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Optimization or Simulation? Comparison of approaches to reservoir operation on the Senegal River

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Design of reservoir operation rules follows, traditionally, two approaches: optimization and simulation. In simulation, the analyst hypothesizes operation rules, and selects them by what-if analysis based on effects of model simulations on different objectives indicators. In optimization, the analyst selects operational objective indicators, finding operation rules as an output. Optimization rules guarantee optimality, but they often require further model simplification, and can be hard to communicate. Selecting the most proper approach depends on the system under analysis, and the analyst expertise and objectives. We present advantage and disadvantages of both approaches, and we test them for the Manantali reservoir operation rule design, on the Senegal River, West Africa. We compare their performance in attaining the system objectives. Objective indicators are defined a-priori, in order to quantify the system performance. Results from this application are not universally generalizable to the entire class, but they allow us to draw conclusions on this system, and to give further information on their application.