

Title: Study on Flood Control Operation of Reservoir Group at Zishui River Basin

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Objectives

It performs limit simulation of flood risk on flood protection objects through typical flood encountering process, analyzes utilization scheme of flood storage capacity under different flood patterns and combinations during joint dispatching of Zhexi and Jintangchong reservoirs, so as to further study the flood control capacity of Zhexi Reservoir, and determine the optimal flood control storage capacity for Jintangchong reservoir. On such basis, Taojiang County and Yiyang City are adopted as research objects to study the flood control effect on excess flood by joint dispatching of reservoir group.

Methods

Flood characteristics of Zishui river basin determines that flood control operation involves a large number of decision variables and complex constraint conditions, featuring high dimension, nonlinear and strong constraint. This study comprehensively considering the hydrological characteristics at Zishui River basin, it is designed to deduce the allocation process of flood control capacity among reservoir group in a iterative and reverse step, and establish joint compensation and dispatching model for series flood control reservoir groups by taking flood control safety of downstream protected objects as objective function, taking safe discharge of river course as main constraint condition, and considering flow trajectory on flood control section as the decision variable during flood forecast.

◆ Optimal strategy of flood control storage capacity for Jintangchong reservoir

The optimal strategy of flood control storage capacity for Jintangchong reservoir is based on the downstream flood control safety, and the optimal compensation regulation method is adopted in Zhexi and Jintangchong reservoir group to meet the 30-year flood control standard in downstream of Zishui River and lower reaches. It takes Yiyang Station as the control section, and the safety discharge in river as the main constraint, seeking to formulate a utilization scheme of reservoirs group that is inclusive to unfavorable flood combination (especially severe flood combination). On such basis, Jintangchong reservoir is selected as the optimal scheme of flood control storage capacity.

◆ Hierarchical dispatching model

Flood control protection objects in this study involve the rural areas downstream of the Zishui River, embankment at lower reaches, Taojiang county, and Yiyang urban area. All protection objects are different in terms of location importance, current flood control capacity, and flood control standards, therefore, it is not appropriate to adopt a single control method for the rigid constraints of flood control sections.

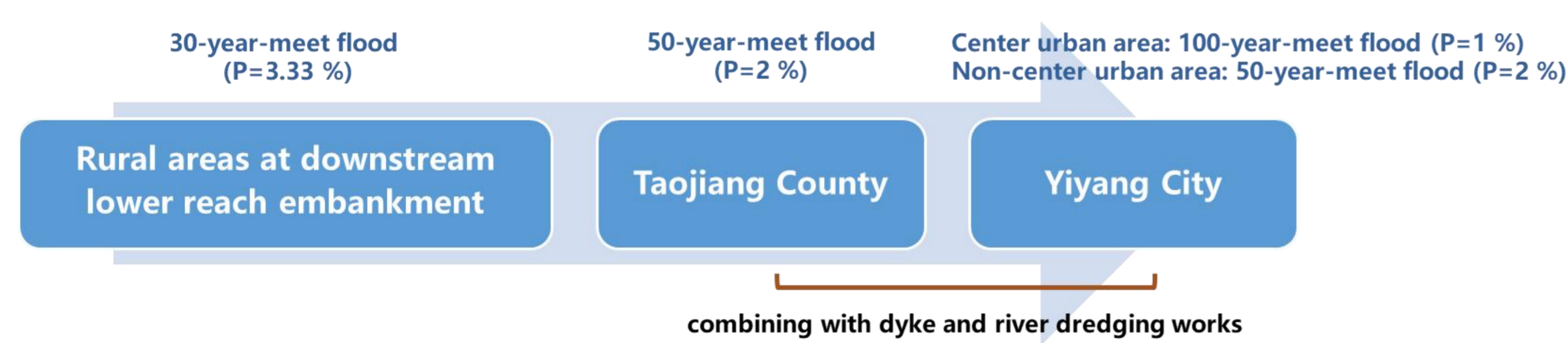


Figure 3 Hierarchical Dispatching Model of Reservoir Group in Zishui Basin

Results

Result shows that the joint dispatching of Jintangchong reservoir and Zhexi reservoir can reduce the flood peak in 50-year and 100-year meet in Taojiang and Yiyang river sections at downstream, which could significantly reduce the pressure of urban flood control.

