# New water management tool may help ease effects of drought

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Continued improvement of climate forecasts is resulting in better information about what rainfall and streamflow may look like months in advance. A researcher from North Carolina State University has developed an innovative water management framework that would take advantage of these forecasts to plan for droughts or excess rain in order to make the most efficient use of an area's water resources.

By using climate forecasts for short-term planning, water managers can better plan for potential shortages due to drought, says Dr. Sankar Arumugam, an assistant professor of civil, construction and environmental engineering at NC State and lead author of the paper. For example, managers could encourage stakeholders to put water-use restrictions in place and launch a water conservation campaign before the drought even arrives. Managers could also use this approach to determine how best to take advantage of surplus water supplies. For example, hydropower facilities could generate additional power instead of spilling the excess water. Arumugam notes that the use of forecasts for planning would also make water managers better able to account for increased water demands due to population growth.

"Our paper proposes a framework that would use forecast data to improve water management, allowing water managers to be proactive with their planning rather than reacting to events after the fact," Arumugam says. Water managers at the federal, state and local level determine how much water can be allotted to various uses, such as hydropower, agriculture, municipal use, recreation and the protection of

aquatic species.

Arumugam says advances in the understanding of how changes in ocean temperature affect the atmosphere and, ultimately, precipitation and temperature, make seasonal or longer-term climate forecasts increasingly reliable. At the same time, Arumugam says, water management is becoming more important due to increasing global population - which means greater water demand - and global climate change, which could stress both humid and arid regions with the former getting wetter and the latter becoming drier.

The proposed framework acknowledges that climate forecasts contain an element of uncertainty, and attempts to mitigate that uncertainty by incorporating water contracts. "These contracts give end-users, such as farmers and municipalities, some idea of what they can expect - allowing them to plan accordingly based on the uncertainty in the climate forecasts," Arumugam says, "It also offers insurance in the form of compensation if the forecast is incorrect and water managers cannot meet the terms of the contract." Similarly, Arumugam explains, if the forecast is accurate and the terms of the contract are met, water managers will have made the most efficient use of the available water resources and will receive a performance fee from the end-users who were party to the contract.

"Although there is uncertainty associated with forecasts, they are correct over the long term, and using this framework would result in long-term benefits for both water users and managers," Arumugam says. For example, the researchers performed a case study looking at the state of Ceara in Brazil, which is an arid region that receives little or no rainfall from June through the following January. "We found there would be significant benefits for the region, primarily in alleviating the vulnerability of poor farming communities if this framework was implemented," Arumugam says.

More information: The study, "Improved Water Allocation Utilizing Probabilistic Climate Forecasts: Short Term Water Contracts in a Risk Management Framework," was published in the Nov. 11 issue of Water Resources *Research*.

Source: North Carolina State University (news : web)