

Institute for Water Resources
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Integrated Risk Management 101

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The Point

Risk



Managing Risk



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Risk

- Risk is a measure of the probability and consequence of uncertain future events
 - ▶ Probability x Consequence
- Risk includes
 - ▶ Potential for gain (opportunities)
 - ▶ Exposure to losses (hazards)



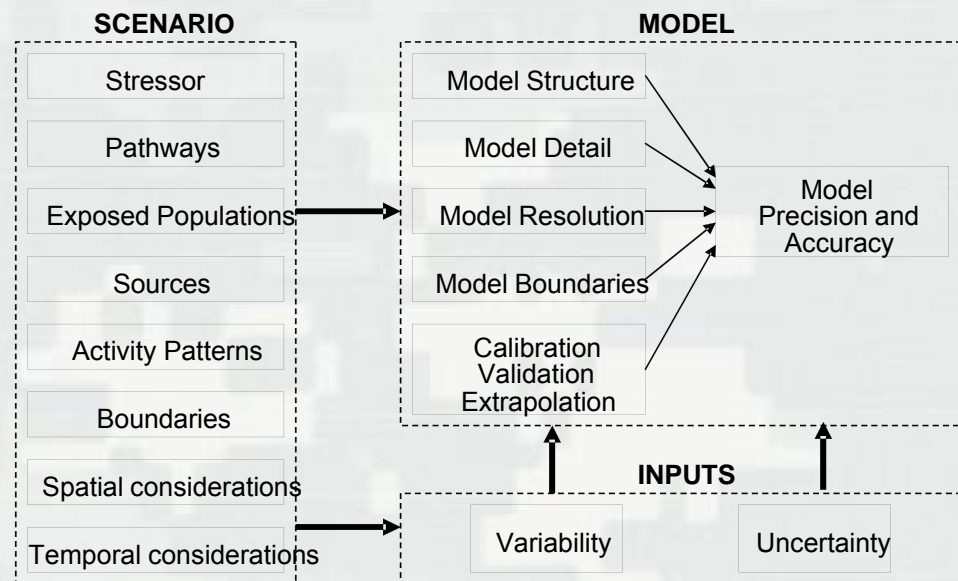
Risks of Interest

- Existing-risk to species, natural cycles, significant resources, uncertain gains
- Risk taking/reduction-what can we gain or achieve, avoid, prevent, mitigate
- Residual risk-what remains after mitigation, local extinction risk that remains
- Transformed risk-forest fire control strategies, dredging sediments
- Transferred risk-reduce risk to one species can increase risk to another

