Risk Management in Planning: Tools and Application

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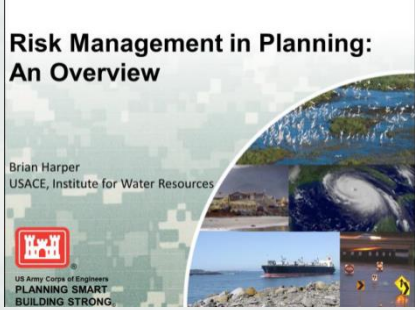
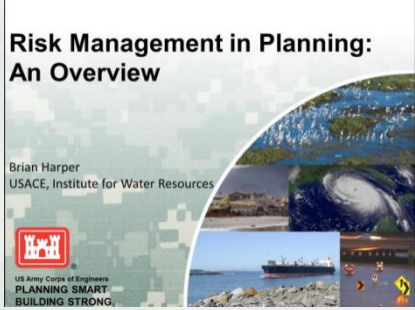
Review of 1st Webinar

Risk Mgmt in Planning: An Overview



- Risk is the effect of uncertainty on the organization's objectives, usually expressed as a combination of likelihood and consequence. (adapted from ISO 31000 - Risk Management)
- Risk Analysis includes 3 activities - Risk Communication, Risk Assessment and Risk Management
- Risk Analysis is an analytic-deliberative process that requires ongoing communication, internally and externally, to inform decision making (from NRC 1996)
- The 6-steps of planning readily accommodate the analytic-deliberative process to support sound decisions
- Risk management in planning requires that the pdt and vertical team explicitly address uncertainty
  - Has it been reduced enough, such that associated risks are tolerable?
  - If so, make the decision with the info in hand
  - If not, what additional work can be done to reduce further?



1st Webinar Links

Slides with Notes are here:

http://planning.usace.army.mil/toolbox/webinars/RiskMgmtOverview_2May2013.pdf

Q&A are here:

http://planning.usace.army.mil/toolbox/webinars/riskanddecisions_webinarqanda.pdf

