CLIMATE CHANGE IMPACT ON THE INFLOW OF LARGE SCALE RESERVOIR BY APPLYING A DISTRIBUTED HYDROLOGICAL MODEL

Kyoto University Student Member ○ Donpapob MANEE
Kyoto University Regular Member Yasuto TACHIKAWA
Kyoto University Regular Member Kazuaki YOROZU

1. INTRODUCTION

In developing country like Thailand, where agriculture is the main source of the economy as well as ensures the well-being of the people, the water resource is quite essential. However, unless the water resources is utilize with a balance approach of supply and demand, it sustainability will become in risk. Therefore proper planning of water resource development as well as the utilization base on uncertainty climate change impact is very necessary.

The large scale of multiple purposes reservoir is main sources to manage and design both flood and drought problem. Therefore, the forecasted hydrological data is very important. It will help the operators to support their decision making to release the water subjected to the rules or constraint in advance and be consisted of the development plan in future.

This study is to apply a distributed hydrological model (1K-FRM), which can reproduce the phenomena of inflow to reservoir, and to apply the model for the near and far future climate change in large scale dam in Thailand.

2. METHODOLOGY

There are 5 large scale reservoirs which are located in northern and central parts of Thailand as shown in Fig1, are selected to analysis with rainfall data of 60 stations over the Ping River basin (Bhumibol Dam) , Nan River Basin (Sirikit Dam), Pasak River Basin (Pasak Jolasid Dam) and Mae Klong River basin (Srinagarind and Vajiralongkorn dams). Rainfall data analysis was conducted by considering the historical of reservoir recorded data as shown in Table 1.

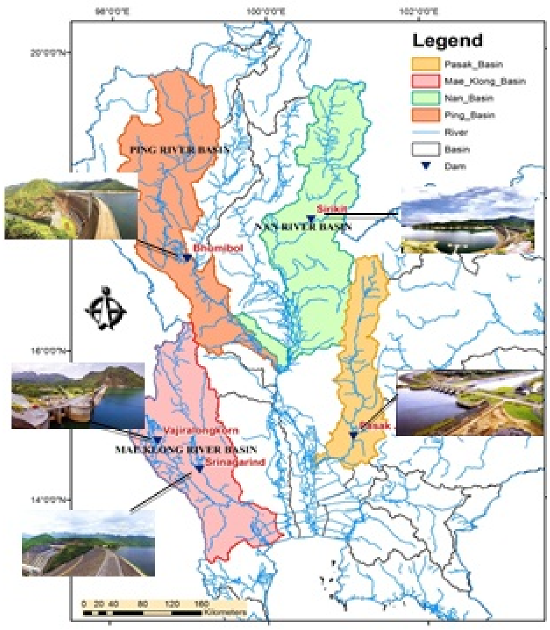

Fig1. The location of large scale reservoir and River Basin of each study area

Table 1 The information of selected reservoir

Name	Bhumibol	Sirikit	Srinagarind	Vajira longkorn	Pasak Jolasid
Location	17°14′33″N 98°58′20″E	17°45′50″N 100°33′48″E	14°24′31″N 99°07′42″E	14°47′58″N 98°35′49″E	14°51′41″N 101°03′58″E
Catchment Area (km2)	26,386	13,130	10,880	3,720	12,292
Storage Capacity (MCM)	13,462	9,510	17,745	8,860	785
Opening Year	1964	1974	1980	1984	1999

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Contact address: C1-1, KyotoDaigaku-Katsura, Nishikyoku, Kyoto, 615-8540, Japan, Tel: +81-7-5383-3365

Hunukumbura and Tachikawa[1] developed a distributed hydrological model, 1K-FRM, based on combination of the watershed model and the flow model. The spatial resolution 3 arc-second (about 100 m) of a digital elevation model (DEM) was used in the watershed model. Moreover, the kinematic wave model was also applied for the watershed model.

For the model calibrating and validation, rainfall discharge and evapotranspiration, and in/outflow of all reservoirs were obtained with corresponding historical data (Opening year to 2008).
After model validation process, the further step is to simulate the future situation of inflow in the reservoir under the impact of climate change. The input data of the generated rainfall will be obtained by Global Climatic Model (GCM) from the Japan Meteorological Agency (JMA).

3. RESULTS

The results of inflow reservoir data analysis are shown in Fig2.Those sub-figures show that the annual inflow of each reservoirs. Presently, 1K-FRM Distributed Hydrological Model is under developing on each River Basin, and comparison between historical the near and far future pattern of inflow for the further research.

