

# Structured Decision Making

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- To what extent does uncertainty influence the decision?

# Framing A Structured Decision Analysis

- Main decision(s):
  - Goals and objectives: \_\_\_\_\_
  - Why: \_\_\_\_\_
- Single or multiple decision makers: \_\_\_\_\_
- Decision complexity:
  - Single or multiple resources: \_\_\_\_\_
  - Single or multiple objectives: \_\_\_\_\_
  - Single or multiple decision variables: \_\_\_\_\_
  - Secondary effects of decisions: \_\_\_\_\_
- Who is involved: \_\_\_\_\_
- Potential conflict: \_\_\_\_\_
- Time frame: \_\_\_\_\_
- Key uncertainties: \_\_\_\_\_



# Many Tools and Methods

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## 1. Structuring the Problem

- Mind maps, influence diagrams
- Decision trees
- Objectives hierarchy analysis

## 2. Analyzing the Problem

- Modeling
- Probability networks
- Analytic Hierarchy Process AHP
- Analytic Network Process ANP
- Scenario analysis
- Comparative risk assessment



## 3. Making the Decision

- Valuation, Cost-Benefit Analysis
- Optimization
- Multi-Attribute Utility Theory MAUT
- Analytic Hierarchy Process AHP
- Simple Multi-Attribute Ranking Technique SMART
- Stochastic Multicriteria Acceptability Analysis SMAA

## 4. Implement & Monitor

- Implementation Monitoring
- Effectiveness Monitoring
- Validation Monitoring
- Passive & Active Adaptive Management

Many of them can be represented in a simple series of steps.

# Structuring a Multi-Objective Decision

1. Identify the alternatives to be ranked.
2. Clarify the objectives that should be met by the top-ranking alternative.
3. Identify criteria (acceptable level) for each objective.

## Structuring a Multi-Objective Decision (cont.)

4. Quantify the degree to which each alternative will meet each objective.
5. Quantify preferences about different objectives (weighting, “risk attitude”).
6. Rank the alternatives by combining information from Steps 4 and 5.
7. Explore your decision -- Do “sensitivity analysis” by changing acceptable levels or weighting.

# Learning

- Synthesize existing studies: identify key uncertainties
- Expert panels (short term) to fill in some uncertainties
- Learn by doing: research, monitoring, & adaptive management
- “Uncertainty is information, too.”



# Appropriate role of science: US Forest Service example

- Scientists not to take advocacy roles
- Scientists advise on risk analysis –
  - possible outcomes given alternative management decisions
  - probabilities of outcomes
  - implications of outcomes (economic, environmental, etc.)
  - implications of uncertainty, and the cost & value of more information
- Scientists can help build and test scenarios
- Scientists conduct a “science consistency evaluation:”  
Did management use all available science and interpret it correctly?

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# Goal Hierarchy Process

1. List goals (objectives) in order from most important to least important.
2. Calculate or estimate the probability that various alternatives will meet respective goals.
3. Filter out alternatives that have unacceptably low probabilities of meeting goals.