ANALYZING TRADEOFFS IN CIVIL WORKS PLANNING

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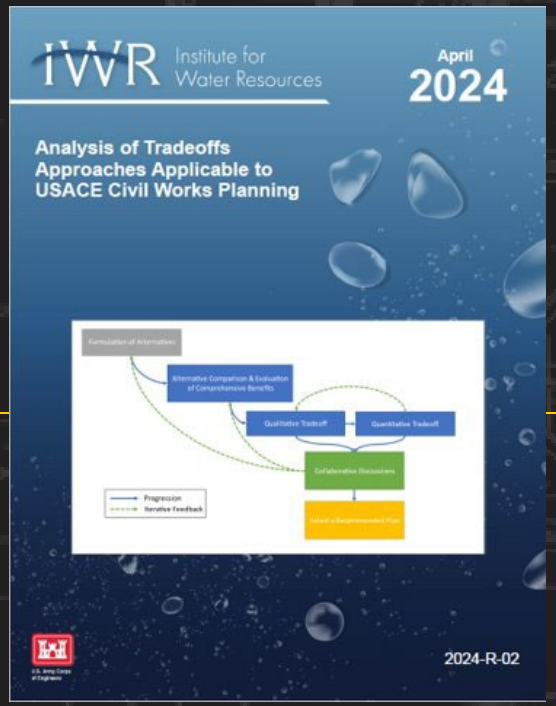

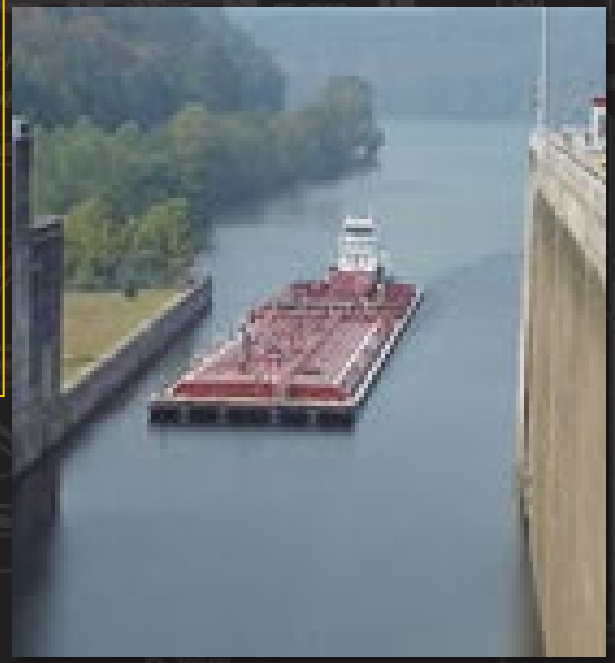

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WARM-UP ACTIVITY

For a hazardous waste site cleanup, rank (1 for most important, 2, 3 for least important) the importance of the following considerations:

economic cost of site remediation

potential damage to the environment (flora and fauna)

potential human life loss or sickness due to hazards from the site

WARM-UP ACTIVITY - TAKE 2

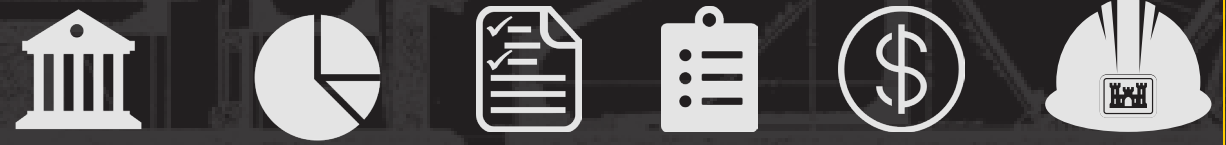
For a hazardous waste site cleanup, now rank (1, 2, 3) the importance of the following considerations:

economic cost of site remediation –
spend $3 billion

potential damage to the environment (flora and fauna)-
destroying 10 square miles of mature, dense forest

potential human life loss or sickness due to hazards from the site -
avoiding a mild two-day illness to 30 people

