

## Gariep Dam Basin Management for Satisfying Ecological Flow Requirements

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**Abstract :** Multi-reservoir optimization operation has been a critical issue for river basin management. Water, as a scarce resource, is in high demand and the problems associated with the reservoir as its storage facility are enormous. The complexity in balancing the supply and demand of this prime resource has created the need to examine the best way to solve the problem using optimization techniques. The objective of this study is to evaluate the performance of the multi-objective meta-heuristic algorithm for the operation of Gariep Dam for satisfying ecological flow requirements. This study uses an evolutionary algorithm called backtrack search algorithm (BSA) to determine the best way to optimise the dam operations of hydropower production, flood control, and water supply without affecting the environmental flow requirement for the survival of aquatic bodies and sustain life downstream of the dam. To achieve this objective, the operations of the dam that corresponds to different tradeoffs between the objectives are optimized. The results indicate the best model from the algorithm that satisfies all the objectives without any constraint violation. It is expected that hydropower generation will be improved and more water will be available for ecological flow requirements with the use of the algorithm. This algorithm also provides farmers with more irrigation water as well to improve their business.

**Keywords :** BSA evolutionary algorithm, metaheuristics, optimization, river basin management

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