diversion, the lower stretch of the Colorado River, which runs through Mexico, is bone dry and has not reached the sea since 1982.

This month Dr Shanafield will be working with US scientists who plan to release 130 million cubic metres of water in an 'environmental flow' aimed at reviving the river's dying landscape.

Her model will be used to calculate how much of the released water is stored underground and where, so it is subsequently available both to the environment and to water users downstream.

Dr Shanafield carried out initial pilot testing of the model using an irrigation canal on the Coorong.

'Recent drought and flood events in parts of Australia highlight the importance of our highly variable river flows,' she says. 'They provide a perfect case test-bed for this model, especially in arid regions where river beds remain dry for much of the year and only flow during periods of high rainfall.'

Dr Shanafield says the model could prove especially useful in the type of low-gradient rivers common to Australia, where surface or groundwater removal by industry, agriculture and local communities is endangering aquifers, ephemeral surface rivers and the ecosystems and human activities that they support.

'It means that instead of making generalisations about groundwater recharge volumes over long stretches of a surface water system, water managers, policy makers and users can acquire quite specific data which they can use to plan, and to fine-tune their management.

'It provides the sort of information we need to keep the world's water bank balance in the black, rather than in the red.'

The director of NCGRT, Professor Craig Simmons says total global groundwater use is estimated by scientists at around 1000 cubic kilometres a year, with the largest users being India, China and the USA.

'UNESCO estimates that, since 1900, the world has drawn down its groundwater reserves by an estimated 4500 cubic kilometres – and demand is continuing to increase, especially in arid countries, which are rapidly running short of water that can be affordably extracted.

'A significant part of the world's food supply depends on groundwater – which is already starting to run short in critical regions such as the western USA, Mexico, northwestern Sahara, Indus Basin and North China Plain,' Professor Simmons says.

'This is an issue every consumer should be concerned about, because it affects the price of food globally.

'In recent years we have seen large fluctuations in the world harvest and food prices, driven by a changing climate. This means the world food supply is likely to be increasingly dependent on groundwater – and if that starts to run out, we're all in trouble.

'Dr Shanafield and her colleagues are pioneering a vital technology to help us avoid that situation. It is a fresh example where Australian science can have a global as well as a local impact.'

Souce: National Centre for Groundwater Research and Training

From **ECOS** online http://www.ecosmagazine.com/?paper=EC14083