



# MANAGING COMPETING WATER USES IN THE PHILIPPINES: ANGAT RESERVOIR

Water is critical for development. As water demand increases, especially in urban areas, competition over finite water resources also increases. Water resources often must be shared between agriculture and growing municipal and hydropower needs. Under these increasing pressures, the ability to withstand droughts and floods is diminished, leaving urban and rural communities even more vulnerable to climate extremes.

The Angat reservoir in the Philippines provides 97% of the water supply for metro Manila, home to 11 million people. Water from Angat also provides irrigation for about 30,000 hectares of rice in Bulacan Province over two seasons, supplies 248MW of hydropower for the island of Luzon, and provides flood protection for downstream communities. The region is strongly affected by inter-annual climate variability, particularly related to the El-Niño Southern Oscillation (ENSO) cycle. In dry years, there is insufficient water for all uses; in wet years, careful management is required to avoid serious floods. The National Water Resources Board (NWRB), in consultation with stakeholders, must allocate water across urban and rural uses—an increasing challenge given growing demands.

With funding from the US Agency for International Development (USAID) and the National Oceanic and Atmospheric Administration (NOAA), IRI has worked since 2003 with NWRB, the national meteorological service (PAGASA), and other stakeholders to identify potential climate risk management strategies. This includes the use of leading edge climate information, such as seasonal forecasts of reservoir inflow, to improve management of the impacts of climate variability in the context of this shared water system.

## Toward a Climate Risk Management Strategy for Angat

Project research has led to important advances in three areas:

**Institutional landscaping.** In partnership with socio-economic researchers at the University of the Philippines, Los Baños, IRI has undertaken



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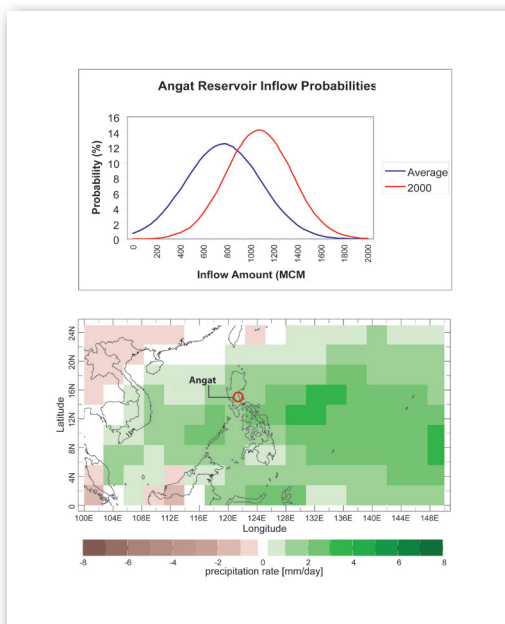
detailed analysis of the policies and regulations guiding water allocation, and through extensive dialogue with stakeholders, mapped how the process works in practice. Understanding the specific needs and constraints of decision-makers is critical to guide climate research and tool development.

**Collaborative climate research and capacity building.** Research undertaken in collaboration with the Philippine meteorological service (PAGASA) has yielded promising results in predicting the summer monsoon onset, and identified a seasonal reversal of the ENSO rainfall signal. PAGASA has gained the capacity to use IRI's Climate Predictability Tool to produce downscaled climate information, including forecasts of Angat inflow based on output from Global Climate Models (GCMs). PAGASA has also received training in regional climate modeling.

**Development of tools/risk management strategies.** In collaboration with NWRB, IRI has developed a reservoir model that integrates seasonal climate forecasts with NWRB's current reservoir management decision process. It is based on the currently used reservoir model, which projects reservoir levels three to six months in advance given particular water allocation decisions. IRI has developed a user-friendly interface for the tool, allowing users to visualize probability curves associated with particular scenarios of future water availability. This tool, presented in a stakeholder workshop in May 2007, could help NWRB and stakeholders better assess possible outcomes from particular allocation decisions given climate conditions in a particular year.

## About the IRI

The IRI works on the development and implementation of strategies to manage climate related risks and opportunities. Building on a multidisciplinary core of expertise, IRI partners with research institutions and local stakeholders to best understand needs, risks and possibilities. The IRI supports sustainable development by bringing the best science to bear on managing climate risks in sectors such as agriculture, food security, water resources, and health. By providing practical advancements that enable better management of climate related risks and opportunities in the present, we are creating solutions that will increase adaptability to long term climate change. IRI is a member of the Earth Institute at Columbia University.



An inflow forecast for Angat (top) shows a shift towards greater inflow (red curve) compared with average conditions (blue curve) by taking into account a forecast of rainfall anomalies for the region (bottom).