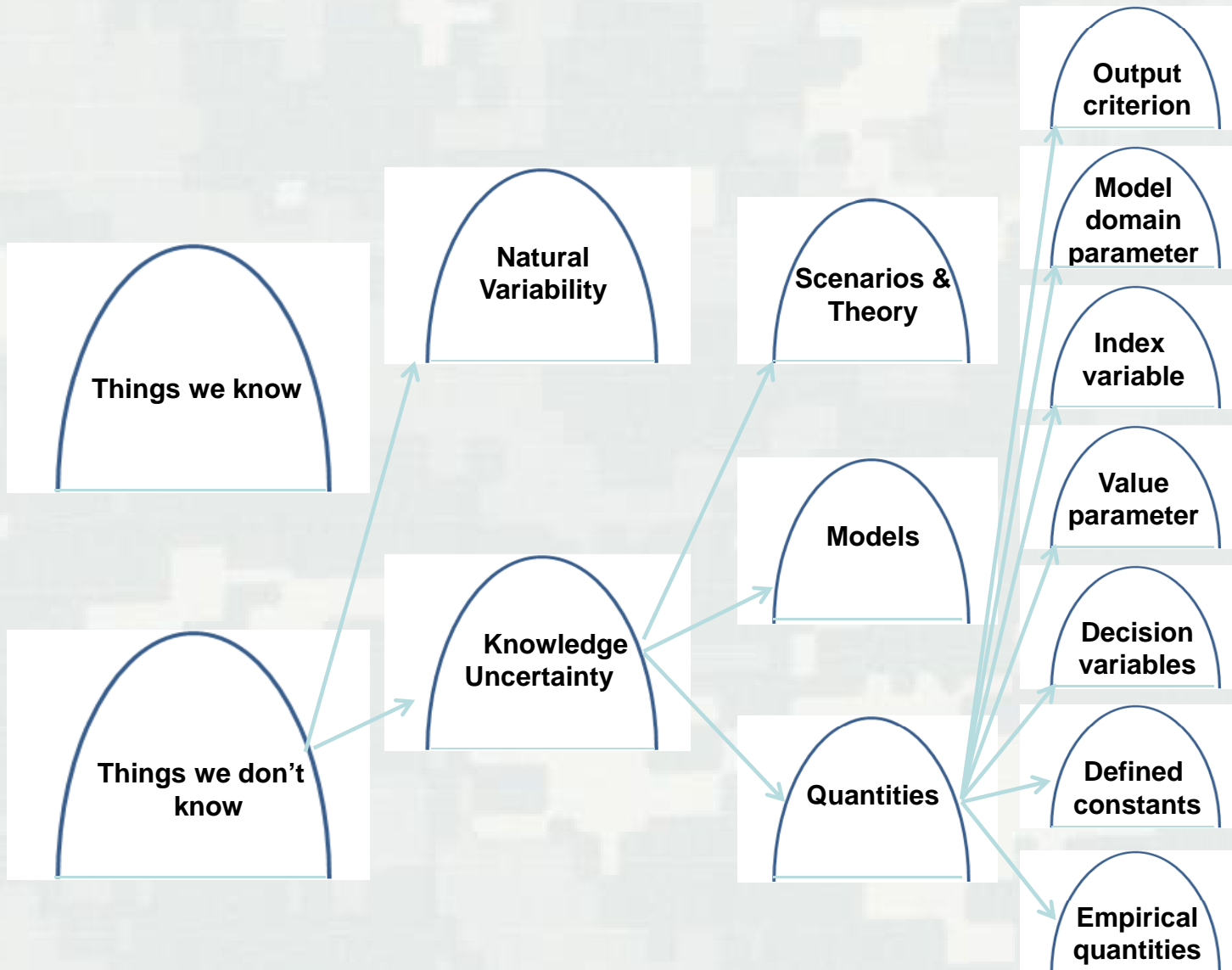


Uncertainty

- From 75,000 feet
 - ▶ Increasing social complexity
 - ▶ Increasingly rapid pace of change
 - ▶ Global effects, e.g., climate change
- Project level