TRADEOFFS & PEOPLE



An Introduction

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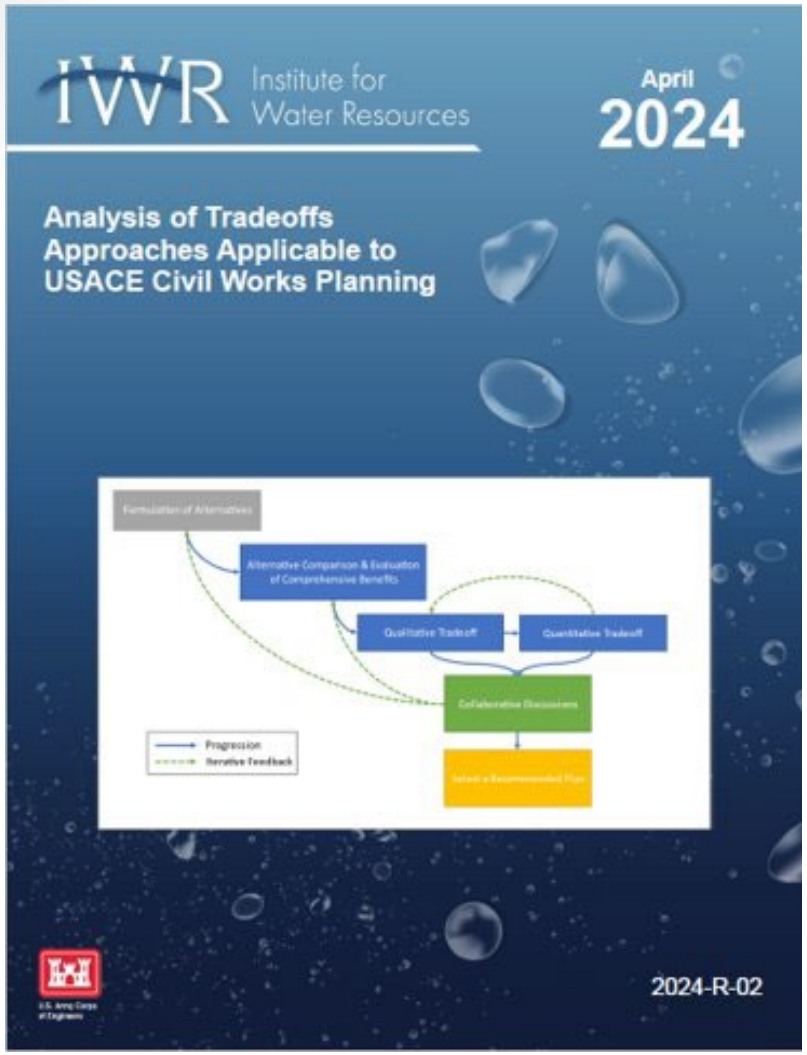
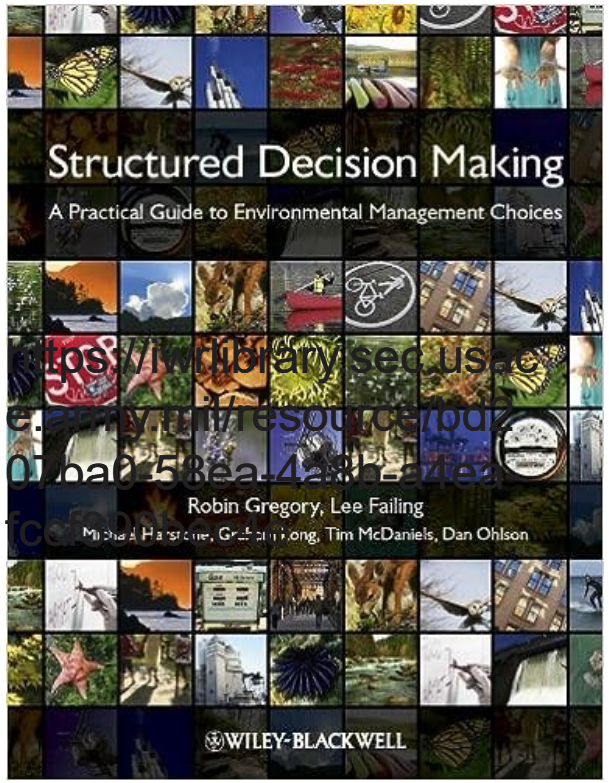
PRESENTATION SOURCES





2024 IWR Tradeoffs Report: https://iwrlibrary.sec.usace.army.mil/resource/f77f4db7-ded5-428e-f44f-0e178e068fc1

WHAT DO WE MEAN BY TRADEOFFS?

- A tradeoff is any situation where making one choice means losing something else (foregoing a benefit or future opportunity)
- Tradeoff analysis can be helpful for finding an acceptable balance across goals or objectives
- Often requires making tough choices
- However, tradeoffs can define **relative gains and losses**, rather than absolutes relative to a criteria or objective

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WHAT DO WE 'REALLY' MEAN BY TRADEOFFS?

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Value Tradeoffs are an important concept for informed decision-making, especially in multiple-objective contexts

- Alternatives deliver a different balance across objectives, and as a result choosing between alternatives involves Value Tradeoffs
- Value Tradeoffs define how much must be gained in the achievement of one objective to compensate for the lesser achievement of a different objective
- Value Tradeoffs are inevitable when selecting between a range of alternatives

GOALS OF ANALYZING TRADEOFFS

- Avoid unnecessary tradeoffs and look for win-wins
- Uncover unavoidable tradeoffs
- Promote constructive discussion and deliberation

Tradeoff Analysis leads to:

- A shared understanding of tradeoffs amongst participants
- Tradeoffs that are explicit and transparent
- Established rationale for decision

VALUE TRADEOFFS: OBJECTIVE VS SUBJECTIVE

"Decision-making is not, cannot, and should not be objective" (Keeney 2020).

Values set the standard for what matters, and they are naturally grounded in subjectivity.

Still, there are objective elements to decision-making (e.g., pareto optimal solutions preferable to non-pareto optimal solutions).

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USACE POLICY & TRADEOFFS

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Tradeoff Analysis is fundamental to the USACE Planning Process – conducting tradeoff analysis in a transparent manner is emphasized repeatedly throughout ER 1105-2-103, especially with respect to comparing economic, environmental and social effects

For example, the Planning Guidance Notebook (ER 1105-2-103). Under the Federal Objective (1-19 section c), states:

> *"Planning studies should provide the partner, Tribes, state and federal agencies, stakeholders, and decision makers with an opportunity to compare alternatives to water resource problems and examine the important **trade-offs** that are present among those alternatives. The **trade-offs** are to be expressed in economic, social, and environmental quality metrics to assess the degree to which the Federal Objectives are met by each alternative. USACE uses a structured planning process and framework to facilitate the comparison of alternatives and **assessment of trade-offs**. The framework in turn is guided by a set of principles to provide reasonable consistency across USACE programs and other federal water resource agencies."*

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USACE POLICY & TRADEOFFS

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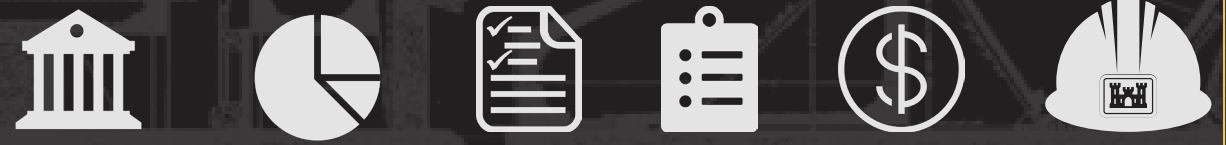
Tradeoff Analysis also meets the requirements of the Comprehensive Benefits Memo (5 Jan., 2021), Planning Requirements & Guidelines (PR&G) (2013).

