## Summary

With the rapid aging of Kariba Dam, the optional solution for the problem has become a universal concern.

As for the first requirement, we analyze the need for reparing or rebuilding the dam. Then, we generally assess the details of the potential costs and benefits[文献]. Finally, we carefully examine the potential costs and benefits of the three different program, and the advantages and disadvantages of each option are obtained.

For the second requirement, we need to adopt the third option. We establish a general site selection model to select the optimum number of dams and their locations on a river. We establish two sub-models to accomplish the object: determination of alternative dam sites and wining sites. As for former, we used the GIS data to obtain information about the changes in elevation and width of the whole river, and combined them with the information gathered from government, we successfully selected 30 feasible dam-building addresses. For the second sub-model , We proposed a Bi-objective optimization problem: cost and risk. Combining the relevant data, we fit all the parameters necessary for the solution, and the proposed fitting formula is highly consistent with the original data. Introducing the hybrid PSO algorithm we acquire a local optimal solution, the results are in appendix .

In order to provide behavior guidance for water resources scheduling in cascade dam systems, we assume that the storage capacity of a dam is only related to upstream inflows, downstream outflows, rainfall and evaporation. And then we establish a discrete dynamic programming model. Introducing two kinds of safety grade judgment basis, we establish the Bi-objective optimization model. Then we divide the water situation into two categories: one is when the water flows ranging from maximum expected discharges to minimum expected discharges and one is when partial area of the system is exposed to the most detrimental effects of the extreme conditions.

For modeling validation, we use the appropriate data transformation to determine the initial value of the model, and solve it under two possible conditions utilizing the POA algorithm. Finally, we provide the control strategy for each condition.

We simulate the whole calculation procedure via computer. The number and the placement of dams selected by our site selection model has a high average safety level and competitive total construction costs.

Also, we choose the discrete height interval of the dam for sensitivity analysis. And the results show that our model is very robust. Also, in the sensitivity analysis of the risk assessment method, we find the possible problems and point out the corresponding solutions.

为了为串联水坝系统水资源的调度提供行为指导, 我们假设某一大坝蓄水量只与上游流入量, 下游流出量, 降雨量与蒸发量有关, 并以此为根据建立了差分动态规划模型. 引入两种安全等级评判依据, 我们建立了双目标优化模型. 然后我们对水域可能面临的情况分为了两类. 一类为当水流量从最大极端到最小极端变化变化时, 一类为考虑局部地区发生极端情况. 最后, 基于我们之前建立的串联大坝系统, 我们采用合适的数据变换确定了模型各初始值大小, 并使用POA算法对水域可能面临的两种情况进行了测试求解, 给出了相应的调控策略.