Research on joint dispatching of reservoir group provides new concept for improving flood control system and optimizing flood control operation of drainage basin, which could provide technical support for the subsequent real-time flood control operation on river basin.

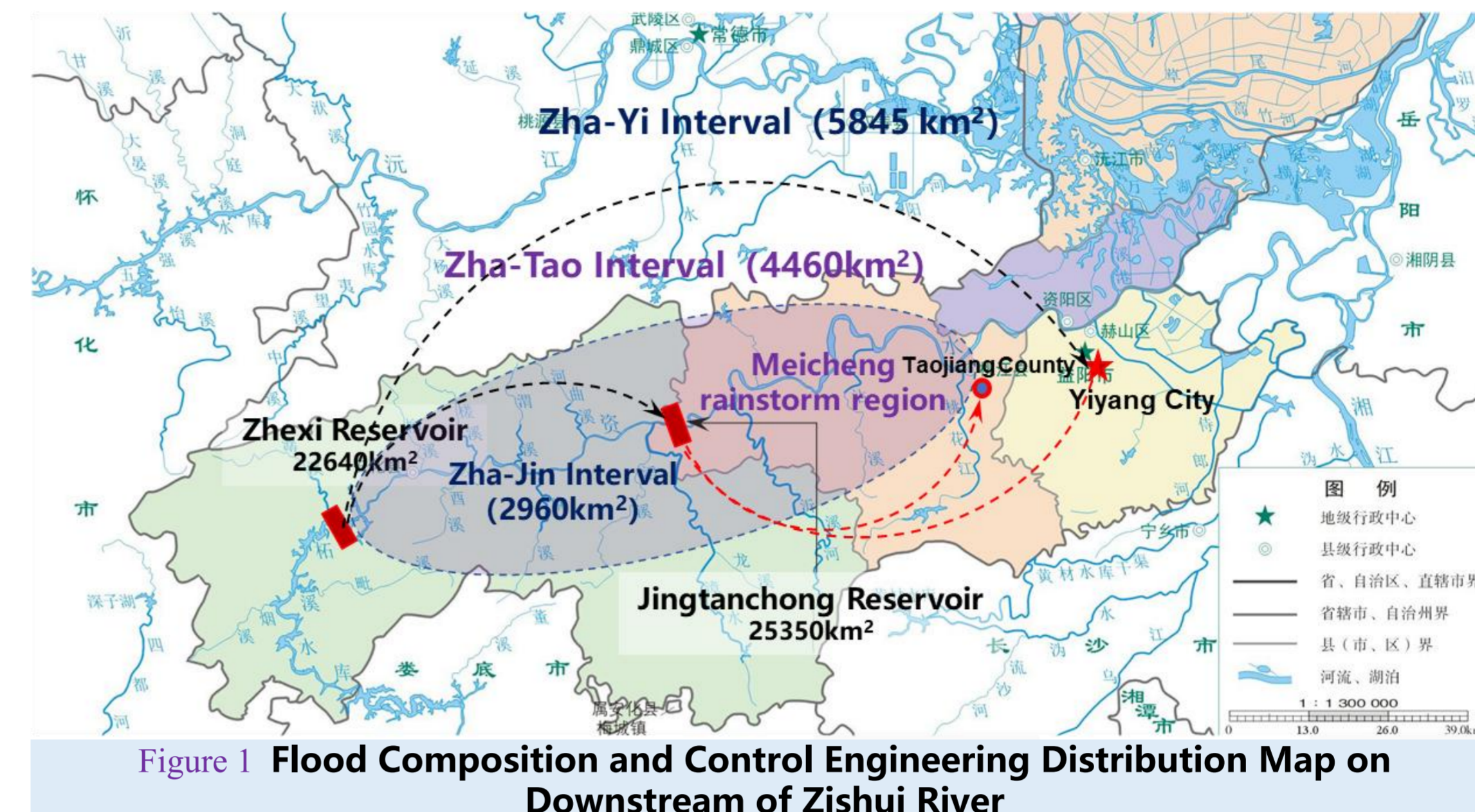


Figure 1 Flood Composition and Control Engineering Distribution Map on Downstream of Zishui River

