Developing and Applying Climate Information for Supporting Adaptation in South East Asia

Application of Climate Change Data to Estimate Irrigation Design Water Duty

This case study demonstrates the use of bias-corrected downscaled climate model data in a paddy water balance model to assess the impact of climate change on irrigation design water duty in the Philippines.

The use of climate services to support climate adaptation in Asia and the Pacific, in particular, is challenged by limited reliable climate information, insufficient capacity to interpret and use of climate information, and limited technical and financial resources.

To address this, the Asian Development Bank supported a technical assistance (TA) project, TA-8359 REG: Regional Climate Projections Consortium and Data Facility for Asia and the Pacific. One of the core activities of this project was to engage on-country project teams to conduct case studies whereby in-country capacities are strengthened through direct involvement in the development and use of climate information in climate change impact assessments.

Following the 10-step approach outlined in the guideline (available at www.rccap.org), this case study focuses on the development of climate information and its application in an impact assessment on paddy water balance.

Context

The National Irrigation Administration (NIA) is mandated to develop all available water resources in the Philippines. It aims to improve its operational capability in designing or retrofitting irrigation systems. Without additional infrastructure and no area available for expansion, the consideration is to increase the efficiency in irrigation operations.

This case study focuses on water duty (liters/second/hectare) to enhance water distribution mechanisms to reduce the effects of seasonal climate change and variability on water supply.

Results

The results of this case study stressed that water availability versus water requirement, as represented by effective rainfall, is largely affected by seasonal changes or variability rather than long-term climate change. It so happened that the location chosen for the case study (Cabanatuan and Muñoz, Nueva Ecija) showed a slight increase in long-term rainfall (wetter regime).

The working efficiency of the irrigation system in this case is still greater than 80% and can be interpreted as not affected by climate change. In case of a severe drought conditions, such thresholds could be breached, so in those cases higher water duty will be needed to maintain the required operations in the field.

Data and Methods

Location
Cabanatuan City, Nueva Ecija (using the Central Luzon's State University's Agrometeorological station)
Latitude: 15.42 °N, Longitude: 120.54 °E

Climate variables
Daily rainfall, mean monthly air temperature (optional)

Time period
1971–2000 (baseline) and 2036–2065 (projections)

Climate data

Outputs from climate model simulations based on two forcing scenarios: RCP4.5 (lower) and RCP8.5 (higher)

Climate simulations:

- CC10-CCSM (regional climate model showing the largest drying at this location)
- CC10-MPI-ESM-LR (in the middle of the projections as is representative of the most consensus)
- Global climate model results from GMCC-CESM and CMCC-CM5 (CMCC-CM5 results had the greatest increase in rainfall but this did not have results for RCP4.5, so the results for CMCC-ESM were also chosen)

Model output bias-corrected using the monthly quantile scaling method

Design water duty assessment

Water duty is computed separately for the wet season and the dry season. For the design of the diversion works and the main canal, the highest water duty for the wet season or dry season is adopted. The computation is done on a 10-day basis considering that the water stored in the paddy will be sufficient to supply the crop requirement for 10 days with zero rainfall. If no irrigation is provided after ten days, the crop will be damaged or the yield will be significantly reduced.

The full case study report, along with the 10-step guideline, is available on the RCCAP portal at www.rccap.org.

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