Planning Risk Management Tools

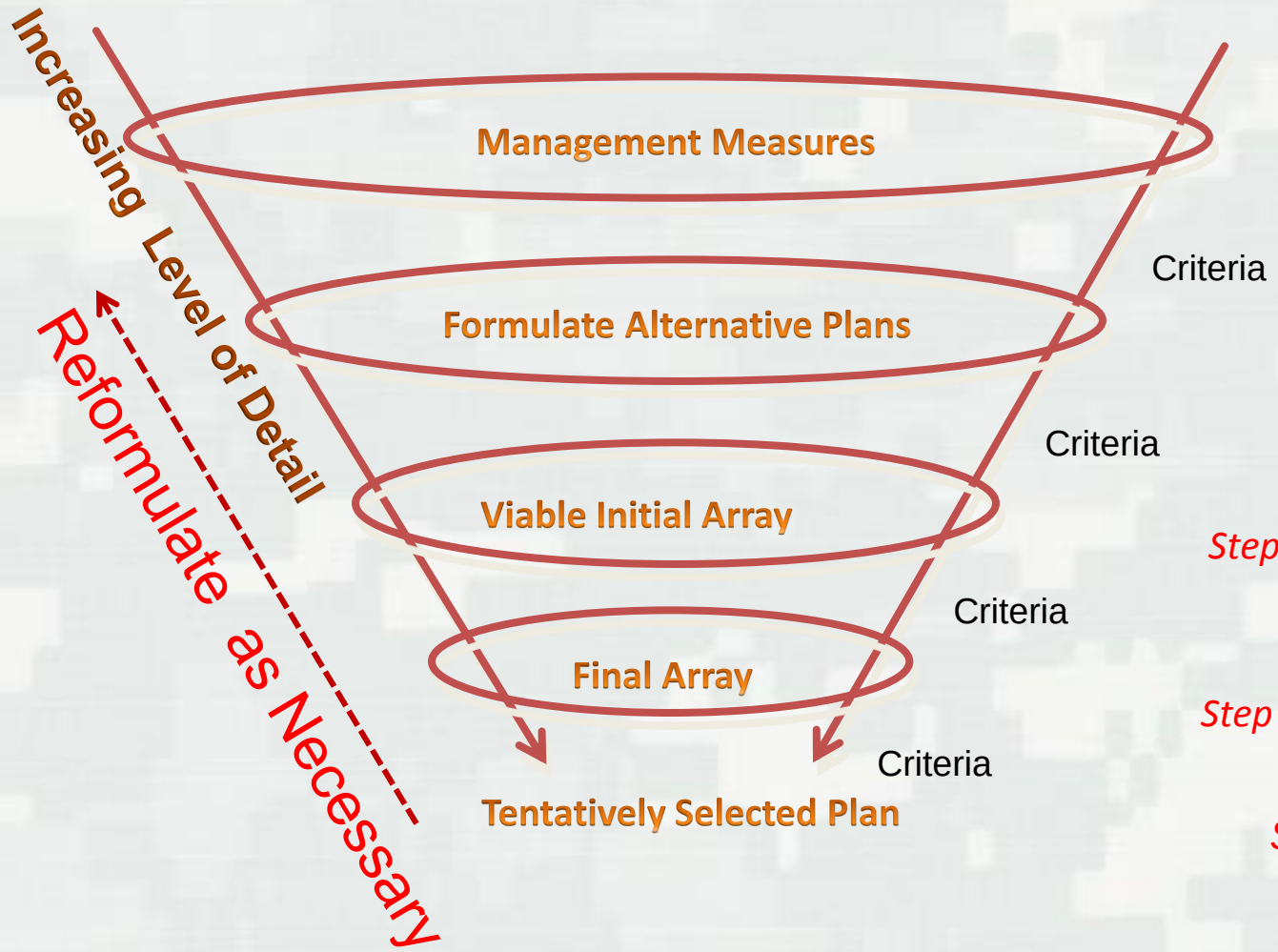
- Decision Management Plan (DMP)
  - Strategy to make the next decision; clearly describe criteria and methods
  - A roadmap to the next milestone
- Risk Register (RR)
  - Identifies uncertainties and risks in the criteria & methods
  - Acceptability of the consequences
  - Mitigation measures and outcomes

Planning Decisions

We make planning decisions when we:

- Formulate, evaluate, compare, and select
- Across a set of decision criteria
  - Benefits: Economic, Environmental, Safety
  - Costs: Construction, LERRDS, OMRR&R
  - Impacts: Environmental, Social, Cultural
  - Legal and Policy requirements
- In comparison to future without project

Plan Formulation Process



Step 1: Specify Problems and Opportunities

Step 2: Inventory and Forecast

Step 3: Formulate Alternative Plans

Step 4: Evaluate Alternative Plans

Step 5: Compare Alternative Plans

Step 6: Plan selection

In Practice……

- Be explicit about the decisions being made and what decision information
- Transparent practices
  - Assumptions
  - Procedural methods and models
  - Analytical results
- Use the Risk Register to identify, assess, and evaluate risks
- Repeated analytic-deliberative
  - This is the confluence of risk assessment and risk management
- Explicit treatment of uncertainties
  - Assessors convey significance of uncertainty
  - Managers take it explicitly into account in decision making

RISK REGISTER EXAMPLES

The Risk Register

- Identify the risk issues in the DMP strategy
- Assess the likelihood and consequence of the risks
- Characterize the uncertainty in this risk assessment
- Identify the risk management options for high risk items
- Recommend and implement actions/tasks in support of the DMP

Initial Risk Register

Concerns related to:

- Problems and Opportunities
- Future Without Project Conditions
- Formulation Strategies
- Screening Criteria
  - Effectiveness, Completeness, Acceptability, Efficiency