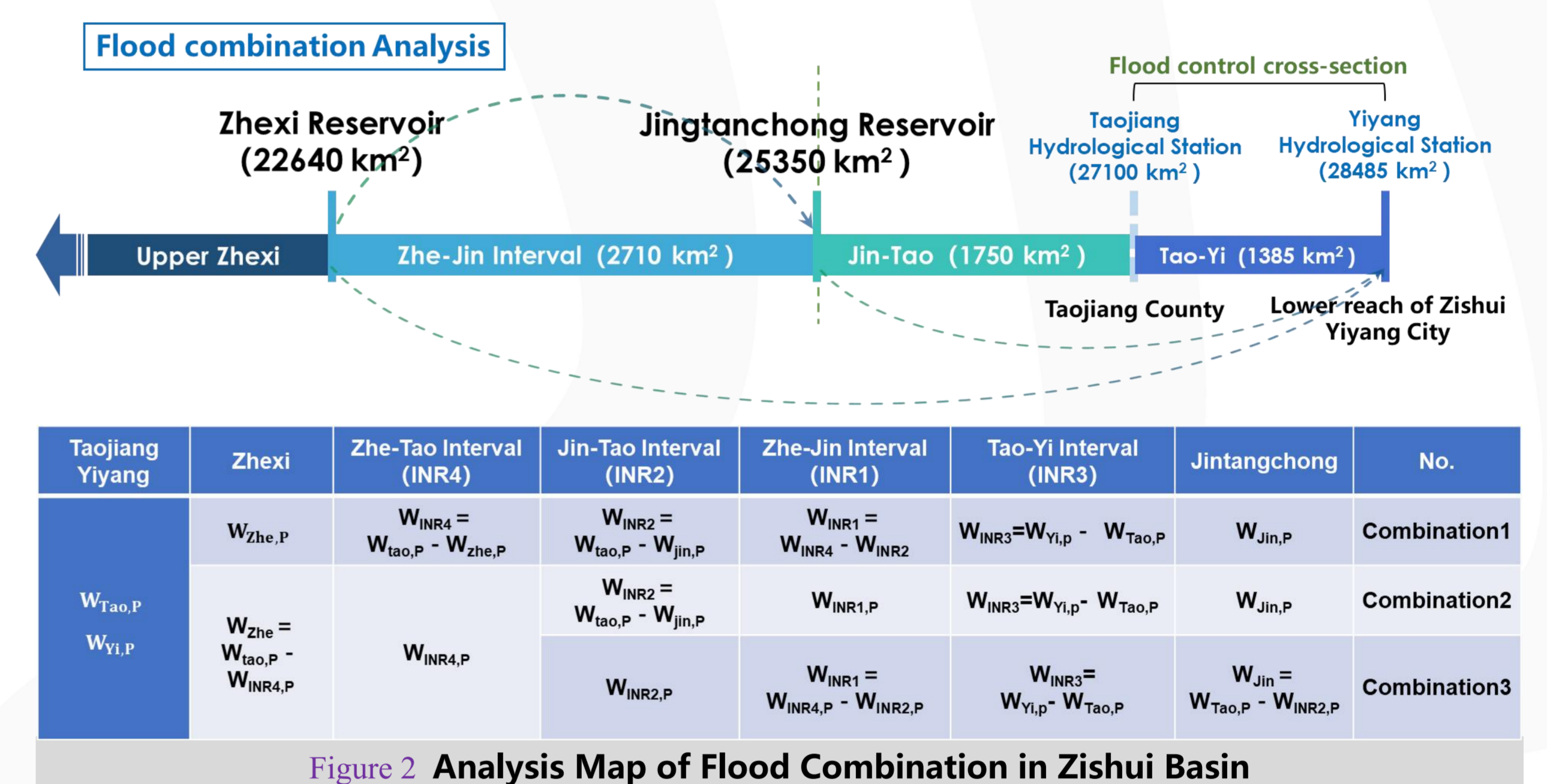


Figure 2 Analysis Map of Flood Combination in Zishui Basin

Conclusions

The traditional idea is to evaluate the effect of reservoir flood control operation by its performance of controlling the whole flood duration. According to this study, although the flood storage capacity that designed on basis of the design flood standard cannot control the whole flood, it can reduce the peak of the corresponding over-frequency flood, and should also be included in its flood control effect. As shown in the above research, although joint dispatching of Zhexi and Jintangchong reservoirs cannot control the 50-year and 100-year floods of Taojiang and Yiyang river section within the safety discharge in river, it can reduce over-frequency flood peak and optimize the designed embankment water level by formulating reasonable dispatching objectives, which is also significant to regional flood control.