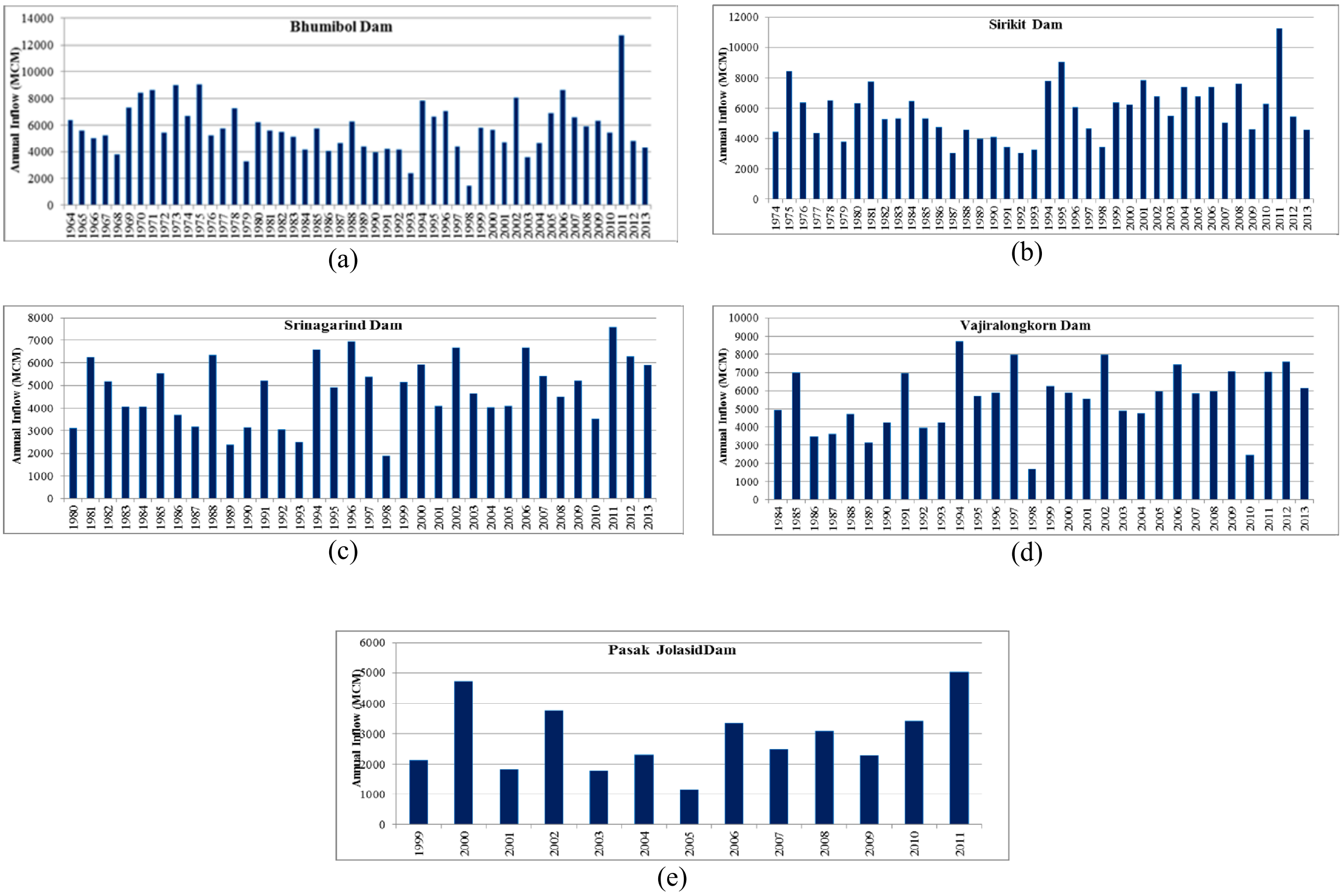

Fig 2. The annual inflow (opening date to 2013) in MCM.
for Bhumibol Dam (a), Sirikit Dam (b), Srinagarind Dam (c), Vajiralongkorn dam (d), Pasak Jolasid Dam (e)

4. CONCLUSIONS

The expected output of the study will obtain the distributed hydrological model and the set of the model parameter, which are represented the characteristic of the hydrological process in the each River Basin. The developed distributed model will be applicable for simulating future inflow series that that supplies water to agriculture and other sectors. The further step of this research will developed methodology for searching the optimal reservoir operation rule curves in corresponding to water resource potentiality.

REFERENCES

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The Electricity Generating Authority of Thailand, EGAT, www.egat.co.th/. (Accessed April 4, 2014)