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IMPACT OF RESERVOIRS ON STREAMFLOW OF UPPER SREPOK RIVER BASIN, VIETNAM

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1. INTRODUCTION

Vietnam has been facing many challenges related to water resources, such as increasing water demand, degradation of water quantity due to climate change, and human activities, among others. One of the most important transboundary river basins in Vietnam is the Srepok River Basin, one of the major tributaries of the Mekong river basin that originates from Vietnam and flows into Cambodian and Laos territory before entering the Mekong Delta. Srepok watershed plays an important role in Central Highland of Viet Nam, it impacts to developing social-economic conditions. The HYPE model was applied to the Upper Srepok River Basin (USRB) in simulating River Discharge. The HYPE model is an open-source model that simulates hydrological processes and water resources development, such as reservoir operation, irrigation, water use, and wastewater discharge in a river basin (Lindström, G. et al., 2010). The model was calibrated and validated (2000–2015) at a daily time step.

2. STUDY AREA

The USRB is one of the tributaries of the Srepok River Basin, one of the most important transboundary river basins in Vietnam as its lower drainage area is in Cambodia, as shown in **Fig. 1**. The Srepok River merges with Sesan River and Sekong River before draining to the Mekong River. The Srepok River Basin has a total area of 30,965 km^2 and about 18,000 km^2 of this lie in Vietnam, in

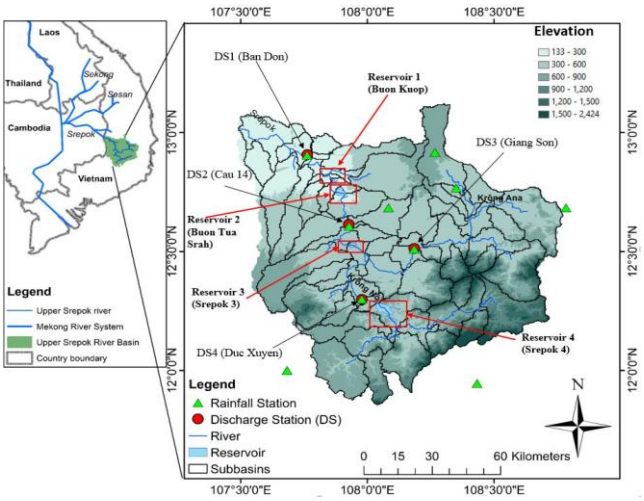

Fig. 1 Location map of Upper Srepok River Basin

which about 12,000 km^2 is the USRB (NCWRP, 2010). Within the USRB, there are four multipurpose dams, which are used for water supply, irrigation, and hydropower. There are also several observation stations within the USRB, which includes 4 water discharge stations and 10 rainfall stations, as shown in **Fig. 1**.

3. METHODOLOGY

3.1 Hydrological Predictions for the Environment (HYPE) Model

HYPE model is a semi-distributed catchment model, which simulates water flow and substances on their way from precipitation through different storage compartments and fluxes to the sea (Lindström et al., 2010). The model structure is based on a multi-catchment approach allowing simultaneous modeling of multiple river basins, with each river basin divided into multiple subbasins and each subbasin is further divided into hydrologic response units (HRUs).