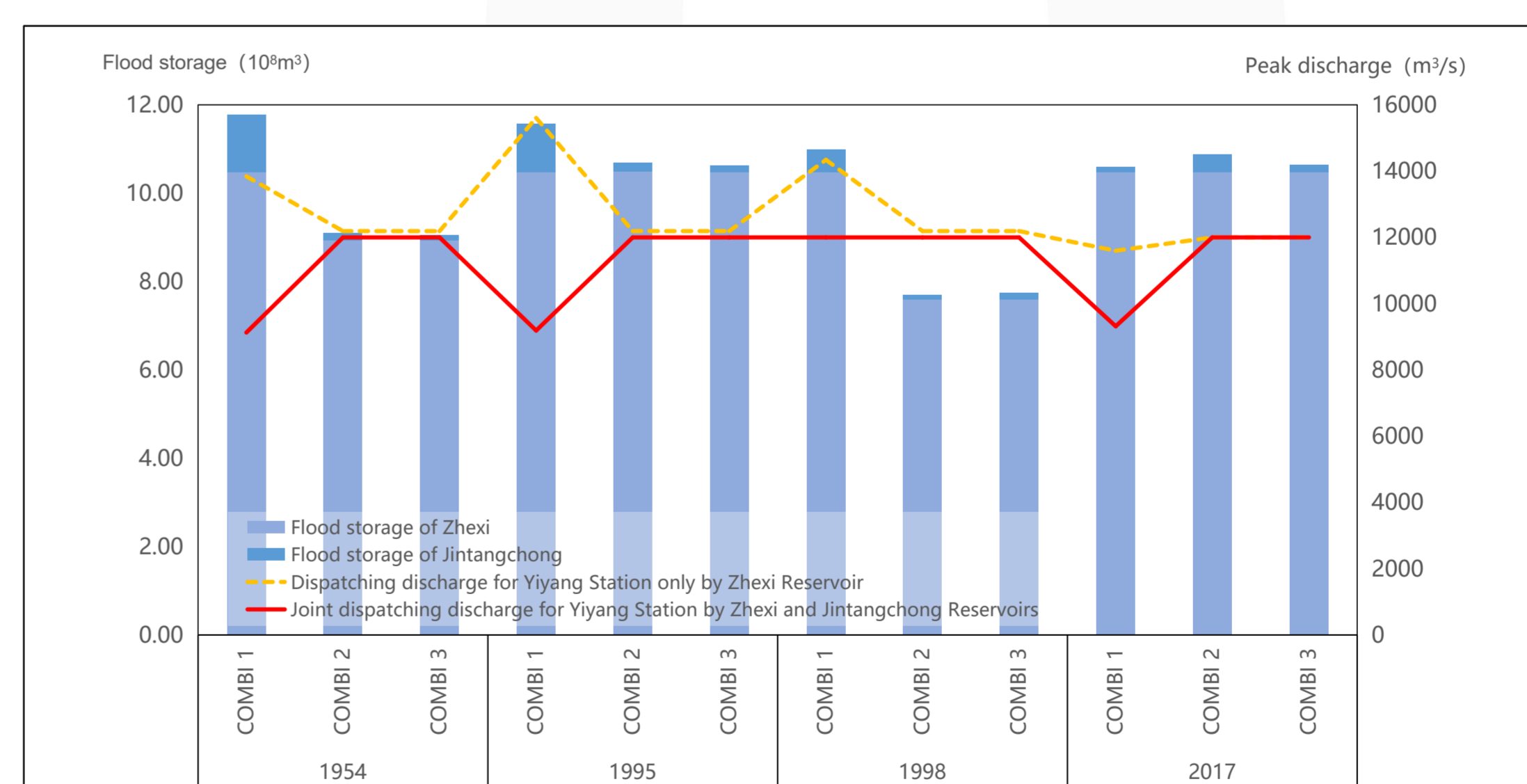


Figure 4 Storage Capacity Allocation Scheme of Joint Dispatching Reservoir Group (P=2%)

