

論文 / 著書情報
Article / Book Information

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Title(English)	Use of Seasonal Streamflow Forecast to Support Reservoir Operation for Flood Mitigation in the Chao Phraya River Basin
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種別(和文)	論文要旨
Type(English)	Summary

論文要旨

THESIS SUMMARY

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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

In 2011, catastrophic flooding occurred in Thailand. From May until October 2011 the country experienced heavy rainfall as a result of five typhoons. The capital city, Bangkok, and industrial areas were inundated from August until December, which caused the Thai economy to lose about USD 45 billion. Because of a lack of information on future rainfall, there was no plan for this unexpectedly severe rainfall event, which affected the Chao Phraya River Basin (CPRB). Thus, two large reservoirs located behind the Bhumibol and Sirikit dams were unable to mitigate the flooding.

Chapter 1 presents the introduction of this study. Background, research motivation, literature reviews, and research objectives are presented in this chapter.

Chapter 2 presents the details of the study area, hydrological model, and data in this study. Furthermore, two major reservoirs that have an impact on the Chap Phraya River Basin are shown in this chapter. Next, this chapter shows the details of the hydrological model that used in this study. Lastly, the details of observed meteorological data and predictive data that are used as input data in the H08 model are shown in this chapter.

Chapter 3, the first method is to select the reservoir operation from the streamflow prediction at the beginning of the wet season. There are three alternative operations for the first method, which was presented in the previous study [Mateo et al., 2014]. Seasonal hydrological predictions were carried out by using European Centre for Medium-Range Weather Forecasts (ECMWF) seasonal precipitation predictive data with two different bias correction techniques. Most of the results of streamflow prediction lead to select the 2011 operation as the reservoir operation scheme in 2011, which cannot mitigate flood in 2011. However, one simulation by quantile mapping, out of 25 ensemble members, that selected the alternative operation that could mitigate flooding during the peak period in October with a lesser peak amount of about 18 percent.

Chapter 4, the second method was updated from the first method, which can be considered as an adaptive reservoir operation. The 6-month ECMWF prediction period was used to support the operation plan for mitigating flooding in the 2011 flood year around each reservoir during the wet season. Decision-making for reservoir operation based on seasonal predictions was conducted on a monthly time scale. There are two different operating plans to compare river discharge results for this method. The first (PlanU) was simply to follow the 2011 operation schedule, which followed the 2011 rule curve. The second (PlanM) resembled reservoir operations described in a previous study, in which the maximum target storage in 2011 was reduced. The results for river discharge based on seasonal predictions obtained using PlanU showed that seasonal predictive information could be useful for flood mitigation and slightly decreased the peak river discharge, by about 4%, for 2011. In contrast, the results for PlanM showed that peak river discharge was reduced by about 20% relative to the observed 2011 river discharge. The reservoir operation under PlanM, which set target storage levels for each reservoir, tended to make each reservoir release its storage earlier than those under PlanU. That is, a combination of seasonal prediction and PlanM best-mitigated flooding. In addition, the use of seasonal predictive data for adaptive reservoir operation in 1995 and the use of past rainfall data for adaptive reservoir operation in 2011 was investigated in this study. The results show that both cases could mitigate floods in 1995 and 2011.

Chapter 5 presents the conclusion of this study. As a whole, the simulation results of the second method of using predictive data in this study show that the prediction data could mitigate flood in 2011. However, there is some aspect that needs to point out in this study, which needs to be further study in the future. First, the current method needs to investigate whether the seasonal predictive data could mitigate for a drought year. Second, the current parameters were calibrated from the previous study to well represent the hydrological process in the Chao Phraya River Basin, especially

at station C2. However, the accuracy of river discharge at station N1 (Nan basin) was still not satisfactory, which is also mentioned in the previous study [Mateo et al., 2014]. Finally, the high accuracy of seasonal predictive data, especially at the beginning of the wets season, is still necessary for reservoir operation in order to give the most benefit to society. Most of the results show that the release rate was increased during August in both reservoirs. In reality, the river channel capacity was not allowed to increase the rate of release during August in Nan river.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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