

## US Fish and Wildlife Service | Problem Framing and Climate Change (with Case Study)

---

Hi, my name is Michelle Haynes, I am a course leader here at the National Conservation Training Center, with the US Fish and Wildlife Service. I work on the structured decision making and adaptive management, and the climate change curriculum. We're very excited about this class that brings together both of those disciplines, decision analysis for climate change. Behind me you can see southwest China, these are the eastern Himalayas, and we'll talk more about these later on in the course. You'll get an experience to learn more about the area.

Throughout this course you'll be introduced to a method, a habit, a way of thinking and tackling the aspects of decisions that make them difficult. This first lecture is on framing management decisions, in the context of climate change. Thinking about how climate change may shift the scale or scope of management decisions. A decision has multiple parts, some may be more visible than others. Some may be clouded by ambiguity, or conflict, yet every decision contains these same parts, whether we acknowledge them or not.

What are they? Well, if you've watched the videos, [INAUDIBLE] *Structured Decision Making* and *Problem Definition* videos by Mike Runge and Sarah Converse with the USGS, then you should be familiar with the Ponderosa Pine Management, the house selection, and the mortgage rate examples. You'll know about problem framing, about objectives, alternatives, consequences, and trade offs.

Before we look in detail at the components of a decision statement, let's take a moment to think broadly about the setting in which we're making decisions. The world has changed, it was always changing, it will always change. Heraclitus said, "Nothing endures but change," and this Greek philosopher also said, "He who does not expect, will not find out the unexpected, for it is trackless and unexplored." This class, *Decision Analysis for Climate Change*, is about expectation, exploration, and understanding change.

This is true not only of the world that we find ourselves in, with the environment and natural systems, but also anthropogenic systems, political system, social systems, economic systems. Think about the technological advances, and the different arenas that even businesses are finding themselves trying to adapt and to shift the way they make decisions and their strategies for adapting to this changing environment.

Let's start off by highlighting some of the points raised in the 2009 National Research Council report, *Informing Decisions in a Changing Climate*. They talk about the end of business. As usual, temperatures and other climactic parameters are already outside the bounds of past human experience. Not only the averages, but especially the likelihood of extreme events are already outside the bounds of experience. For planning and decision making, human society is already in terra incognita. Recently experienced climatic events are not likely to serve as guides, to what to expect next.

So where does that lead us? They come to conclusion one, the end of climate stationarity requires that organizations and individuals alter their standard practices and decision routines to take climate change into account. Let's go through that again. The end of climate stationarity requires that organizations and individuals alter their standard practices and decision routines to take climate change into account. They come up with an uncertainty management framework, and on page 21 you can see, they come to the need for high quality decisions that have these five components. Problem definition, clear objectives, alternatives linked to objectives, assessment of consequences, and confronting trade-offs.

Sound familiar? We hope that through this course, you'll learn more about each of these components and how they can aid your decision making to think about climate change. So what this all of this change mean? Well, it probably means that the decision problem, will the actions, our actions, still be effective to achieve our goals given climate change? This question is too narrow. It means that doing a revised consequence analysis of our selected alternatives doesn't provide a large enough perspective. In this course, you'll learn how climate change creates a need to examine each component of the decision. To look at what we're not doing, at new targets, on how to modify goals, to create new actions.

You know in our educational system, we learn about problem solving and how important that is, but, usually we're given these nice packaged problems. Solve this, generate this answer, we don't often think about how to define the problem, to think about how large, or how small it should be, to consider who is involved in actually solving that decision, that problem. So the first step is actually thinking about these problems, these issues, these concerns that we have, as a decision, as a choice, to how to usefully structure a problem.

There's no perfect way, there's no correct way to structure it. Because it depends on every situation, and it's this combination of skill and experience and persistence to actually frame the decision in a way

that's most useful to your context. So recognizing that what you have on your hands is a decision, is a choice, can actually be quite difficult. Particularly around climate change, there's usually this sense of urgency. There's some need for something to happen, this feeling of being overwhelmed with all the uncertainty. Or maybe there's this plan, or policy, that needs to be developed, or a prioritization list.

But without any explicit recognition that there are choices to be made, among those plans or other plans, that there are different ways that that plan, or prioritization list could happen. So there's no decision problem that does not benefit from a clearly defined objectives and evaluation criteria. So what is a decision statement? This parallels the scoping phase, and other planning processes. But it also focuses on identifying information that's directly relevant to the decision context. Breaking down the decision statement, you've already heard about some of the ways to do this from the videos, it involves a trigger. Why is this decision being made now?