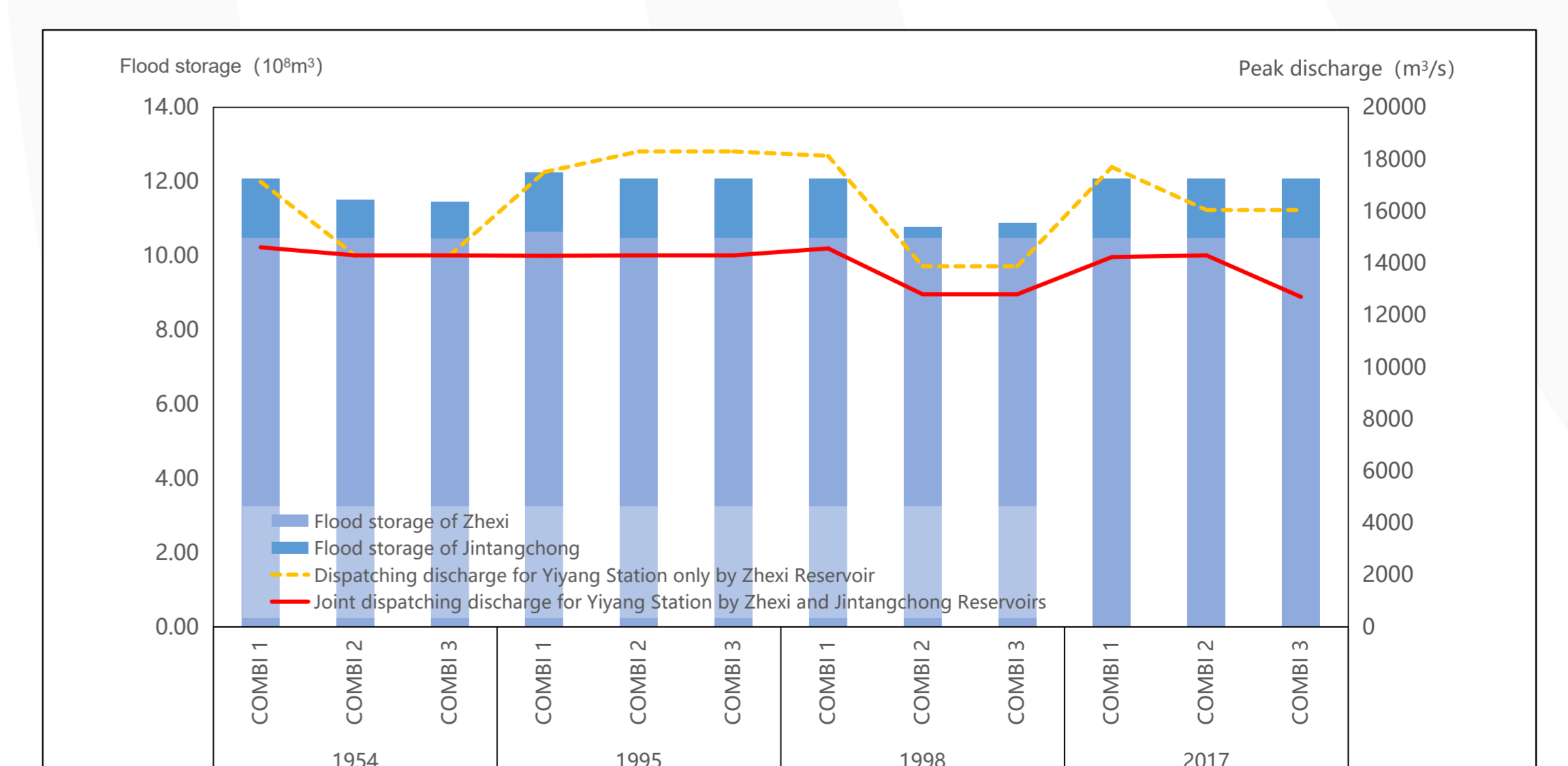


Figure 5 Storage Capacity Allocation Scheme of Joint Dispatching Reservoir Group (P=1%)