ICIMOD

TRAINING REPORT ON

The impact of climate change on the Kabul River basin using the JAMS/J2000 modelling system

06-16 November 2019
Kathmandu, Nepal

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Strengthening Water Resources Management in Afghanistan (SWaRMA)

Background

The Strengthening Water Resources Management in Afghanistan (SWaRMA) Initiative conducted an institutional capacity building training on climate change and its impacts on the Kabul River basin from 6 to 16 November 2019 in Kathmandu, Nepal. The training was a continuation of a series of trainings on hydrological analysis and modelling by SWaRMA, which is supported by the governments of Afghanistan and Australia and implemented by the International Centre for Integrated Mountain Development (ICIMOD) and the Commonwealth Scientific and Industrial Research Organization (CSIRO). SWaRMA has been co-creating knowledge and providing co-learning opportunities to enhance the capacity of Afghanistan partners in managing water resources.

Previously, in collaboration with the National Water Affairs Regulation Authority (NWARA) (formerly the Ministry of Energy and Water (MEW)), Afghanistan, SWaRMA had organized a training on the application of the J2000 hydrological model in the Kabul River basin from October to November 2018 in New Delhi, India. Subsequently, two participants joined ICIMOD as interns for one-and-a-half months for an in-depth training and to set up the Kabul sub-river basin model.

About the training

The November 2019 training involved six participants representing NWARA, Kabul Polytechnic University (KPU), and Afghanistan's National Environmental Protection Agency (NEPA). They were all participants of the New Delhi training in November 2018 as well.

The J2000 is a standard hydrological model within the JAMS Modelling System that has been adapted to represent the importance of hydrological processes in the Himalayan region. The participants learned to use the model to analyse different aspects of climate change, downscaling of global climate models (GCMs), and evaluating future changes in temperature and precipitation patterns in the basin. Data on future temperature and precipitation from the selected GCMs were applied into the J2000 hydrological model to compute the basin's future hydrological regimes. The participants analysed the hydrological regimes using R (the programming language), factoring in snowmelt patterns and the different components of the regime such as runoff components and evapotranspiration. The analysis was followed by discussions on the GCMs, uncertainty, and future scenarios.

During the analysis and discussion, the participants were able to understand the uncertainty in the future GCM models and approaches in downscaling while running the model and conducting output analysis using R. This enabled the participants to use the acquired information for further analysis in their area of interest. Participants will also be able to conduct analysis and acquire the required basin data to support water resource management activities in the basin.

The 2018 New Delhi training helped the participants understand hydrological processes and modelling, while this 2019 training continued along the same line to prepare them to conduct climate change impact study. The participants can now quantify and critically analyse the water availability of historic and future periods in their basin. It has also paved the way for further collaborative activities on the different aspects of water resource management.

Facilitators

Santosh Nepal
Group Lead – Climate and Hydrology, ICIMOD

Saurav Pradhananga
Water and Climate Analyst

Kabi Raj Khatiwada
Water Resources Analyst

Participants

Name	Organization	Position
Mohammad Tayib Bromand	Ministry of Energy and Water	Water Resources and Climate Change Adaptation Specialist
Fazlullah Durrani	Ministry of Energy and Water	Hydrologist / GIS Engineer
Rohullah Malikzooi	Kabul Polytechnic University	Assistant Professor
Ahmad Tamim Kabiry	National Environmental Protection Agency (NEPA)	Head of IT Department
Milad Dildar	ICIMOD Intern	Glaciologist
Najeebullah Jamal	ICIMOD Intern	Hydrologist

Analysis of the Kabul River basin's future hydrological regime during the training

FIGURE 1 **CHANGE IN PRECIPITATION AND TEMPERATURE BY THE END OF THE 21ST CENTURY (2071–2100) WITH RESPECT TO REFERENCE PERIOD OF 1981–2010**

