



Australian water tools for predicting water availability in low data environments

A Regional Drought Mechanism pilot project

Drought has serious economic, social and environmental impacts and can persist without clear signs of onset and recovery. A range of satellite and on-ground data can help identify areas at risk of drought. Many drought-prone developing countries do not have the resources to collect and analyse this data, making it hard to prepare for drought.

As part of the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) Regional Drought Mechanism, Australia piloted an innovative approach to producing national-level assessments of water availability and water scarcity in Cambodia by integrating three water management tools widely used in Australia.

Background

UN ESCAP established the Regional Drought Mechanism under its long-standing Regional Space Applications Programme for Sustainable Development (RESAP). Australia is a long-term RESAP collaborator and an important contributor to developing the Regional Drought Mechanism.

The Drought Mechanism provides governments and farmers with a toolbox of space-based products, information, and services to support evidence-based, proactive decision-making. It also provides training and technical support.

In February 2016, the Cambodian Government requested UN ESCAP to adopt Cambodia as a Regional Drought Mechanism pilot country. The Cambodian pilot included the Australian project to trial an innovative approach to developing national-level assessments of water availability and water scarcity, based on satellite rainfall, available in-situ data, and re-analysis of global climate data sets.

While the Drought Mechanism provides metrics to show the onset of meteorological drought (i.e. lack of rainfall and low soil moisture), it has limited capacity to predict the impact of a hydrological drought (i.e. low levels of streamflow, reservoir/lake or groundwater). Low water availability presents significant practical challenges, for example, if river flows are too low for pumps to work or to fill irrigation channels.

The Australian project built on the Drought Mechanism by adding hydrological drought metrics, generated by integrating three Australian water tools.

Australian Water Tools

Geoscience Australia, Digital Earth Australia Open Data Cube

ODC technology is a free, open-source global initiative that makes data analysis easier, reduces the overall cost for users, and lowers the technical barriers traditionally associated with managing and analysing large amounts of earth observation data. Digital Earth Australia ODC was one of world's first operational cubes.

Australian Bureau of Meteorology (BoM) Water Forecasting tools

This service provides information on likely streamflows for the next seven days and the next three months (seasonal streamflow forecast). It indicates whether a river is likely to rise, fall or stay the same, and how this compares to the average flow for that time of the year. The forecasts are generated automatically by combining real-time observations of rainfall and streamflow from Australia's national network of rain and river gauges with the Bureau's rainfall forecasts. Hydrological models calculate how much runoff is likely at key locations.

Key Findings

- Integrating the three tools is technically feasible and can be applied to other countries.
- The approach can provide forecasts in areas with limited gauging networks by supplementing the local networks with remote sensed data, which in turn can support better water management and governance.
- Connecting with the Cambodia ODC enabled many Source model inputs to be generated automatically, reducing the time to build the model, potentially making modelling more accessible to water managers.
- Complex information can be communicated in a relatively simple format, and accessed through mobile technology.
- The metrics could be developed and presented at relatively low cost.

eWater Source

eWater Source is a hydrological modelling platform used throughout Australia and increasingly around the world, especially in Asia. It takes rainfall and other meteorological inputs and combines this with relevant factors, such as water management infrastructure (reservoirs, irrigation systems, etc) and land use (cropping, forestry, urban, etc) to produce a water balance of the study area. In advanced applications, Source can forecast the likely water available based on rainfall predictions.

The Cambodian pilot

The Cambodian project involved:

- Preparing a Cambodian Open Data Cube (ODC) using public data sets.
- Data processing, by connecting the Cambodian ODC with the BoM's tools for producing bias-corrected rainfall estimates and streamflow forecasts.
- Developing workflows to connect the Cambodian ODC with Source to estimate water balance and flows.

An interactive dashboard was created to communicate drought and water availability metrics. Users can look at historical information across Cambodia and more detailed information including forecast streamflow for three trial catchments. The dashboard is hosted by eWater on Amazon Web Services and is publicly available at <http://escap.ewater.org.au>.



UN ESCAP dashboard

Potential next steps

- Testing the communication products in a real environment with farmers and stakeholders.
- Exploring opportunities to strengthen results, i.e. whether more advanced model calibration or using regional climate models to assimilate gauge data improves the forecast streamflow accuracy.
- Developing workflows to automatically update data fed into the Cambodian ODC and subsequently into the forecasting tools and Source.

For more information, download 'WaterTools: A Guide to three national level platforms that support the management of Australia's scarce water resources' from waterpartnership.org.au/publications.

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