

## WHAT IS SDM?

Structured Decision Making (SDM) is an organized framework for making defensible choices in situations where there are multiple interests, high stakes, and uncertainty. The SDM process by itself does not identify a solution or select a preferred management option. Instead it actively engages stakeholders, technical experts and decision makers. It provides insight about the decision by clarifying the things people care about, identifying creative alternatives, evaluating how well different objectives are satisfied by different actions, exploring how risky some alternatives are relative to others, and exposing the fundamental trade-offs or choices that need to be made.

SDM helps people make decisions that are value-based (i.e. based on “what matters”), transparent (able to clearly show how and why choices were made), and efficient. It estimates impacts based on best available information, and actively deals with uncertainty. The collaborative process promotes dialogue and debate, and helps people focus on interests rather than positions. It results in trust, learning, and capacity building for future decisions. The SDM process is geared towards finding mutually acceptable alternatives, but consensus on a preferred alternative (although ideal) is not mandatory. The main sources of agreement and disagreement among participants are clarified and clearly documented for presentation to decision makers.

## SDM STEPS



SDM is based on a common-sense set of core steps to aid decision-making. Learning occurs at each step, and the steps may be iterated (repeated) as required.

A variety of tools and techniques from the decision sciences (e.g. influence diagrams, objectives hierarchies, means-ends diagrams, strategy tables, consequence tables) distinguish SDM from other processes. They are used at each step to help groups deal with complex decisions.

### **Step 1: Establish process and clarify the decision context**

What is the decision to be made and who will make it? What is the scope or limitations of the process and the decision (i.e. what's in and what's out)? What are the constraints for the process (timelines, budget, legal issues)? Who needs to be involved in developing solutions, and how will they work together? Decision sketching (running through the SDM steps in a quick overview manner) can help clarify the scope, what information is required, and where resources should be focused throughout the process.

### **Step 2: Define objectives and evaluation criteria**

The core of SDM is a set of well-defined objectives and evaluation criteria that clarifies values (the things that people care about), drives the search for creative solutions, and becomes the framework for comparing alternatives. **Objectives are simply a statement of “what matters” and the preferred direction of change** (e.g. increase revenues, increase the abundance of salmon, minimize greenhouse gas emissions, minimize impact on grizzly bear habitat). All the things that matter are included as objectives (not just those we have data for, not just those we can measure with a number). There are no “right” objectives, but there are some that are more useful than others for informing a decision.

It is important to separate **fundamental** or **ends** objectives (the outcomes we really care about and are trying to achieve) from **means** objectives (the ways we can achieve the ends). For example, a fundamental objective would be ‘Maximize air quality’ and a means objective would be ‘Minimize industrial emissions’. To get from means to ends, ask “Why is that important?” To get from ends to means, ask “How could we achieve that?” To clarify hard-to-quantify objectives (e.g. spiritual quality or visual quality), ask “What do you mean by that?” Means objectives can lead you to good alternatives, but only fundamental objectives should be used to evaluate alternatives. Other types of objectives can be **process** (e.g. maximize public involvement in the process) or **strategic** (e.g. be consistent with departmental vision).

Objectives and sub-objectives are shown in a hierarchy – this doesn't mean that some are more important than others, just that they're organized. At early stages you can eliminate the verb indicating preferred direction. Objectives are not targets – note the difference between 'Minimize greenhouse gas emissions' and 'Minimize greenhouse gas emissions by 25%'.

A good set of objectives should be complete (all the things that matter are included), concise (no double counting), affected by the alternatives being considered, relevant and understandable to everyone, and ideally independent (the value of one does not depend on any of the others).

OBJECTIVE • SUB-OBJECTIVE	EVALUATION CRITERIA
Caribou • Abundance • Distribution	Population # Total habitat area (ha)
Fish • Abundance • Food sources	Population # Benthic biomass (kg)
Cost • To government • To industry	\$ \$
Traditional lifestyles • Navigation routes • Ceremonial sites	Fall/spring navigability # of sites affected

**Evaluation criteria (sometimes called performance measures) define exactly what is meant by the objective and how it will be measured.** They are used to consistently estimate and report the predicted consequences of different actions, for the purposes of making a choice. Evaluation criteria are only useful if they communicate key differences in performance of one alternative over another on a specific objective. Good evaluation criteria are complete and concise, clearly understood by everyone involved (including being explicit about uncertainty), direct (accurately report on the consequences of interest), and operational (the required information can be obtained). They don't have to be a number!

