# THE WORLD WIDE WATER WEB DEPENDS ON NATURAL STORAGE

## Replenishing the system to support sustained availability

The world's water supply is under pressure today. Countries and regions around the globe are challenged to address water scarcity.

According to the United Nations, water scarcity can mean scarcity in availability due to physical shortage, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure.[1] Geography, culture and local economies also affect availability and access. Impacts of climate change add to the complexity of the issue. Increasing use amplifies the need to better manage demand from people, industry and the environment.

To explore the critical role of natural storage in providing a sustainable water supply worldwide, we spoke with Mike Woolgar, Water Strategy Director, United Kingdom (UK).

***How would you describe the relationship between natural storage and the state of the world's water supply today?***

**Mike Woolgar:** Many human activities have tended, over time, to damage natural storage—such as lakes, ponds and aquifers—through draining ponds and marshes; channelizing rivers so they flow rapidly to the sea instead of recharging natural storage; polluting streams and lakes so they become less usable; and over-drawing from groundwater. Add in population growth and the effects of climate change, which will almost certainly alter the distribution of rainfall if not the actual raw volume, and our storage systems are coming under more and more pressure.

Humans and society have tended to draw from the natural storage bank as though it were infinite, but it is not. We need to recognize the value of water and the cost of overuse and pay back some of the debt by restoring storage. We need to replenish the system to reduce its fragility and establish a healthier balance between supply and demand, including everyone's needs over the long term.

Restoring storage is good all around; it helps people, plants and wildlife and improves the environment overall. To have useful, affordable, good quality and sufficient water, there must be a healthy water environment, which requires all of us to make sure that water sources are not polluted or overused. We also need to understand how sources interact with each other within the water system—what I call the world wide water web.

***Can you expand on this concept – the world wide water web?***

**Mike Woolgar**: All aspects of our lives are related to water availability—the right quality in the right quantity and at the right time and place. It's hard to think of anything we do that is not

[1] United Nations, www.unwater.org

dependent on the movement, treatment, management and use of water. One use affects another, either directly or indirectly; in our daily lives, we should think about water in the context of a world wide web of interconnectivity and interdependence.

When the amount of water available is over and above the needs for it—drinking, bathing and other domestic uses, industry, agriculture, as well as a functioning environment—then the interdependencies of the web are not evident to us. When demand rises really close to available supplies, or worse, when demand outstrips availability, then the web strands compete, showing the fragility of the web system. The weakening effects become all too clear—drawing on more resources in one part of the system reduces availability in another. Stresses and strains call attention to unmindful consumption, which stands in the way of sustainable outcomes. Ample storage in the system helps to provide a sustainable ecosystem—which supports affordable and sufficient supply.

The situation can be very different in different places. Where there is a large surplus over demand, the need to make changes is less urgent compared to where water availability is stressed. For example, a beer brewer I was talking to a few years back developed a water-use standard to reduce the water use per litre of beer produced; however, as they sought to implement the standard, the brewer discovered that in Peru they needed to make even more investment to both secure their supply and ensure that the local vegetable farmers were not affected by their operation; in contrast, in the Czech Republic, investment in reduced water use was not needed and in fact would have just increased costs and energy consumption in a region where water was abundant.

Good water management around the world is important to keep more storage in the environment as a whole, which creates a buffer between our usage and the available supply. Mindful consumption helps the natural environment continue to flourish and allows us to draw a little more without going into overdraft when there is an extended dry period.

## *How could climate change affect storage?*

**Mike Woolgar**: The effects will differ depending on the scale and type of climate change impacting every location. For example, low-lying natural water storage near the coast may well be swamped by sea-level rise over time, and the varying rainfall, which we expect, will alter the timing and volume of river flows. Studies by the British Geological Survey and UK Centre for Ecology & Hydrology[2] show that storage in groundwater aquifers in the UK may be affected; the impact is very dependent on the way that climate change affects the intensity of rainfall and its distribution over the year. Climate change influences on temperature and the growing season will affect plant uptake of water, which in turn can affect water storage in soil and river flows.

## *What are the ways that storage can be restored to support a sustainable water supply?*

**Mike Woolgar**: All sorts of ways, large scale and small scale, especially if one is willing to define storage widely enough. We will need to restore natural storage and probably supplement it with new reservoirs, or, subject to energy and carbon

2 Christopher R. Jackson, Rakia Meister and Christel Prudhommel, "2011 Modelling the effects of climate change and its uncertainty on UK Chalk groundwater resources from an ensemble of global climate model projections," Journal of Hydrology, 399 (1-2), 12-28.

cost, with desalination, which takes from the ultimate storage, the sea. Efforts can include restoration of wetlands, peatlands and natural river courses to improve water retention. The restoration of peatlands and wetlands has been helpful in the UK. Restoration, by increasing the amount of water held in storage, reduces carbon releases, and the additional water held in the "sponge" is released slowly into streams, which means that water can be taken for treatment for water supplies more reliably.

People should be mindful of how they waste water, and thus use less—which allows more water to stay in the system.

Households can capture rainfall in on-site storage to avoid drawing water from remote rivers, lakes and reservoirs. For example, in New Zealand, some 10 percent of households reportedly use harvested rainwater for drinking;[3] many households around the world rely on wells and springs for domestic purposes. Storage in these natural systems can be enhanced by capturing more rainfall.

If everyone with a garden installed rainwater butts for garden watering, the additional storage would quickly mount up. Less water would then need to be taken from the municipal system.

In the UK, we have lost a huge number of ponds. All villages used to have them for watering cattle and other livestock; over time many of these ponds have been filled in. Thankfully, the number of ponds is now growing again.[4] Though we won't use the water for domestic purposes, replenishment is a good thing for the environment and natural storage generally.

In the developing world, there has been a great deal of interest sand dams.[5] These are leaky barriers on seasonal rivers that capture sand and other river-bed material, meaning that water can be retained in the sandy deposits for some time after the last flood has passed. This water will tend to increase local groundwater levels and make water available for a period during the dry season; by replenishing groundwater, there is less need to use water from deeper below the earth. There are now many of these sand dams in Kenya.

***How could large-scale water users, such as agriculture, industry and utilities, improve practices to help establish a healthier balance between supply and demand?***

**Mike Woolgar**: Large-scale users like agriculture could adopt no-till farming, which in the right soils can reduce losses and increase soil water retention; they can also build on-farm storage to capture excess winter river flows. Industry could recycle more of their water, reducing what is taken from the environment and keeping their water resource stored on site in their recycling plant. Water utilities can, subject to cost of course, build new reservoirs or install new water transfers to dry areas from places with excess water storage; utilities can also reduce leakage and losses from supply systems, which would allow more water to stay in the system.

***Recognizing the complexity of the world wide water web, what advice can guide people and communities as they consider how to address water scarcity?***

**Mike Woolgar**: Individuals may feel that using slightly less water every day is insignificant, but,

[3] Building Research Association of New Zealand (Branz)
[4] Countryside Survey Technical Report 7/07, January 2010
[5] The Water Project, www.thewaterproject.org

if enough of us just do it, the effect can be huge. When addressing the issue collectively, some interventions can be costly—paying back the environmental debt I mentioned earlier. However, bringing the right combination of interventions that consider today's and tomorrow's needs is vital to sustained water availability throughout the world.

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