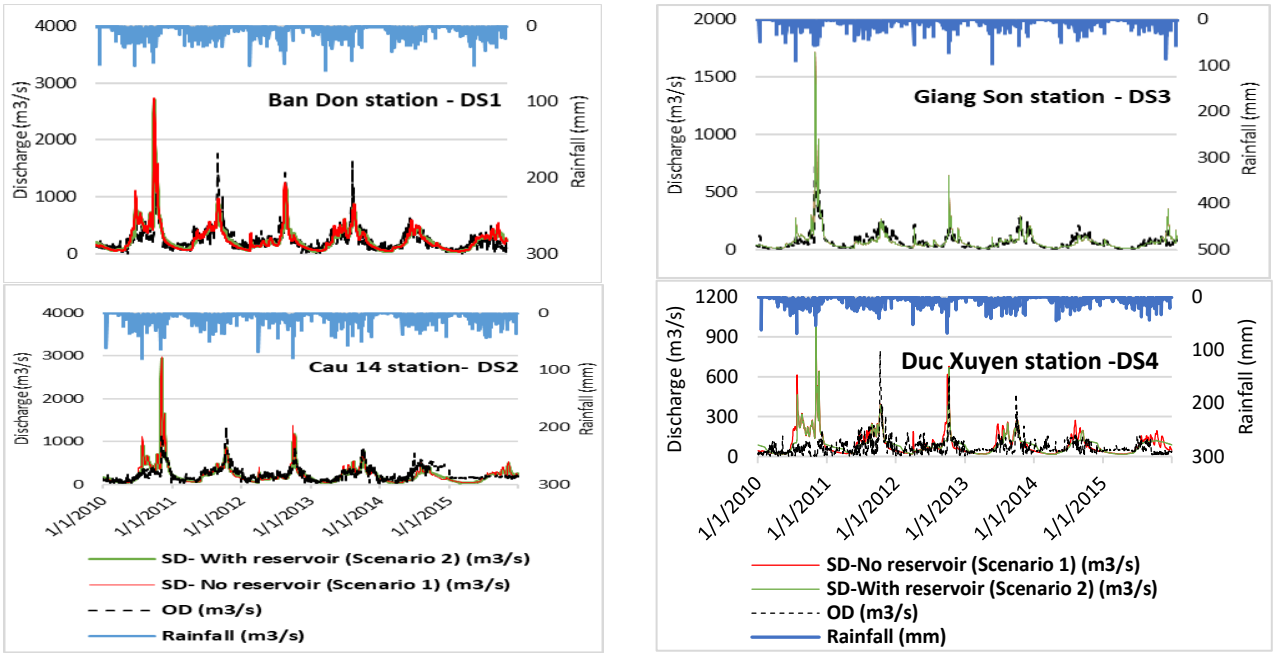

Figure 2. Simulated River Discharge in two scenarios with and no reservoir

3.2. Data input

The HYPE model was set up from 1980 to 2015 for the river discharge simulation. The required input data include average air temperature, daily rainfall data. We also utilized 30×30m DEM from U.S. Geological Survey. The total volume of four reservoirs is also included.

3.3. Parameter Setup

For river discharge simulation, the parameters for field capacity (*wcfc*) and the effective porosity (*wcep*) and the parameters related to the process like Evaporation (alfapt) and Recession (*rrcs1*, *rrcs2*) were set and calibrated.

4. RESULTS AND DISCUSSION

The daily discharge was simulated without reservoirs (Scenario 1). The observed and simulated discharge at four discharge stations from DS1 to DS4 is shown in **Fig.2. T**he simulated flows in DS1, DS2, and DS4 vary with the observed flow, while the simulated flow in DS3 shows relatively closer results with the observed discharge. The RMSE value for these simulations was also calculated in **Table 1**.

Table 1 Model evaluation in 2 simulated scenarios

RMSE index (m3/s)				
Discharge Station	DS1	DS2	DS3	DS4
Case 1. No reservoir	144.1	124.4	46.4	87.4
Case 2. With reservoir	93.2	80.3	46.4	57.3

Then, simulation of the discharge with reservoirs (Scenario 2) without their daily operation is also carried out in this study. The simulations from Scenario 2 show better results than Scenario 1, and the RMSE is lower, as shown in **Table 1**.

5. CONCLUSION

This study shows the potential of the HYPE model in estimating river discharge. The approach in the two scenarios With and No lakes shows a clear difference between the two scenarios, thereby showing the influence of the reservoir on the flow at USRB.

REFERENCE

Lindström, G., Pers, C., Rosberg, J., Strömqvist, J., and Arheimer B.: *Development and test of the HYPE (Hydrological Predictions for the Environment) model – A water quality model for different spatial scales.* Hydrology Research, 41 (3–4), 2010, pp. 295–319.