Risk Category /Shortcut	Risk Description	Consequences	**Consequence Rating** *Severity, frequency, duration of impact on study success or project outcomes.*	**Likelihood Rating** *Probability of deviation from expectation***.**
Limited Alternatives	A fewer number of detailed alternatives will be evaluated because of time limitations (e.g., 3 vs. 10 alternatives in the final array)	There may be concern as to whether the Selected Plan is the optimized plan, and that an evaluation of a broader array of alternatives may have identified a different cost-effective alternative that was not evaluated in detail. May not get stakeholder buy-in.	High because this assumes we won't get HQ or stakeholder support and acceptance.	High

Uncertainty *Range of potential results.*	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Recommendation for reducing or "buy down" the risk (optional column)**	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Levels of rating buy down from mitigation recommendation**
Medium because of the uncertainty between High and Medium ratings by team members	H	H	M	H(M)	Will attempt to bracket a wide range of alternatives in a comprehensive screening process. We will be screening a large number of alternatives up front (preliminary array). Batch processing components.	M	L	M	L(M)	2

Risk Category/Shortcut	**Risk Description**	**Consequences**	**Consequence Rating** *Severity, frequency, duration of impact on study success or project outcomes.*	**Likelihood Rating** *Probability of deviation from expectation*.
Identifying Problems & Opportunities	A reduced amount of time will be spent on identifying problems, opportunities and objectives.	Some problems and opportunities could get missed or identified later in Plan Formulation Process which would require revisiting steps made towards formulation.	Low - we are not likely to have missed anything significant. We have evaluated problems, opportunities and objectives for this region for over 10 years.	Low - we have evaluated problems, opportunities and objectives for this region for over 10 years.

Uncertainty *Range of potential results.*	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Recommendation for reducing or "buy down" the risk (optional column)**	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Levels of rating buy down from mitigation recommendation**
Low - based on past experience with ROG and DECOMP	L	L	L	L(L)	None identified	L	L	L	L(L)	0

Future w/o Assumptions	Assumption that 2nd Generation CERP Projects in place for the FWO condition. Includes C-43, BBCW, C-111SC and BCWPA.	BBCW and C-111SC - since projects are being constructed by the sponsor prior to authorization,-not including in the FWO would be a disconnect.	Low - under construction	Low - expect that Congress will ultimately authorize and fund, just a matter of timing.
		C-43 would be complimentary to this PIR	Low - complimentary to the outcome of the project	Low - expect that Congress will ultimately authorize and fund, just a matter of timing.
		There could be a disconnect in plan formulation and benefit evaluation due to seepage impacts and S-9 pump station operation changes resulting from BCWPA.	Medium	Low - expect that Congress will ultimately authorize and fund, just a matter of timing.

High - don't know when Congress will authorize and fund.	N	L	L	N(L)	None identified	N	L	H	N(H)	0
High - don't know when Congress will authorize and fund.	L	L	M	L(M)	None identified	L	L	M	L(M)	0
High - don't know when Congress will authorize and fund.	M	L	H	L(H)	Could run sensitivity analysis without BCWPA, but would increase time and cost to the study.	M	L	M	L(M)	0

Climate Change - Sea Level Rise	Conduct sea level rise evaluation only on the TSP, using a static scenario based GIS sea level rise mapping effort similar to previous CERP PIRs.	EC requires significant amount of time and effort modeling various sea level rise scenarios. Requires evaluation of all alternatives -- impacts schedule.	Low - objectives of project are consistent with mitigating for sea level rise.	Low

Low	L	L	L	L(L)	Present a narrative and GIS based evaluation of sea level rise scenarios on the TSP. Include an explanation of how formulation and plan selection would not be impacted by sea level rise.	L	L	L	L(L)	0

Risks in Comparing

- What are the “differences that make a difference”?
- In other words, among the criteria, which ones are most sensitive to the choice of plans.
- Would reducing uncertainty in one or more of the criteria make the difference in benefit, cost, or impact clearer?