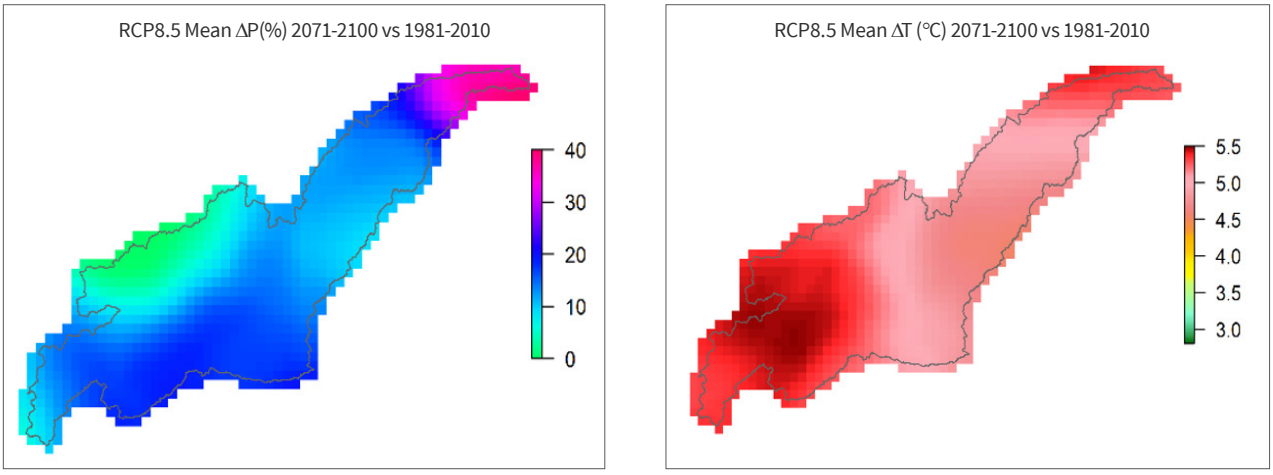


FIGURE 2 **COMPARISON OF PRECIPITATION AND DISCHARGE DURING 2071–2100 WITH REFERENCE PERIOD OF 1981–2010**

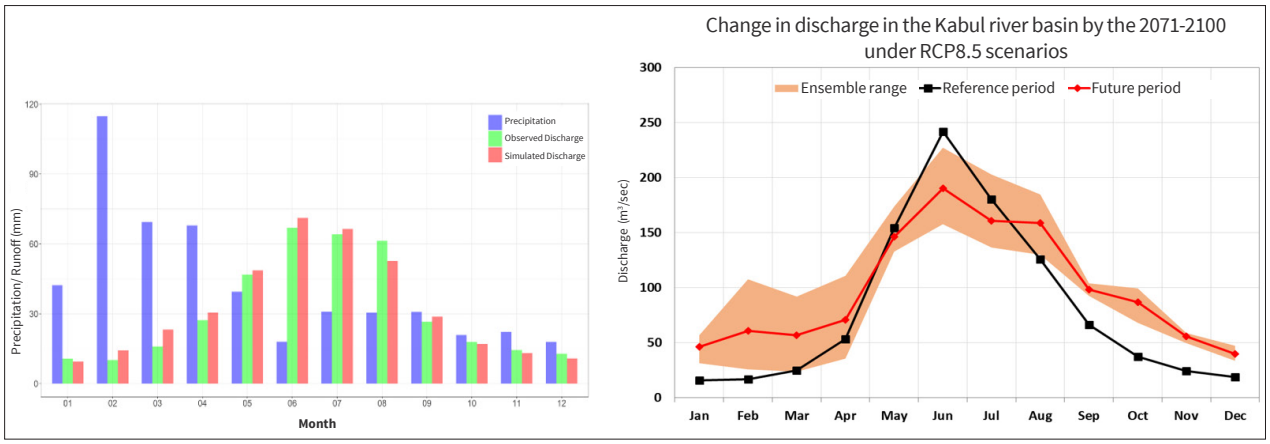


FIGURE 3 COMPARISON OF PERCENTAGE OF THE RUNOFF COMPONENTS FROM THE FOUR GCMS RUNS DURING 2071–2100 (RIGHT BAR) WITH REFERENCE PERIOD OF 1981–2010 (LEFT BAR) FOR EACH MONTH