- Comp Benefits Memo requires teams to take a multi-criteria decision approach to analyze benefits in total and equally, including economic, environmental and social benefits/impacts

- PR&G requires teams to take a more comprehensive approach to water projects to maximize economic, environmental and social benefit, while emphasizing collaboration and transparency in the evaluation and decision-making process

- Using tradeoff methods, qualitative, quantitative or multi-modal, executed in a collaborative environment, will be critical for developing a shared understanding and ultimately deciding on a recommended plan

TRADEOFF APPROACHES



Qualitative Tradeoff Approaches

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SETTING THE STAGE FOR TRADEOFF ANALYSIS

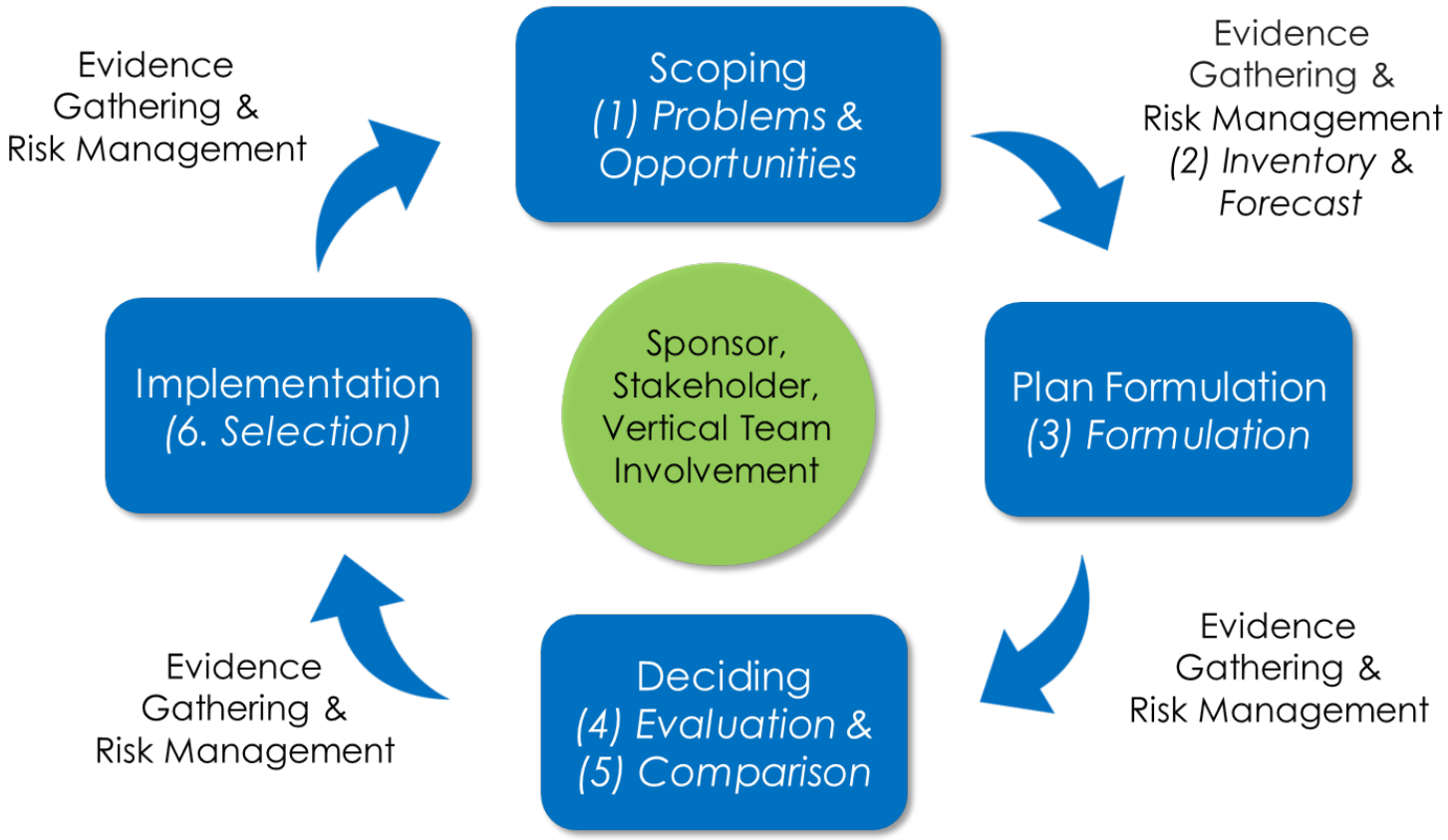
The success of a multi-objective decision process is most often related to the organization and facilitation of the process, rather than the technical method used for analyzing tradeoffs.

Important organization and facilitation questions to address:

- Who will be involved, and to what degree?
- Who will facilitate the process?
- How will collaboration be structured?
- How will info be gathered and shared?
- Ultimately, how will decisions be made?