Risk Category/ Shortcut	**Risk Description**	**Consequences**	**Consequence Rating** *Severity, frequency, duration of impact on study success or project outcomes.*	**Likelihood Rating** *Probability of deviation from expectation.*
Data for Design	Reduced design data acquired, no new contracts to acquire data.	Increased design assumptions resulting in potential cost and schedule increases (i.e. subsurface investigations, topo and hydro data higher contingency for cost estimates, over/under design of features, over predict/under predict costs, can't address construction impacts adequately)	Medium	High

Uncertainty *Range of potential results.*	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Recommendation for reducing or "buy down" the risk (optional column)**	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Levels of rating buy down from mitigation recommendation**
Low	M	H	L	H(L)	Use existing data and studies to reduce risk. Identify areas where spot data (limited additional data) or desk top analysis may be useful. Capture any remaining uncertainties in the contingencies.	M	M	L	M(L)	1

Risk Category/ Shortcut	**Risk Description**	**Consequences**	**Consequence Rating** *Severity, frequency, duration of impact on study success or project outcomes.*	**Likelihood Rating** *Probability of deviation from expectation.*
Reduced Level of Design	Reduced level of operational detail regarding how facilities will operate together	May need to include additional features to accurately operate to achieve goals, which will lead to an increase in project cost. Features may likely have to be modified due to short design window. Plan may call for a specific feature based on assumptions, where design may require different size for actual operations. Reduced timeframe does not permit enough time to make decision whether operations or design changes are necessary. It may	High	High

Uncertainty *Range of potential results.*	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Recommendation for reducing or "buy down" the risk (optional column)**	**Consequence**	**Likelihood**	**Uncertainty**	**Risk (uncertainty)**	**Levels of rating buy down from mitigation recommendation**
Low	H	H	L	H(L)	Build in flexibility in preliminary design plan rather than dictating detailed infrastructure requirements and specifications in the project plan.	M	H	M	H(M)	0

Assessors	Action	Risk and its cause	Consequence	Consequence rating	Evidence for consequence rating
PM, Section Chief and PDT Biologist, Geographer, Engineer and Landscape Architect (mainly PL-E	Task: PDT uses existing data only to satisfy the necessary environment laws and regulations, agency reviews.	Existing data is not sufficient to satisfy resource agencies	We are delayed in reaching compliance with environmental regulation, resource agency approval, and obtaining permits to implement the project	Medium	Based on previous experience, we are typically required to gather site specific data.

Likelihood rating	Evidence for likelihood rating	Confidence rating	Risk Rating	Risk Management Options	Recommendation
Medium	Typically we are able to work with the resource and regulatory agencies to implement projects. However it is likely that there might be special conditions that need to be satisfied prior to construction. Depending on the requirements, we may experience project delay.	Low	Medium	Coordinate with agencies in advance to anticipate requirements and facilitate understanding.	Coordinate with agencies in advance to anticipate requirements and facilitate understanding.

Risks in the Agency Recommendation

Before we publish the final report, how much do we need to reduce uncertainty in costs, benefits, impacts, etc of the recommended plan?

902 limit

Resource Agency Concerns

BCOE

What do we do now, what do we do in PED?

Assessors	Action	Risk and its cause	Consequence	Consequence rating	Evidence for consequence rating
PDT Hydraulic Engineer	Task: Evaluate current data available (topo, LIDAR); to determine what else is needed to start refining designs. Expect Reduced Survey Data collection overall (cross sections, bathymetric, groundtruth LIDAR).	Project development based on presently available data and reduced data collection will increase design assumptions and may result in an inaccurate basis of design, design and/or quantity take-offs.	Study level quantities and cost estimates may not adequately reflect actual project costs. Potential cost and schedule increases. Higher contingencies. 902 Bust if costs are incorrect.	High	Depending on what is found during the site visit, study level quantities and cost estimates can increase greatly. Excavation, dredging and placement quantities are the main drivers of cost for many of the candidate site restoration measures. Lack of higher resolution data will result in uncertainty with regard to quantity take-offs.

Likelihood rating	Evidence for likelihood rating	Confidence rating	Risk Rating	Risk Management Options	Recommendation
High	Project consists of multiple candidate sites. Likelihood is that one or more sites will experience cost/schedule increases due to inaccurate basis of design, design and/or quantity take-offs.	Medium	High	Assess minimal data needs and existing data gaps. Data gaps should be analyzed with specific regard to increasing accuracy of cost estimate. Efficient data collection methods should be employed to collect data identified as critical to producing a reasonably accurate and defensible cost estimate. (e.g., locations with the greatest uncertainty; largest sites)	It is recommended that the data collection strategy described as a risk management option for this project be executed.