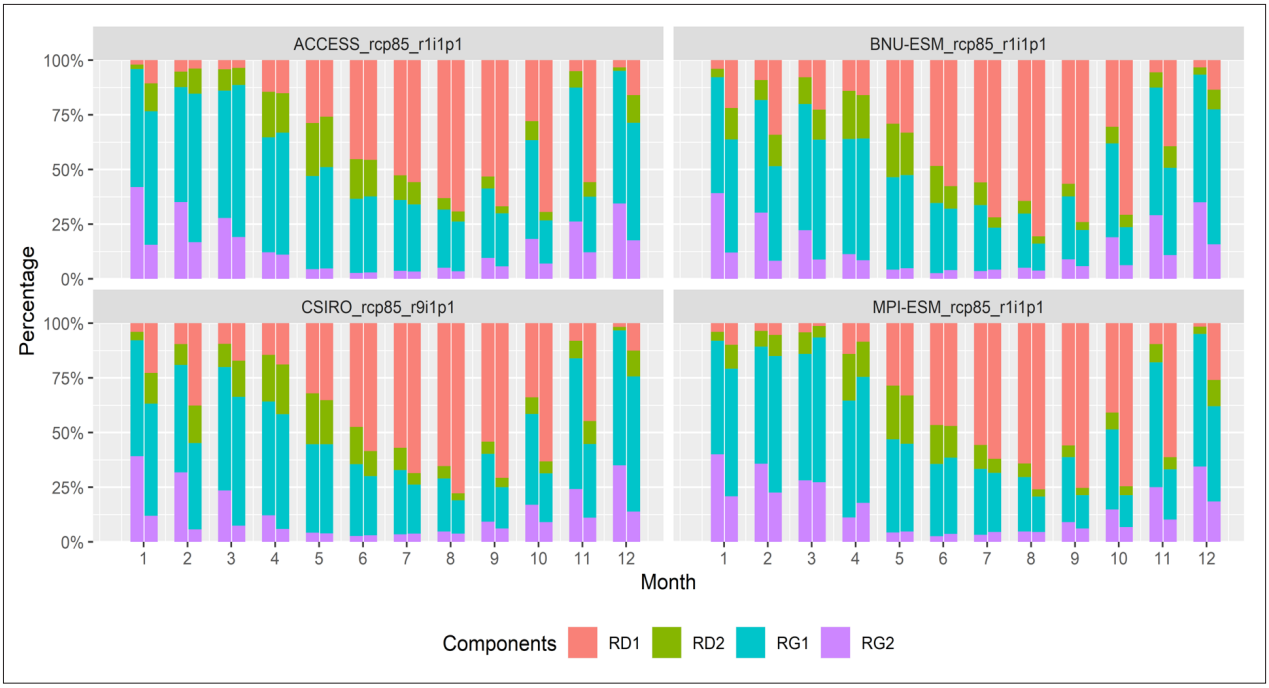
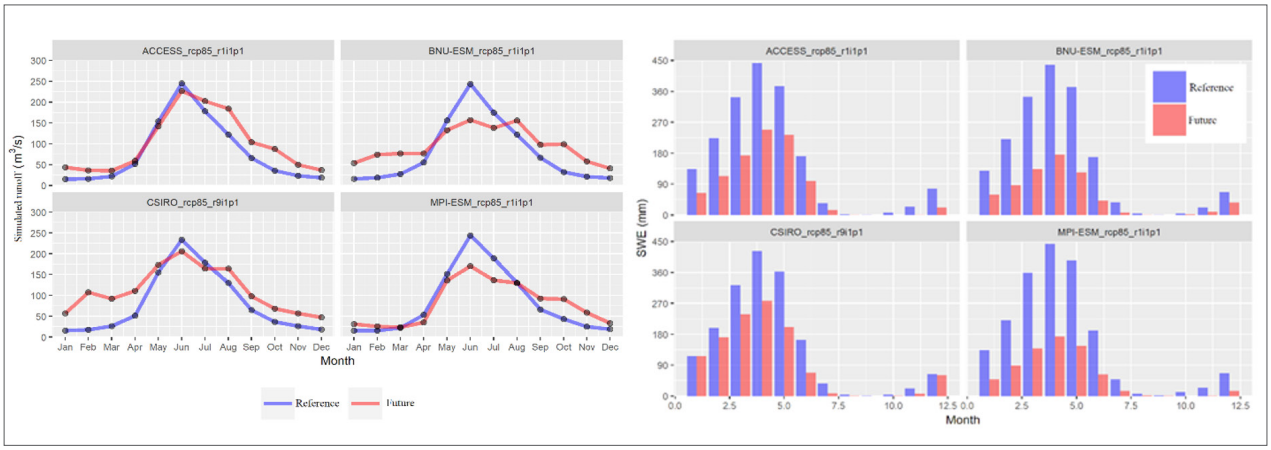


FIGURE 4 COMPARISON OF SIMULATED RUNOFF FOR FOUR GCMS AND ENSEMBLE SNOW WATER EQUIVALENT FOR THE PERIOD OF 2071–2100 (RIGHT BAR) WITH REFERENCE PERIOD OF 1981–2010 (LEFT BAR) FOR EACH MONTH



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