SETTING THE STAGE FOR TRADEOFF ANALYSIS

- Get Organized!
- Be Transparent
- Identify who, how and when people will be involved, including the use of a skilled facilitator
- Shared understanding of objectives, decision criteria, tradeoff techniques to use, and how decisions will be made – BEFORE decision-making happens



TRADEOFF TECHNIQUES: WHERE TO BEGIN

- Planning decisions should use, at minimum, a qualitative tradeoff process
- Not every decision has to use a quantitative tradeoff analysis
- Scale analysis, whether it is qualitative or quantitative, to complexity of project

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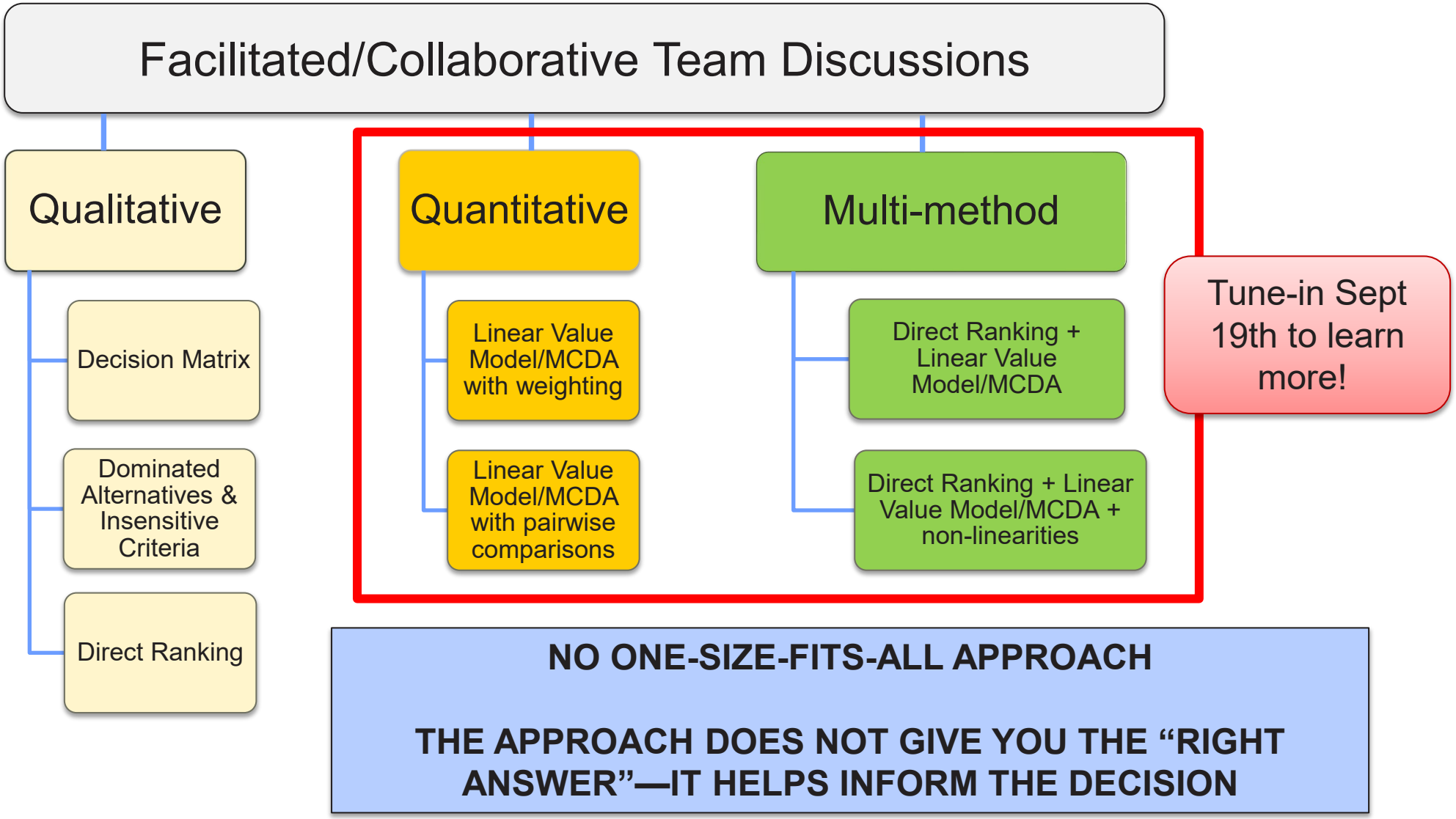
POTENTIAL TRADEOFF APPROACHES



*Refer to IWR Report 2024-R-02 for full discussion of each method

QUALITATIVE TRADEOFF ANALYSIS

Qualitative tradeoff approaches use structure, facilitated discussion to evaluate and compare alternatives

No additional quantification of value preferences is completed

An effective qualitative tradeoff analysis will:

Clarify **unavoidable** tradeoffs

Highlight key **tradeoffs & uncertainties**

Identify where **additional discussion** may add value

QUALITATIVE TRADEOFFS: FOUR-STEP COLLABORATIVE PROCESS

1. DEPICT

- Show results
- Single decision matrix

2. ELIMINATE INSENSITIVE CRITERIA

- Remove criteria that not change in output between alternatives
- Document

3. COMPARE ALTERNATIVES

- Eliminate dominated alternatives
- Document

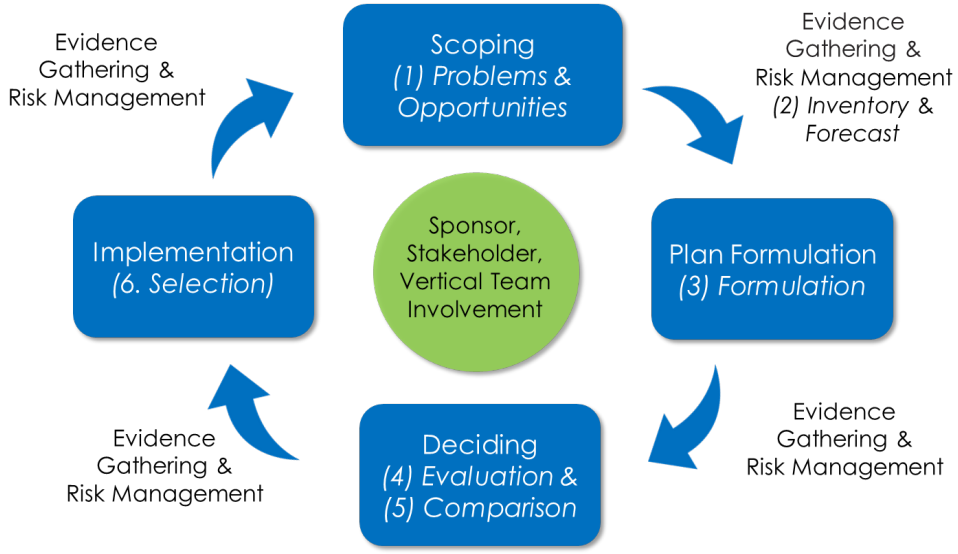
4. DOCUMENT

- Areas of agreement & disagreement
- Helps inform value judgments

EXAMPLE: QUALITATIVE TRADEOFFS DECISION MATRIX DEVELOPMENT

Step 1) Depict Results in a single **decision matrix** or table.

Objective	Performance Measure	More/Less Better?	Alternatives					
			FWOP	A	B	C	D	E



Decision Matrix Best Practices:

1) Describe each metric, its purpose and how it's measured
2) Ensure specific, independent metrics (avoid double counting)
3) Use colors and numbers to help visually present information
4) Explain the meaning behind numbers/colors since matrix may amplify small differences
5) Communicate uncertainty and timing of effects too

EXAMPLE:
DEPICT RESULTS IN A DECISION MATRIX

Objective	Metric	More/Less Better?	Alternatives							
			FWOP	A	B	C	D	E	F	G
Maximize NED benefits minus costs	Average Annual Net Benefits ($Million)	More	0	($10)	$45	$53	$100	$80	($20)	$62
Provide forage habitat for migrating birds	Habitat Created (Acres)	More	0	120	20	10	10	20	20	20
Allow communities to remain in place in the face of SLC	Permanently Displaced Population (Count)	Less	70	20	20	40	50	60	30	40
Protect key community and cultural assets	Community and Cultural Assets Exposed in 1% AEP Event (Count)	Less	20	15	10	10	10	20	10	10
Reduce business interruption from storm events	RED Losses ($Million)	Less	$55	$42	$35	$35	$50	$50	$41	$37
Reduce life safety risk	Average Annual Life Loss (AALL)	Less	20	20	20	20	20	20	20	20

DISCUSS AND EVALUATE RESULTS

During Step 1, ensure metrics are reported in the 'most' helpful way possible

- Is there a 'better' way to present information to support decision-making?
- For example, are there linear and non-linear metrics?

Metric	Alternatives							
	FWOP	A	B	C	D	E	F	G
Average Annual Net NED Benefits ($Million)	0	($10)	$45	$53	$100	$80	($20)	$62
Habitat Created (Acres)	0	120	20	10	10	20	20	20
Permanently Displaced Population (Count)	70	20	20	40	50	60	30	40
Community and Cultural Assets Exposed during 1% AEP Event (Count)	20	15	10	10	10	20	10	10
RED Losses ($Million)	$55	$42	$35	$35	$50	$50	$41	$37
Average Annual Life Loss (Count)	20	20	20	20	20	20	20	20

WHAT ARE NON-LINEAR METRICS?

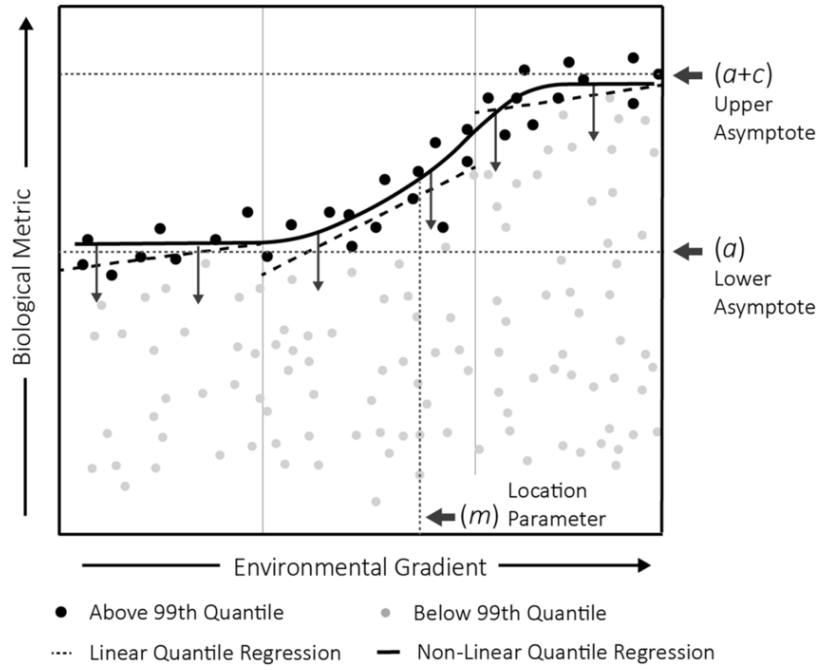
Linear metrics = each unit of change provides the same amount of benefit or disbenefit as the one before.

Non-linear metrics = do not have this uniform relationship

For example, consider forage habitat for migratory birds.