Action	Risk and its cause	Consequence	Consequence rating	Evidence for consequence rating
Event: Reduced Tide Data collection	Project development based on presently available data and reduced data collection will increase design assumptions and may result in an inaccurate basis of design, design and/or quantity take-offs.	Significant potential cost and schedule increases. Higher contingencies. 902 Bust if costs are incorrect.	Medium	Excavation, dredging and placement quantities are the main drivers of cost for many of the candidate site restoration measures. Lack of higher resolution data will result in uncertainty with regard to quantity take-offs. (e.g., 2.5" acceptable uncertainty for every foot of excavation.)

Likelihood rating	Evidence for likelihood rating	Confidence rating	Risk Rating	Risk Management Options	Recommendation
High	Project consists of multiple candidate sites. Likelihood is that one or more sites will experience cost/schedule increases due to inaccurate basis of design, design and/or quantity take-offs.	Medium	High	Assess minimal data needs and existing data gaps. Data gaps should be analyzed with specific regard to increasing accuracy of cost estimate. Efficient data collection methods should be employed to collect data identified as critical to producing a reasonably accurate and defensible cost estimate.	It is recommended that the data collection strategy described as a risk management option for this project be executed.

SELECTING A PLAN – DECISION MAKING UNDER UNCERTAINTY

Uncertainty

- Consider net NED benefits as a decision criterion

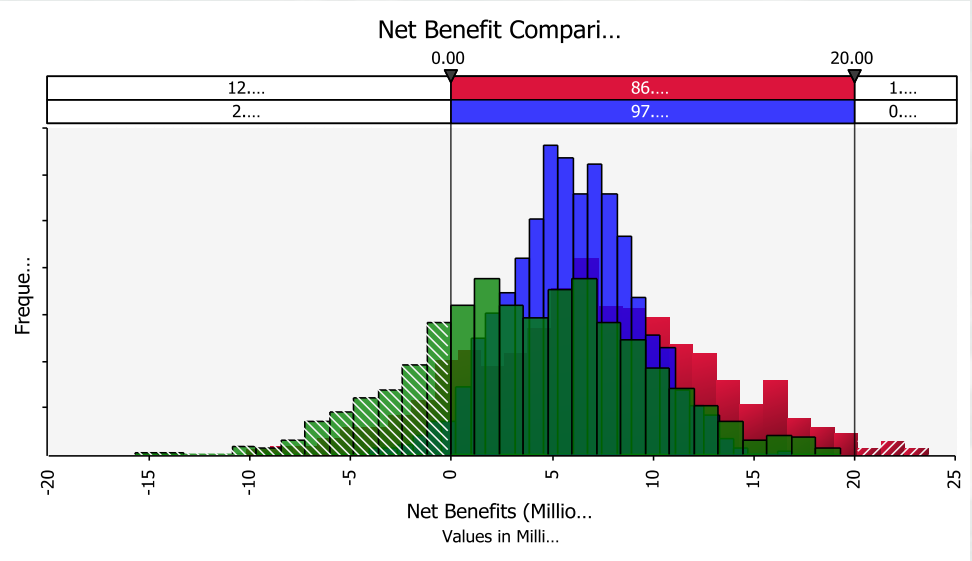
Net Benefits	Plan 1: Red	Plan 2: Blue	Plan 3: Green
Mean	$6,998,000	$6,001,142	$4,000,039