This could be directly related to climate change, maybe you need to make climate change adaptation plan, it could even be an agency requirement to do that. Maybe it's directly related, in that, you have to develop a new management program to address a problem they wouldn't have arisen we're not for climate change. Maybe there's a sea level rise issue that you need to address. It could be indirectly related to climate change, or it could be completely unrelated to climate change. But, you need to still think about the effects of climate change, in that decision context.

In framing the decision, you also think about the action. So that is the decision, it's the allocation of resources, the commitment of action, that you're trying to choose. And at this point the problem framing, you're not actually selecting your preferred alternative, or your preferred action. You're just identifying the type of action. Will it be forestry management actions? Or will be something more specific, such as a percent of trees to cut? You also want to identify the frequency and timing of the decision. How often is a decision made? Are other decisions linked to this one?

In climate change, you may want to reduce the cycle time, so that you're linking back and actually making the decision at more frequent intervals than you would otherwise, in recognition that some of the underlying processes are changing more rapidly. The decision maker, think about how climate change may introduce another decision maker. Maybe there's greater need for partnership, or it could go out to a higher level of the decision maker, maybe it's moved up the chain. Or in some way, it impacts who has the authority to make the decision. So the decision maker actually ties in very closely

with the scope and scale, at which you define the problem.

And in fact these are iterative, the decision maker depends on the scale at which you define the decision and the scope of the decision. So, reflect on how the problem could be framed at different scales, and what that would mean in terms of the who, what, where, when, why and how the decision. Sometimes, large, multiple landscape scale decisions benefit from initial framing and iteration at a smaller scale. There are examples where this has been done at a smaller, maybe a local scale, and then expanded up to regional scale and then the larger scale, because sometimes the context is just too broad. And who is the decision maker at that large scale? So there are some dangers associated with defining the decision to part of the scale even then we often hear about that in mind of climate change maybe we need to look at a broader scale. Well maybe we need to look at it, but it could still be defined at the smaller scale that's more manageable.

Constraints, so this is another aspect that you want to identify when you're thinking about how to frame your decision. There are increasingly prevalent mandates and directives to address climate change, and sometimes these are highly specified, other times there are more vague. So you can utilize the ambiguity around this to really address climate change in the decision analysis framework. Looking at it to know what you can do there. And with uncertainty, you can see that this is something that we can learn to identify and classify. Throughout this course, we're going to address uncertainty in great detail in one of the modules. At this point, just note where you think it exists, and may be relevant to the decision.

So, do a quick run through. What do you think makes this decision problem difficult? Why can't you go ahead and make the decision? What's hard about it? So take a moment just to jot down and think about what phase of the decision, which part of the, decision the problem, the objectives, the alternatives, the consequences, or the trade-offs, would be the most difficult? Where would you want to spend most of your attention, and the problem decomposition? And now, we're going to go on a journey.

Tashi delek, that's Tibetan for hello, and I'm wearing a Tibetan dress, and behind me you can see a Tibetan yak herders hut. I did my Ph.D. research in southwest China, on the eastern Himalayas, looking at policy change and climate change impacts on the yak herding livelihoods and on alpine meadow diversity. I'd like to introduce you to Joshie

My name is Joshie, my family has lived at the foot of the mountain for many generations. Before my

parents did not own their own land or livestock. They worked for the landlord.

You'll learn more about him during this class. He is a Tibetan yak herder, he lives in the eastern Himalayas, in an international biodiversity hot-spot called the three parallel rivers, UNESCO World Heritage Site. He doesn't know that. The three parallel rivers are the Mekong, the Salween, and the upper tributaries of the Yangtze river. They flow together in these valleys, that are north to south, parallel to each other. With peaks higher than 6,000 meters and low arid valleys, they provide water to over a billion people. He doesn't know that part either. Joshie lives in a very remote village, and the fit of one of these mountains is about 2,000 meters in elevation.

He lives with his wife, his six-year-old son, and his mother. Their primary source of income are the dairy products that come from their yaks, cows, and the yak-cow hybrid. Let's hear more from Joshie.

The conditions have changed in the last decade since I've been herding. There isn't as much snow in the spring, and the winter, the snow isn't as deep where it's cold. But the grass doesn't come earlier, in fact there are more shrubs which are toxic to the cattle and have sharp points. My old friends said that the grass used to be knee high, and the yaks were bigger and produced much more milk. Now there are bare patches, and the yak gets sick and produce much less milk.