- When it's limited, benefit may increase linearly.
- Once enough is available, more habitat may not produce a linear amount of benefit.

Sometimes this happens because metrics are **proxy measures** for more difficult-to-measure metrics. Forage habitat isn't what we want to maximize; instead, abundance of migratory birds is the goal.



SIMPLIFYING NON-LINEAR METRICS

One method: make the measure binary. Identify point when benefit is achieved, regardless of linear scale.

For the example, assume 20 acres or more of habitat for migrating birds is sufficient.

	Objective	Performance Measure	More/Less Better?	Alternatives							
				FWOP	A	B	C	D	E	F	G
Initial:	Provide forage habitat for migrating birds	Habitat Created (Acres)	More	0	120	20	10	10	20	20	20
Revised:	Provide sufficient habitat to support migrating birds	Binary measure: 1 sufficient, 0 not	More	0	1	1	0	0	1	1	1

Or another approach: work with stakeholders to define how incremental changes would be valued. e.g., 5 acres is scored “0” since it doesn’t provide enough habitat, 10 acres is scored “.25,” 20 acres or more is scored “1.”

*If adjusting for non-linearity, technical or policy rationale **should be coordinated with the vertical team and documented**

EXAMPLE DECISION MATRIX: DISCUSS, DEPICT, COMPARE

1) Step 1: Depict results in matrix

   * Table includes revised habitat metric

2) **Step 2: eliminate insensitive criteria and dominated alternatives**

Metric	Alternatives							
	FWOP	A	B	C	D	E	F	G
Average Annual Net NED Benefits ($Million)	0	($10)	$45	$53	$100	$80	($20)	$62
Habitat Created (Acres)	0	1	1	0	0	1	1	1
Permanently Displaced Population (Count)	70	20	20	40	50	60	30	40
Community and Cultural Assets Exposed during 1% AEP Event (Count)	20	15	10	10	10	20	10	10
RED Losses ($Million)	$55	$42	$35	$35	$50	$50	$41	$37
Average Annual Life Loss (Count)	20	20	20	20	20	20	20	20

ELIMINATE INSENSITIVE CRITERIA

1) Depict results in matrix
2) **Eliminate insensitive criteria (i.e., the same across all alternatives)**
   - Life safety risk doesn't change between alternatives
   - Note, small changes in a metric may also be considered insensitive (team decision, must be documented)

Metric	Alternatives							
	FWOP	A	B	C	D	E	F	G
Average Annual Net NED Benefits ($Million)	0	($10)	$45	$53	$100	$80	($20)	$62
Habitat Created (Acres)	0	1	1	0	0	1	1	1
Permanently Displaced Population (Count)	70	20	20	40	50	60	30	40
Community and Cultural Assets Exposed during 1% AEP Event (Count)	20	15	10	10	10	20	10	10
RED Losses ($Million)	$55	$42	$35	$35	$50	$50	$41	$37
Average Annual Life Loss (Count)	20	20	20	20	20	20	20	20

NEXT ELIMINATE DOMINATED ALTERNATIVES

1) Depict results in matrix
2) Eliminate insensitive criteria
3) **Eliminate dominated and practically dominated alternatives**

   - Alt. A is *dominated* by Alt. B, since B performs better in all metrics than A.

   - This wasn't true before the non-linearity adjustment!

Metric	Alternatives							
	FWOP	A	B	C	D	E	F	G
Average Annual Net NED Benefits ($Million)	0	($10)	$45	$53	$100	$80	($20)	$62
Habitat Created (Acres)	0	1	1	0	0	1	1	1
Permanently Displaced Population (Count)	70	20	20	40	50	60	30	40
Community and Cultural Assets Exposed during	20	15	10	10	10	20	10	10
RED Losses ($Million)	$55	$42	$35	$35	$50	$50	$41	$37
Average Annual Life Loss (Count)	20	20	20	20	20	20	20	20

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…ELIMINATE…

1) Depict results in matrix
2) Eliminate insensitive criteria
3) **Eliminate dominated and practically dominated alternatives**

   - Alt. A is dominated by Alt. B

   - Alt. F is dominated by Alt. B

Metric	Alternatives							
	FWOP	A	B	C	D	E	F	G
Average Annual Net NED Benefits ($Million)	0	($10)	$45	$53	$100	$80	($20)	$62
Habitat Created (Acres)	0	1	1	0	0	1	1	1
Permanently Displaced Population (Count)	70	20	20	40	50	60	30	40
Community and Cultural Assets Exposed during	20	15	10	10	10	20	30	10
RED Losses ($Million)	$55	$42	$35	$35	$50	$50	$41	$37
Average Annual Life Loss (Count)	20	20	20	20	20	20	20	20

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…ELIMINATE…

1) Depict results in matrix
2) Eliminate insensitive criteria
3) Eliminate dominated and practically dominated alternatives

   -Alt. A is *dominated* by Alt. B

   -Alt. F is dominated by Alt. B

   -Alt. G may ***practically dominate*** Alt. C. *this decision is made by the team and must be documented!

Metric	Alternatives							
	FWOP	A	B	C	D	E	F	G
Average Annual Net NED Benefits ($Million)	0	($10)	$45	$53	$100	$80	($20)	$62
Habitat Created (Acres)	0	1	1	0	0	1	1	1
Permanently Displaced Population (Count)	70	20	20	40	50	60	30	40
Community and Cultural Assets Exposed during 1% AEP Event (Count)	20	15	10	10	10	20	30	10
RED Losses ($Million)	$55	$42	$35	$35	$50	$50	$41	$37
Average Annual Life Loss (Count)	20	20	20	20	20	20	20	20

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…ELIMINATE…

Simplify decision matrix

Remaining alternatives offer distinct combinations of benefits, likely at different price points.