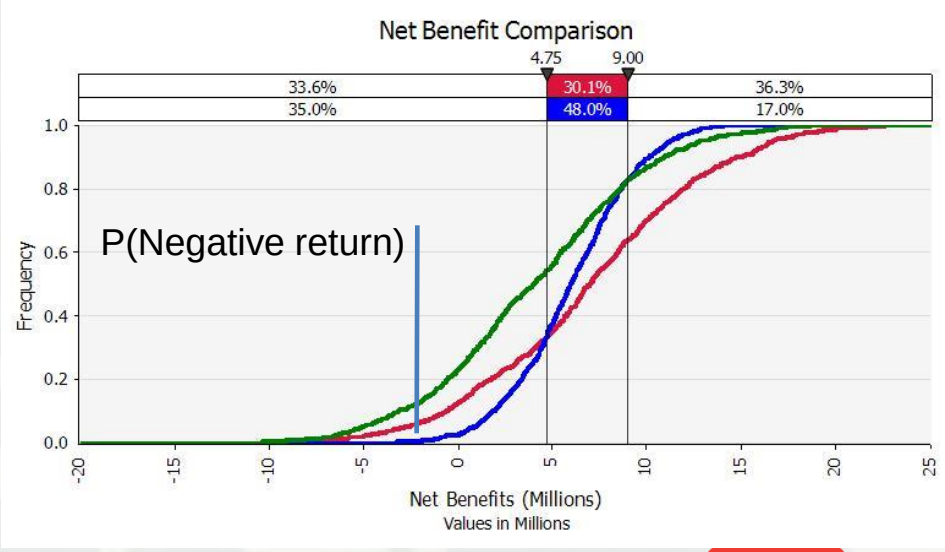
- Which is the best plan?

Decision making will becoming multi-dimensional. Can we handle that?

Uncertainty

Five Number Summary	Plan 1	Plan 2	Plan 3
Plus Mean	Red	Blue	Green
Mean	$ 6,998,000	$ 6,001,142	$ 4,000,039
Minimum	$ (10,173,310)	$ (4,114,583)	$ (15,726,346)
1st Quartile	$ 3,076,969	$ 3,960,606	$ 318,544
Median	$ 6,978,948	$ 5,952,181	$ 4,031,267
3rd Quartile	$ 10,931,366	$ 8,087,706	$ 7,682,767
Maximum	$ 23,635,943	$ 16,894,192	$ 19,273,900





Which is the best plan now?

Possible Rules for Making Decisions Under Uncertainty

- Maximax—appeals to gamblers (R, G, B)
  - Choose plan with best upside payoff
- Maximin—appeals to cautious (B,R,G)
  - Choose plan with best downside payoff
- Laplace—risk neutral (R,B,G)
  - Choose plan based on expected value payoff
- Hurwicz—neither neutral nor extreme (depends on weights)
  - Choose plan based on assigned weights
- Regret-make wrong decision and regret it (Red)
  - Identify the maximum regret associated w/ each choice
  - Choose plan that minimizes this regret

Regret

From Table on slide 19

States of the world

	Min	Max
Red	$ (10,173,310)	$ 23,635,943
Blue	$ (4,114,583)	$ 16,894,192
Green	$ (15,726,346)	$ 19,273,900

