DEEP UNCERTAINTY Decision Analysis: An Interactive Exercise

It's really hard to answer what you have to have in absence of knowledge of what you can get and then it's even harder to figure out how to compromise.

[Music]

The total system storage is going up but they're not releasing anything so there's not an increase in the water level downstream. But eventually the largest reservoirs fill up and they can no longer take in any more water so they have to release it.

[Music]

So do you want your food, your lights, or protection?

My name is Julie Quinn, I'm a PostDoc with Pat. I'll be giving an exercise today for your decision analysis class.

So we talked a lot in class about how defining the problem often is the problem. Yeah, so I'm really excited about this exercise. It's something Julie's done before with the World Bank.

What we're going to be doing in this decision-making exercise is focusing on uncertainty and how to formulate an optimization problem.

And so to start with, what I'd like you guys to do is to formulate groups of, say, six students and at your table choose two students each to represent The Ministry of Energy, The Ministry of Agriculture, and The Federal Flood Agency. And so you guys are going to have to advocate for your stakeholder interest group in this decision-making exercise.

It's just so high stakes and difficult. Yeah. It's a lot of pressure if you mess it up in real life.

Yeah so we went to a conference last year on decision making under deep uncertainty.

We don't even know the probability distributions of the future and the jargon that people use for this is deep uncertainty in the sense that we're not even, we don't even know what we don't know.

One of these deep uncertainties that people often don't even consider is how to formulate a problem.

So we'll start out with a visual of a watershed and a bunch of people seated around a table of a watershed. This is a classic picture from Professor Loucks’ textbook.
Well that's a part of the book that just talks about the need to involve what we call stakeholders, people that are going be impacted by whatever decisions are being made. The effort and the time and the expense it takes to make a decision is proportional to the number of stakeholders involved, the number of people you have to convince.

The other visuals that we'll bring in are when we compare alternative operating policies from these different formulations, looking at these probability density functions of, over time what is the water level downstream and that will illustrate that there's a much higher probability of overtopping the dikes.

And so they're leaving open capacity for any future flood events.

If we look at this flood vulnerability objective so the maximum water level downstream, a lot of the solutions from that other formulation exceed the dike height at the hundred-year flood.

Okay, so this is how consulting group one decides to formulate the problem.

I think the visualization tool was really helpful because we were all so just in the dark when we were trying to set thresholds.

And so really the point of this whole process is that it helps the students realize that just blindly stating requirements doesn't help you resolve trade-offs.

And then once you get into it, it's really important to think about kind of modern analytics, modern decision tools that can help you frame these kinds of questions.

But it was really helpful and it really changed the tone of our discussion when we, when we saw the solutions that were possible and then we could sort of suggest entirely different, you know, options instead of just saying oh I want this.

It's difficult, because most of the times like we were looking at objectives like hydropower, and water deficit and how it would affect farmers and like flooding that is responsible for human lives. And you're trying to come up with a way to quantify these and find out which one is most important.

I'm inclined to set up a high limit on the number of days for flood resilience.

So you're like you want to be resistant to outliers.

But I don't think you really internalize fully, you know, the, the concept of a negotiated problem formulation process, until you actually do it yourself.

And ultimately this is kind of simulates some of the challenges in group decision making particularly when there are pretty severe consequences if you make a mistake.