

Exercise 2.3.

The Clear Lake Dam controls the water level in Clear Lake, a well known resort in Dreamland. The Dam Commission is trying to decide how much water to release in each of the next four months. The Lake is currently 150 mm below flood stage. The dam is capable of lowering the water level 200 mm each month, but additional precipitation and evaporation affect the dam. The weather near Clear Lake is highly variable. The Dam Commission has divided the months into two month blocks of similar weather. The months within each block have the same probabilities for weather, which are assumed independent of one another. In each month of the first block, they assign a probability of $1/2$ to having a natural 100-mm increase in water levels and probabilities of $1/4$ to having a 50-mm decrease or a 250-mm increase in water levels. All these figures correspond to natural changes in water level without dam releases. In each month of the second block, they assign a probability of $1/2$ to having a natural 150-mm increase in water levels and probabilities of $1/4$ to having a 50-mm increase or a 350-mm increase in water levels. If a flood occurs, then damage is assessed at \$10,000 per mm above flood level. A water level too low leads to costly importation of water. These costs are \$5000 per mm less than 250 mm below flood stage.

Knowing this:

- Identify the known parameters
- Identify the uncertain parameters
- Identify the first-stage decisions
- Identify the second-stage decisions
- Formulate the stochastic optimization problem that minimizes the expected cost of the company and solve it
- Formulate the expected value problem and solve it
- Find the value of the stochastic solution (VSS)

Note: consider that the water release for the next four months has necessarily to be decided at the beginning of the first month.