They are **pareto optimal** and **efficient**.

To further refine alternatives, and move towards a recommendation, stakeholders/decision-making assess **value tradeoffs**.

A strategy to do that could be **direct ranking**.

Metric	Alternatives				
	FWOP	B	D	E	G
Average Annual Net NED Benefits ($Million)	0	$45	$100	$80	$62
Habitat Created (Acres)	0	1	0	1	1
Permanently Displaced Population (Count)	70	20	50	60	40
Community and Cultural Assets Exposed during 1% AEP Event (Count)	20	10	10	20	10
RED Losses ($Million)	$55	$35	$50	$50	$37

DIRECT RANKING

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Direct ranking asks **each participant** to rank alternatives.

Each participant ordinally ranks the alternatives (in example, 1-4) and assigns points to them (100 for the top-ranked alternative, close to 100 for one almost as good, 50 for one half as good, etc.).

The assigned points can be *normalized* (scaled to between zero and one) and examined against the results from all participants.

Sample results can be seen in the figure to the right, with higher numbers representing more-favored plans.

What can we tell from these results?

	Rank	Points
No Action		
Alternative B		
Alternative C		
Alternative E		
Alternative F		

	B	D	E	G
Person 1	0.30	0.24	0.36	0.10
Person 2	0.30	0.24	0.36	0.10
Person 3	0.13	0.24	0.39	0.24
Person 4	0.32	0.18	0.38	0.11
Person 5	0.28	0.28	0.34	0.10
Person 6	0.32	0.18	0.11	0.38
Person 7	0.26	0.26	0.41	0.07

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EXAMPLE DECISION MATRIX: DISCUSS AND DEPICT

Alternative	Effectiveness				Efficiency	Acceptable	Complete	NED	EQ	OSE	Lead Conc.
	Reduces sediment migration	Restores natural channel	Increases riparian habitat	Reasonably maximizes benefits	Minimizes cost relative to benefit	Minimizes policy concerns	Considered complete	Estimated annualized cost	Positive effects on resources	Reasonably maximizes other perspectives	Reduces lead conc. Aater 50 years
1- No Action	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW
2 – Max Eco (RM 0-10)	LOW	LOW	LOW	LOW	MEDIUM	HIGH	HIGH	LOW	LOW	MEDIUM	LOW
3 – Max Eco (RM 0-35)	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM	MEDIUM	LOW
4 – Max Eco Meramec R.	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	LOW	LOW	LOW	LOW
5 – Max Efficiency Big R.	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH	HIGH	MEDIUM
6- Max Eco Big R.	HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH	HIGH	MEDIUM	HIGH	HIGH	MEDIUM
7 – Max Eco Study Area	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM

Modified from Table 6.5 St. Louis Riverfront – Meramec River Basin Ecosystem Restoration Feasibility Study (2019)

DECISION MATRIX- COMPARE, AND ELIMINATE INSENSITIVE CRITERIA & DOMINATED ALTERNATIVES

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Alternative	Effectiveness				Efficiency	Acceptable	Complete	NED	EQ	OSE	Lead Conc.
	Reduces sediment migration	Restores natural channel	Increases riparian habitat	Reasonably maximizes benefits	Minimizes cost relative to benefit	Minimizes policy concerns	Considered complete	Estimated annualized cost	Positive effects on resources	Reasonably maximizes other perspectives	Reduces lead conc. Aater 50 years
1- No Action	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW
2 – Max Eco (RM 0-10)	LOW	LOW	LOW	LOW	MEDIUM	HIGH	HIGH	LOW	LOW	MEDIUM	LOW
3 – Max Eco (RM 0-35)	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM	MEDIUM	LOW
4 – Max Eco Meramec R.	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	LOW	LOW	LOW	LOW
5 – Max Efficiency Big R.	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH	HIGH	MEDIUM
6- Max Eco Big R.	HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH	HIGH	MEDIUM	HIGH	HIGH	MEDIUM
7 – Max Eco Study Area	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM

Modified from Table 6.5 St. Louis Riverfront – Meramec River Basin Ecosystem Restoration Feasibility Study (2019)

EXAMPLE DECISION MATRIX: GENERALIZED WATERSHED STUDY

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Color shading is used to facilitate a qualitative tradeoff discussion:

- Green indicates highest achievement relative to criteria
- Red indicates lowest achievement relative to criteria
- Color coding can be helpful for showing relative differences and not absolutes

	Reduce the risk to public safety from flooding in the River Basin	Reduce the risk of damages to residential, agricultural and commercial/ industrial areas	Restore aquatic habitat for the River ecosystem	Restore natural stream processes in the River	Improve water supply reliability and availability	Encourage the wise use of the floodplain	Cost	Mitigation (habitat, cultural, hydraulic)
Unit of measure	Life Loss	Estimated Damages $	Aquatic habit restored	Acres hydrologic/ geomorphic processes restored	Acre-feet of water supplied or recharged	Wise use of floodplain	$	Amount required
Range	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5
Constructed Scale with increments defined	5) High LRR in urban/deep 4) Moderate LRR in urban/deep 3) Low LRR in urban 2) No change/marginal 1) Life risk increase	5) High FRM damage reduction in urban/deep 4) Moderate FRM damage reduction in urban/deep 3) Low in urban 2) No change/marginal/ incidental 1) FRM damage increase	5) High, lot of benefits for spp./acres/connectivity 4) Moderate benefit 3) Low benefits 2) No change/marginal/ incidental 1) Adverse impact	5) High restoration of process 4) Small/Moderate restoration of process 3) No change 2) Small/Moderate adverse impact to stream process 1) High adverse impact to process	5) High benefits of acre-feet 4) Medium 3) Low 2) None/Neutral 1) Negative impacts	5) Large areas protected 4) Flowage easement 3) No change in FEMA designation 2) Develop on floodplain 1) On undeveloped urban floodplain	5) High 4) Medium-High 3) Medium 2) Low-Medium 1) Low	5) Uniquely difficult 4) Most areas require 3) 1-2 areas require 2) Few, common mitigation 1) None
Desired Direction	high	high	high	high	high	high	low	low
ER Only	4	4	4	4	3	5	4	4
FRM & ER	3	3	5	4	3	3	5	3
FRM & WS Alt 1	5	4	1.5	1	4	1	5	5
FRM & WS Alt 2	4	4	4	4	3	4	3	4
FRM & ER & WS	5	5	4	3	4	4	2	3
ER & WS	4	4	4	4	4	5	4	5