The goal of this step is to produce one common set of objectives and evaluation criteria that everyone agrees will be used to evaluate the alternatives. **\*\* People may disagree about which objectives matter the most or which alternative is best, but they need to agree on a common structure for making the decision.**

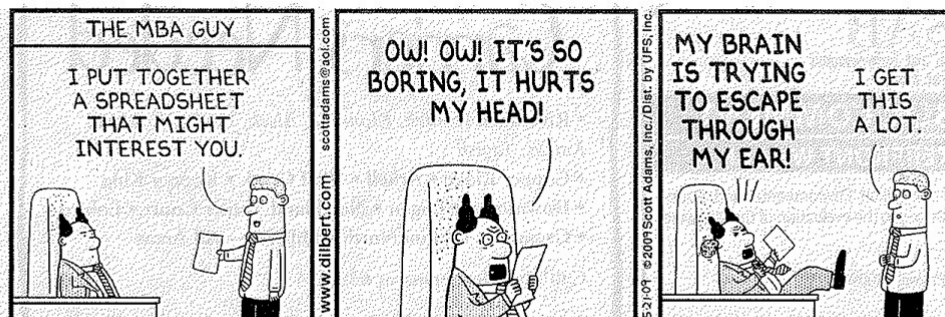
### Step 3: Develop alternatives

This step is about the search for creative solutions to address what really matters, as defined by your objectives. The range of alternatives should reflect truly different mixes of desired outcomes or different priorities, and present decision-makers with realistic options. It is also important to search for 'robust' alternatives that address key uncertainties (i.e. that are flexible enough to accommodate various outcomes, or that perform well across a range of possible alternatives). **Strategy tables** can be used as a 'menu' from which to choose combinations of possible management actions.

As you examine the range of alternatives, you can eliminate those that perform poorly for most of your objectives, and combine some elements of the different alternatives to create new ones. Short-listed alternatives should be small in number but high in quality. They should be value-focused (designed to address the fundamental objectives), technically sound (based on best available information about cause and effect relationships), and able to expose key trade-off choices.

### Step 4: Estimate consequences

This step links objectives, evaluation criteria, and alternatives into a **consequence table** (created as an Excel spreadsheet) to show the impacts of various alternatives on the things that matter.



Actually, the consequence table is a very useful way to summarize the information you need to compare options and make a decision. It helps you narrow your focus to the critical areas where trade-offs need to be made, and create a shared understanding of how different choices impact different values.

Objectives	Measures	Option A	Option B	Option C
Maximize financial return	Net present value (\$)	\$1,000,000	\$1,250,000	\$850,000
Minimize area of disturbed wetland	Area impacted wetland (ha)	10 ha (+/- 2 ha)	6 ha (+/- 1 ha)	4 ha (+/- 1 ha)
Minimize risk of contaminated soil	Max. potential soil contamination index	Medium	Medium	High
Maximize reliability to customers	Length of line near tall trees (km)	14 km	16 km	22 km

In this example, we are looking at Option A and comparing it with Options B and C. Option B performs significantly better (green) than Option A on some of the objectives. Option C performs significantly worse (red) than Option A for all the objectives except one. At this step you need to agree on the preferred direction, otherwise you can't compare whether one alternative is 'better' or 'worse' than another. A good consequence table summarizes the best available information from 'experts' (whether they be scientists, economists, or traditional knowledge holders), is understandable to the entire audience, and highlights any uncertainties.

### **Step 5: Evaluate trade-offs and make choices**

**Trade-offs (how much you would give up on one objective to achieve gains on another)** are difficult but usually unavoidable. The SDM process requires that participants make explicit choices about which alternative they prefer, based on their own values and their understanding of the values of others. Uncertainty (information we would like to have but don't) and the level of risk associated with certain choices are openly discussed. Other tools such as weighting of evaluation criteria or scoring/ranking alternatives may also be used. Emphasis is on group discussion and collaborative decision-making, and the goal is to find an alternative that achieves a balance across multiple objectives. However, consensus is not mandatory. Areas of agreement and disagreement are documented and presented to decision makers.

Key questions to consider: Are the trade-offs clear enough that you can make an informed choice? Do the trade-offs suggest a new alternative? This is also the time to test your objectives – do they define what really matters to you and others? Test your evaluation criteria – do they help you compare alternatives and decide which one you prefer? If there's a reason why you prefer one alternative over another, is it shown in the table? Would a different choice of evaluation criteria change your decision?

### **Step 6: Implement and monitor**

The challenge at this point is to implement the decision in a way that reduces uncertainty, improves the quality of information for future decisions, and provides opportunities to revise and adapt based on what is learned.

### **WANT TO LEARN MORE ABOUT SDM?**

- [www.structureddecisionmaking.org](http://www.structureddecisionmaking.org)
- Gregory, R., L. Failing, M. Harstone, G. Long, T. McDaniels, and D. Ohlson. 2012. Structured Decision Making: A Practical Guide to Environmental Management Choices. (Book available for purchase on Amazon)
- Compass Resource Management Ltd. <http://www.compassrm.com/>  
Also materials provided at 'Introduction to Structured Decision Making' training seminar, April 16-18, 2013.
- Industry Canada. 2011. Triple Bottom Line and Structured Decision-Making: A Case Study of BC Hydro. [http://www.ic.gc.ca/eic/site/csr-rse.nsf/eng/h\\_rs00564.html](http://www.ic.gc.ca/eic/site/csr-rse.nsf/eng/h_rs00564.html)
- Available on the YLUPC website [www.planyukon.ca](http://www.planyukon.ca) (Go to Workshops – Recent – From Claim to Plan and Beyond, January 30-31, 2013):
  - Structured Decision Making: Overview and Some Examples (presentation by Dan Ohlson).
  - Exploring the opportunity for Structured Decision Making in support of Yukon regional land use planning (discussion paper prepared for DRPC by Dan Ohlson and Lesley Cabott, 2013).