

## Optimal operation of a multibasin reservoir system

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**Abstract.** A simulation–optimization procedure is presented for evaluating the extent of interbasin transfer of water in the Peninsular Indian river system consisting of 15 reservoirs on four river basins. A system-dependent simulation model is developed incorporating the concept of reservoir zoning to facilitate releases and transfers. The simulation model generates a larger number of solutions which are then screened by the optimization model. The Box complex nonlinear programming algorithm is used for the optimization. The performance of the system is evaluated through simulation with the optimal reservoir zones with respect to four indices, reliability, resiliency, vulnerability and deficit ratio. The results indicate that by operating the system of 15 reservoirs as a single unit the existing utilization of water may be increased significantly.

**Keywords.** Reservoir operation; simulation; optimization; reliability.

### 1. Introduction

The distribution of water resources is, in general, uneven in most countries. In India, the distribution is uneven both in time and space. Rainfall, which is the prime source of water in India, is mostly confined to the four monsoon months of June to September. The eight non-monsoon months receive less than 10% of the annual rainfall, as a result of which many parts of the country experience a scarcity of water during these months. The distribution of water over space is also uneven, with about 64% of the total water concentrated in the Himalayan river basins of Ganga, Indus and Brahmaputra. It is estimated that because of this uneven distribution, one-third of the country is drought-prone while about one-eighth of the country is flood-prone. To enhance the utilization of water resources through better distribution, the Government of India proposed the National Perspective Plan (NPP) for water resources development, consisting of two components, the Himalayan River Development and the Peninsular River Development (Ministry of Irrigation 1980). In