

# Mixed water portfolio helps thirsty cities

January 18 2010

---

(PhysOrg.com) -- Computer simulations for drought-prone areas reveal that when urban water planners combine three approaches of buying water -- permanent rights, options and leases -- the city avoids surplus water and high costs, and reduces shortages, according to civil engineers.

"Just like with stock portfolios, if you buy diverse stocks, you diversify your risk," said Patrick Reed, associate professor of civil engineering, Penn State. "Right now, cities don't necessarily diversify their risk through the ways in which they buy water."

Reed and his colleagues are trying to understand the benefits and trade-offs associated with buying water using a mix of market instruments in the Lower Rio Grande Valley of southern Texas. Those models incorporated the various purchasing options, along with variables such as cost, amount of surplus water and the probability of water shortages.

The researchers found that when cities in the region rely solely on permanent rights, they could incur high costs -- \$13 million a year -- and require lots of surplus water yet still face significant supply failures in drought years. Alternatively, a careful mix of permanent rights, options and leases can dramatically lower costs -- \$10 million a year -- increase water available to the environment and avoid supply failures during droughts.

A major focus of the research is to provide decision-makers with water planning models that graphically illustrate how options, leases and permanent rights affect cost, surplus water and probability of water

shortages.

"This work not only demonstrates how we can combine multiple objectives to solve a problem, but also visualize the problem and learn from it," said Reed. "It is an innovative hybrid between engineering and policy to create highly adaptive and resilient water supply systems."

Most cities that buy water rely on permanent rights to ensure reliable water supply. It is like buying a percent of the water flowing into a reservoir.

"But you do not know what the inflows are going to be so you are essentially buying a percent of a question mark," Reed adds.

Often the city ends up buying a lot of water to cover potential shortages, resulting in extra cost and surplus water that is not available for other uses. If a city fears there will be shortages, it can purchase a monthly lease to cover the shortfall. But because demand is already high by then, the city pays a high price for the water.

The other choice for urban planners is to use options, which let them buy water at lower prices at a later date.

"It takes the volatility out of pricing and they (planners) can buy a volume of water at the original price later in summer when demand is high," said Reed.

The researchers reported their findings in a recent issue of *Water Resources Research*. Reed says the team's findings are especially relevant in the face of growing population and climate change.

The team tested its model against the worst drought on record in the Lower Rio Grande Valley. It found that the city made significant savings and averted water shortages when it used a diverse set of market

instruments to buy water.

"We were able to find a solution that does not have any critical water shortages, without having surplus water or substantive costs," Reed explained.

Researchers say the simulations present utility companies with a variety of solutions for efficient water management, along with the implications of each solution.

The simulations also suggest that utilities that start off with a less diverse portfolio begin to use more of the market when drought happens and the city starts running out of water. In contrast, when utilities use more of the market at the start, the city saves money and averts water shortages in a [drought](#).

"Economic instruments such as leases and options provide a lot of flexibility to urban [water](#) planners, particularly in the western United States," said Reed. "They provide the ability to be resilient to droughts."

Provided by Pennsylvania State University

Citation: Mixed water portfolio helps thirsty cities (2010, January 18) retrieved 7 May 2024 from <https://phys.org/news/2010-01-portfolio-thirsty-cities.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.