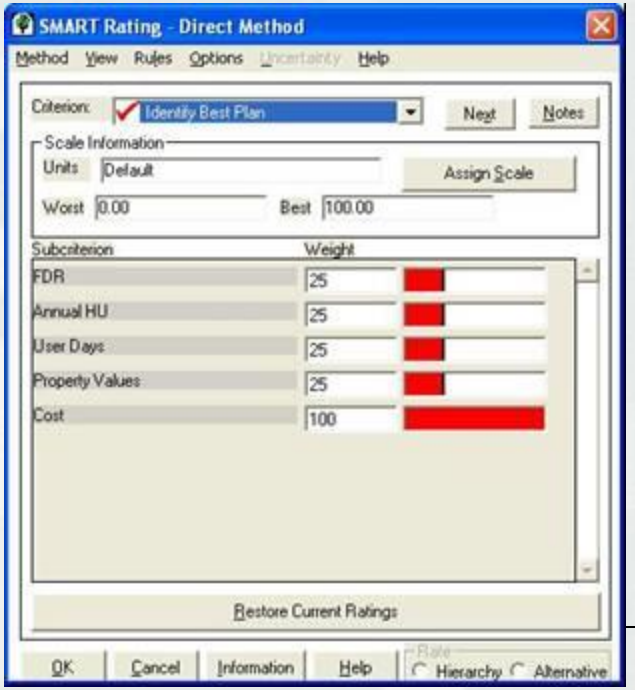
Regret Matrix

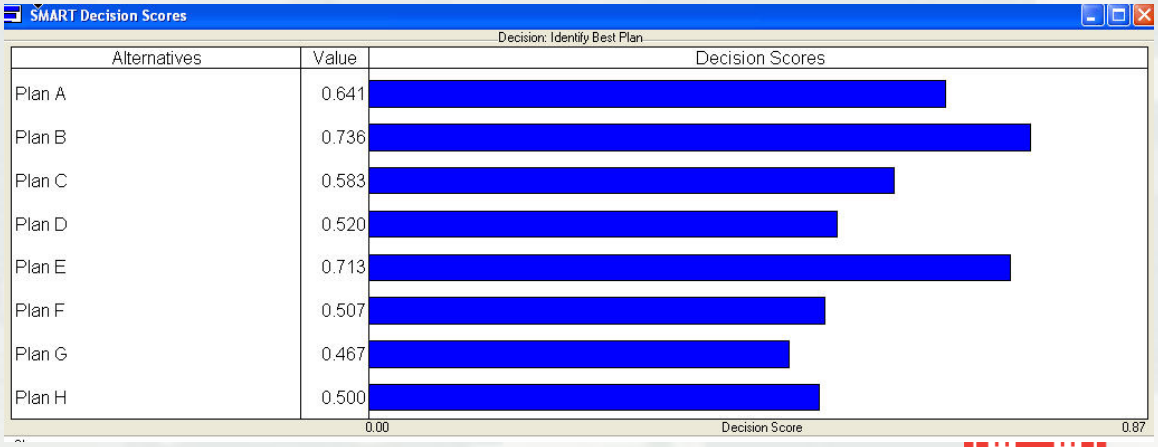
			Maximum
Red	$ 6,058,727	$ -	$ 6,058,727
Blue	$ -	$ 6,741,751	$ 6,741,751
Green	$ 11,611,763	$ 4,362,043	$ 11,611,763
		Minimax	$ 6,058,727

If we choose red our regret will at most be $6.1 million

Trade-Offs

	Plan A	Plan B	Plan C	Plan D	Plan E	Plan F	Plan G	Plan H
Flood risk management ($1000s EAD)	$10	$800	$60	$80	$25	$50	$100	$900
Annual HU's	46	0	50	90	85	75	116	116
Annual user days of urban recreation	700	0	850	2000	1000	800	3000	3000
Property value effects	2	3	2	1	3	1	2	3
Cost ($Millions)	$15	$15	$23	$33	$20	$27	$53	$68





Premise Sets

If DM believes: Sediment budget will be > 0.64 E	If DM believes: Sediment budget will be < 0.64 E
If DM wishes to: Assure certainty of SRS	If DM wishes to: Maintain flexibility to adjust program to sediment realized
If DM is willing to: Risk financial loss if sediment is < 0.64 E	If DM is willing to: Risk financial loss if sediment is > 0.64 E
Budget for large outlay in initial years.	Commit to long-term budgeting
	Risk temporarily reduced levels of protection for low-probability sequential stores
Then DM should: Select SRS	Then DM should: Delay decision on SRS and select SSBs

Source: Adapted from U.S. Army Corps of Engineers (1985a).

Using Risk to inform Decisions

- Risk Management - What recommendation would the team make today and why? What decision criteria and metrics would be used?
- Risk Assessment - How can uncertainties in the metrics affect study objectives?
- Risk Communication – internal and external, to understand views of others and to characterize uncertainty & risk issues
- Sound decisions can be made in spite of the uncertainties

Questions?

Type questions in the chat box.
We will answer as many as time allows.

For more information:

http://www.corpsriskanalysisgateway.us/index.cfm
http://www.corpsplanning.us

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