Climate Informed Decision Tools for a Multi-use Reservoir: The case of Angat and Manila, Philippines

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Outline

• Climate and Water Resources Risk in Manila

• Decision Tool for Water Allocation
  – using seasonal forecast

• Dry-year Option Contracts

• Conclusion – Climate Risk Management for Water Managers
  – Building Resilience Systems
Northeast Monsoon (Oct – Dec)
Inflow to Angat Reservoir

Streamflow (in hm³) vs Rainfall (mm)

- Streamflow
- Rainfall

JJAS – 30%
OND – 46%

3-months lag correlation

\[ \rho(Nino3.4,Q_{JJAS}) = -0.20 \]
\[ \rho(Nino3.4,Q_{OND}) = -0.51 \]
Seasonal Climate Forecast
Angat Reservoir – Manila Water Supply

Aerial view of the Angat Hydroelectric Plant

 Courtesy of Mr. Rodolfo German (Angat dam)
Reservoir Management

Forecast of Inflows

Hydropower
Water Delivery
Storage
Spill
Critical Months for Water Management

![Bar chart showing the number of years with spills by month. The chart indicates that November and December have the highest number of spills, with January and February having a relatively lower number.]
Angat Decision Rule

ANGAT H.E. PLANT

ELEVATION (m)


UPPER LOWER
Dynamic Rule Curve

Flood

Inflow
Dry Forecast

Less Flood Risk

Less Inflow

More Storage Possible
Wet Forecast

Greater Flood Risk

More Inflow

More Release Possible
Decision Tool for Water Management

Seasonal Inflow Forecast
Increased Hydropower

Hydropower Generated (in GWH)

- Actual
- Updated Forecast
- October Forecast
- Observed

Year

1987 1989 1991 1993 1995 1997 1999 2001

Observed Inflow

0 50 100 150 200 250 300 350 400
Irrigation Improvement

Year

Allocation for Irrigation (in hm³)

- December
- November
- October

Current Reservoir Contents

Low Inflow

First Priority: Manila Water

Remaining Water: Agriculture and Hydropower

"Business as Usual"

Urban Centers
Dry Year Option Contracts

Current Reservoir Contents

Probabilistic Inflow Forecast

Contracts w/ Dry Year Option
Climate Risk Management for Water Managers

• Building Resilience Systems
  – Seasonal Climate forecasts
    • Early Warnings of Drought, Flood
  – Decision Support
  – Economic mechanisms
    • Dry year option/insurance

• Better outcomes
  – Maximize the “good” years
  – Reduce risk exposure in dry years
Thank You!

The mission of the IRI is to enhance society's capability to understand, anticipate and manage the impacts of seasonal climate fluctuations, in order to improve human welfare and the environment, especially in developing countries.
• Thank you!