As part of your background scoping, you discover several scientific papers, that detail the dramatic climate change in the Tibetan plateau, particularly this area of southwest China on the eastern plateau. These changes are comparable only to those that have been experienced in the polar regions, in recent decades. You also discover several papers that talk about interviews with the yak herders, and the way that they have responded to changes and their socioeconomic systems, and in their ecological systems. You also find a couple papers that talk about shrub encroachment into the alpine meadows, and see how this may impact the yak herding livelihoods, and some of the problems that Joshie is facing.

I'm not sure my son will raise yaks, it's a rough life. You may find work in the city, but that's temporary and uncertain, and I don't want him to be so far away. Not like the yaks, they're the lifeboat the Tibetan culture, they provide us so many things. That's why I was so sad to see my old friend sell all his yaks. The risk of them getting sick or dying was too great. I'd like to raise yaks that produce more milk, perhaps the yak-cows, but I'm not sure.

Now that you've heard from Joshie about his concerns, take five minutes to practice writing up the elements of a decision problem. Jot down the trigger, the action, frequency and timing, scope and scale, decision maker, constraints, and certainty, and any uncertainties that are related to climate change. And if you have a sense of the preliminary approach that will be used in decision analysis. So think through to the best of your understanding from what you've heard, what these elements might be.

OK, now we're back. Let's go through some of the elements of the decision problem. What did you write down? What was the trigger? Well, you heard several things, his neighbor who had sold some of his yaks. That might be a trigger for him to think about. Or maybe one of them is starting to show signs of sickness. So that might be a concern, there could be multiple triggers. We may not be completely clear about what the trigger is in this case, but we have an idea as to the trigger for this decision. And what is that action? Well, there could be different ways you could stage this. It could be how to optimize yak herding to provide the most return on the dairy products.

That would be one way to frame it. Another way would be, how to optimize his livelihoods to best provide his means of income. So you could think more broadly at that level. So we'll come back to action, and depending on how we frame it there could be multiple actions that would actually be the decision in this context. Frequency and timing, well, if you sell all of your livestock that could be a one-time decision, but there might be a potential to then recoup some of the heard in subsequent years. So, right now we'll decide that this is a one-off decision, but there may be a reason to think that it's linked to other decisions that could be made down the road.

The decision maker, well, is the decision maker just Joshie or are there other parties that are involved in the decision? Maybe his wife, maybe his son is relevant. Maybe other people are decision makers depending on some of the actions or some of the scales at which we define the decision context. His small group members might be involved or maybe his village leader, other people that are responsible for certain decisions about how he can change the timing associated with where he takes his livestock.

Constraints, and scope and scale. So, these are very interrelated in this context. The scale and scope of the decision we talked about, well maybe it's just around his herd management practices. Maybe it's around how to optimize a livelihood, different job or income sources. If it's about the herd management, then some of the actions may involve other people and there may be constraints associated with those, in that he's not able to take his livestock anywhere he wants, any time he wants. There are some

constraints around when and where he can take how many livestock.

And uncertainties, well, you've heard some uncertainties expressed. Will the yaks get sick? If they get sick will they die? When would they get sick? Is it something I need to worry about now? Or is it something that would just impact my son? Are there other options? If I get a job now besides yak herding and sell my livestock what would my son do? What if he's not able to get a job? So, we heard several uncertainties that are related to this decision. And some of those are due to climate change and certainties about the range land health, about alpine meadows, about the vegetation quality for the yaks and how that impacts their dairy outputs. Also, the more direct impact on the yaks themselves, the temperature has. And also some other indirect effects through parasites another diseases that the yaks are more susceptible to, because of climate change.

So a preliminary decision analysis approach, do we think this is a single objective or multiple objective decision problem? It could be single objective, or it could be multiple objective, it might just be how to best manage the livestock. Or maybe it's how to best manage now and in the future, maybe there's a certain time objective as well associated with that. So those are all the kinds of things you can think about and how you would frame the decision problem. And remember, with the decision problem, there's more than one way to frame the decision.

And so you can choose among different ways of looking at it, different scales and scopes of the decision, and try it this way and then if it doesn't seem to fit as you move towards objective and alternatives, then you may want to modify that. You may want to improve or change things in the way that you've initially framed it. So again, this is an iterative process, but we have some things to go on for right now.