QUALITATIVE PROCESS & DOCUMENTING DEGREE OF AGREEMENT

If a qualitative process is moving towards a decision regarding a recommend plan, an appropriate next step would be to capture and document the degree of agreement on alternatives.

One approach is for individuals to indicate the following:

Endorse = Enthusiastic support. 'This is a great solution'.

Accept = Support. 'Maybe not the best solution in my mind, but it is one I can support'.

Oppose = No support. 'I cannot support this solution'.

Example of documenting support for alternatives:

Alternative	Number of entities that:			Main reasons for support	Main reasons against
	Endorse	Accept	Oppose		
A	2	4	3	Hydropower benefit, low cost	Aquatic habitat impacts
B	7	2	0	Balanced across criteria	None
C	6	1	2	Recreation benefit	High cost, flood risk impacts
D	3	3	3	Regional economic benefits	Cultural impacts
E	5	2	2	Aquatic habitat benefits	Hydropower impacts

QUALITATIVE PROCESS & DIRECT RANKING

- If a qualitative process is moving towards a decision regarding a recommend plan, another option is direct ranking alternatives.
- Numbers are used to assign ranks or scores, but the value preferences themselves are not quantified
- Steps include:

1) Shared Understanding: Team reviews and confirms understanding of objectives, criteria definitions, alternatives, and potential effects through discussions
2) Individual Ranks: Each person ranks alternatives with 1 being most preferred
3) Alternative Scoring: Each person scores the alternatives, assigning a score of 100 to the #1 ranked alternative
4) Collaboration: Team participates in collaborative discussion to highlight different rankings and potentially reach agreement on rank order of alternatives and/or narrow set of potential alternatives

Direct Ranking Questionnaire

Name: _____

Alternative	Rank	Points
A		
B		
C		
D		
E		

EXAMPLE OF DIRECT RANKING: WILLAMETTE VALLEY SYSTEM O&M PROGRAMMATIC EIS

- Team developed multiple criteria to evaluate alternatives, considering cost, economic, environmental and social effects
- Direct ranking approach was used to find areas of agreement among team members
- This collaborative approach help team narrow alternatives

Criteria	Metric	No Action Alternative	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4	Alt 5
	salmon population risk	salmon population is at risk							
Effectiveness meeting Objectives 4-6	Downstream survival relative rank: 1=best, 7=worst	7	1	2	4	5	6	3	4
Effectiveness meeting Objectives 4-6	Bull trout habitat gains	No habitat gains for bull trout	Least habitat gains for bull trout	Habitat gains for bull trout	Habitat gains for bull trout	Habitat gains for bull trout	No habitat gains for bull trout	Habitat gains for bull trout	Habitat gains for bull trout
Estimated Total Annual Cost	Millions of US $	$9	+$95	+$58	+$53	+$17	+$21	+$104	+$53
Economic impact to recreation	Change in Average Annual NED Recreation Benefits (total for all reservoirs in millions of dollars) from NAA	$20.45	+$0.31	+$0.17	+$0.02	-$0.76	-$1.27	+$0.17	+$0.02
Acceptability Criteria: Economic	Impact to RED from Recreation Effects	–	Low	Medium	Medium	High	High	Medium	Medium

[1]No color indicates no, negligible, or minor effects
Green indicates a positive/beneficial effect
Yellow indicates a moderate negative/adverse effect
Orange indicates a high negative/adverse effect

REVIEW OF QUALITATIVE TOOLS

Approach	Advantages	Disadvantages
Matrix Table	Visual tool to help compare alternatives and help during facilitated discussions	May confuse if colors/values/words are used without being defined
Dominated Alternatives & Insensitive Criteria	To simplify a set of alternatives by: - removing alternative(s) that are outperformed by other alternatives - Removing criteria that do not change across alternatives	May require value judgments with what it means to “not change” and for potentially dominated alternatives
Direct Ranking	• Simple to understand • Helps focus facilitated discussions • Helps find common agreements/disagreements	Vulnerable to personal biases and errors

ALL require collaboration and documentation

MORE TO COME….

Our next PCoP presentation on Sept 19 will cover **Quantitative** Tradeoff Analysis

- How do you do MCDA?
- How can you elicit weights?
- How can MCDA results be used?
- And so much more!

IWR-WRC is actively working on additional collaborative tradeoffs trainings and products.

TAKE HOME MESSAGES

- Decision-making is not objective. Analyzing tradeoffs involves incorporating subjective information (values and preferences).
- Be transparent about how subjective and objective information is separated and utilized.
- Effective organization and facilitation of the process is key to success.
- Plan for your process: resources, time for iteration, involvement, skills.
- Employ qualitive tradeoffs techniques using decision matrix / effect table.
- Consider if appropriate for quantitative or multi-method tradeoffs approaches.
- Tell the story.