Uncertainty



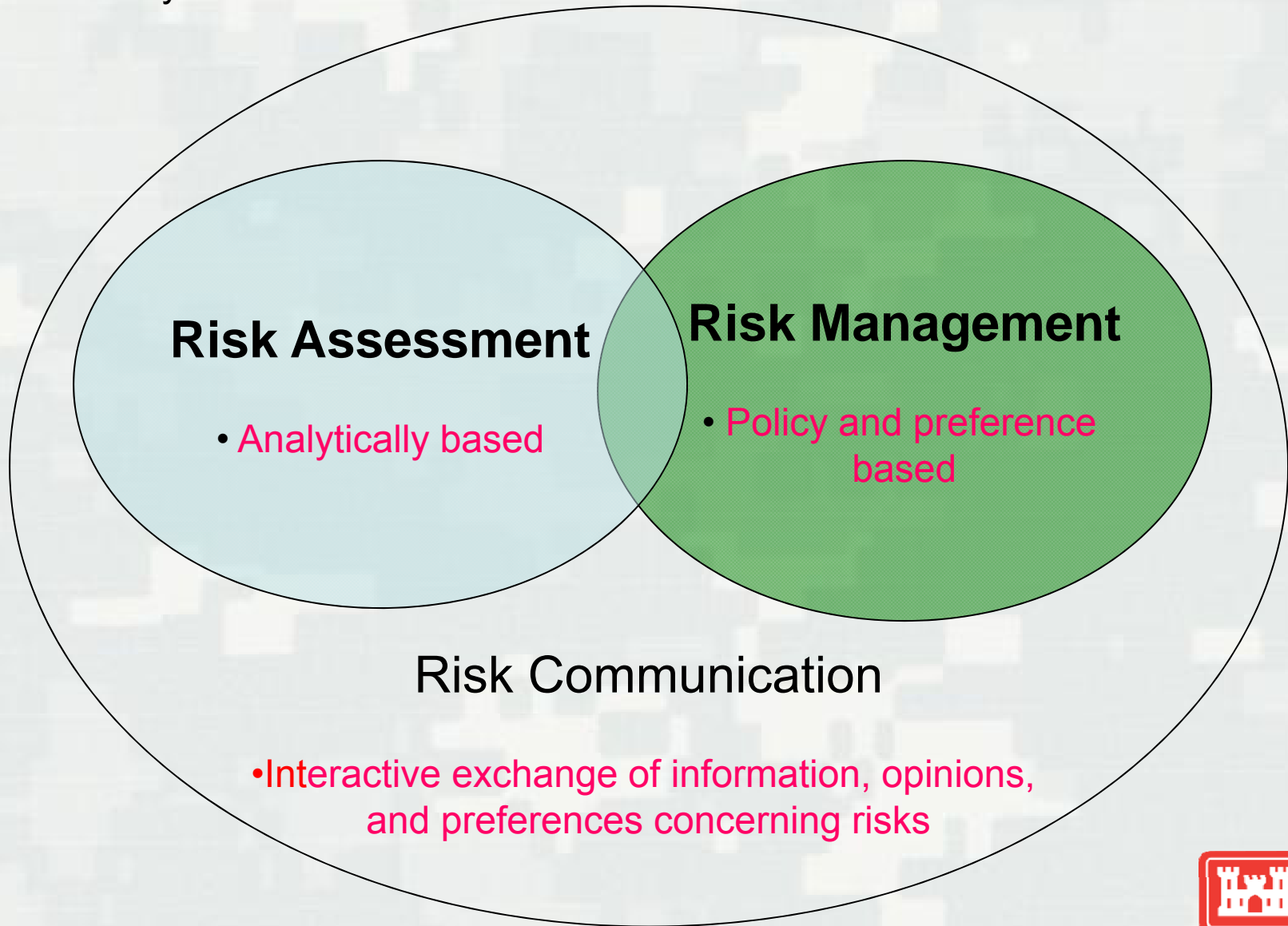
Applying the principles

What do you usually know with certainty in an ecosystem restoration study?

What is usually in the pile of things you don't know?



Risk Analysis->Decision-Making
Under Uncertainty



Risk Management

- What is the problem?
- What questions do we want risk assessment to answer?
- What can be done to reduce the impact of the risk described?
- What can be done to reduce the likelihood of the risk described?
- What are the trade-offs of the available options?
- What is the best way to address the described ?
- Is it working?



Risk Management Strategies

Risk Management Strategies	
Accept the risk as is?	
Risk Reduction	Risk Taking
Risk Avoidance	Risk Creation
Risk Prevention	Risk Stimulation
Risk Mitigation	Risk Promotion
Risk Transfer	Risk Sharing
Risk Retention	Risk Ignoring



Risk Assessment

- What can go wrong?
- How can it happen?
- How likely is it?
- What are the consequences?

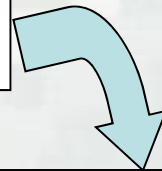


Risk Assessment Model

An analytical and scientifically based process consisting of the following steps:

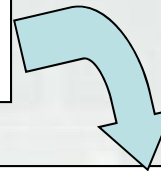
Look for the Hazard or Opportunity

Identify the hazards that can cause harm or the opportunities for gain that are uncertain.



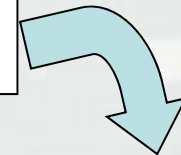
Consequence Assessment

Decide who or what may be harmed or benefited and in what ways. Gather and analyze the relevant data. Characterize the consequences and their uncertainty qualitatively or quantitatively.



Likelihood Assessment

Assess the likelihood of the various adverse and beneficial consequences. Characterize these likelihoods and their uncertainty qualitatively or quantitatively.



Risk Characterization

Estimate the probability of occurrence, the severity of adverse consequences, and the magnitude of potential gains, including attendant uncertainties, of the hazards and opportunities identified based on the evidence in the preceding steps. Characterize the risk qualitatively or quantitatively with appropriate attention to baseline and residual risks, risk reductions, transformations and transfers.

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Qualitative Risk Assessment Methods Toolbox

- Increase or Decrease Risk
- Risk Narratives
- Evidence Mapping
- Screening
- Ratings
- Rankings
 - Enhanced Criteria Ranking
- Operational Risk Management (Risk Matrix)
- Develop a Generic Process
- Qualitative Assessment Models
- Multi-Criteria Decision Analysis



Quantitative Risk Assessment

- Safety Assessment
- Scenario Planning
- Scenario Analysis
 - ▶ Deterministic Scenario Analysis
 - ▶ Probabilistic Scenario Analysis
- Sensitivity Analysis
- Uncertainty Analysis
- Modeling
- Vulnerability Assessment

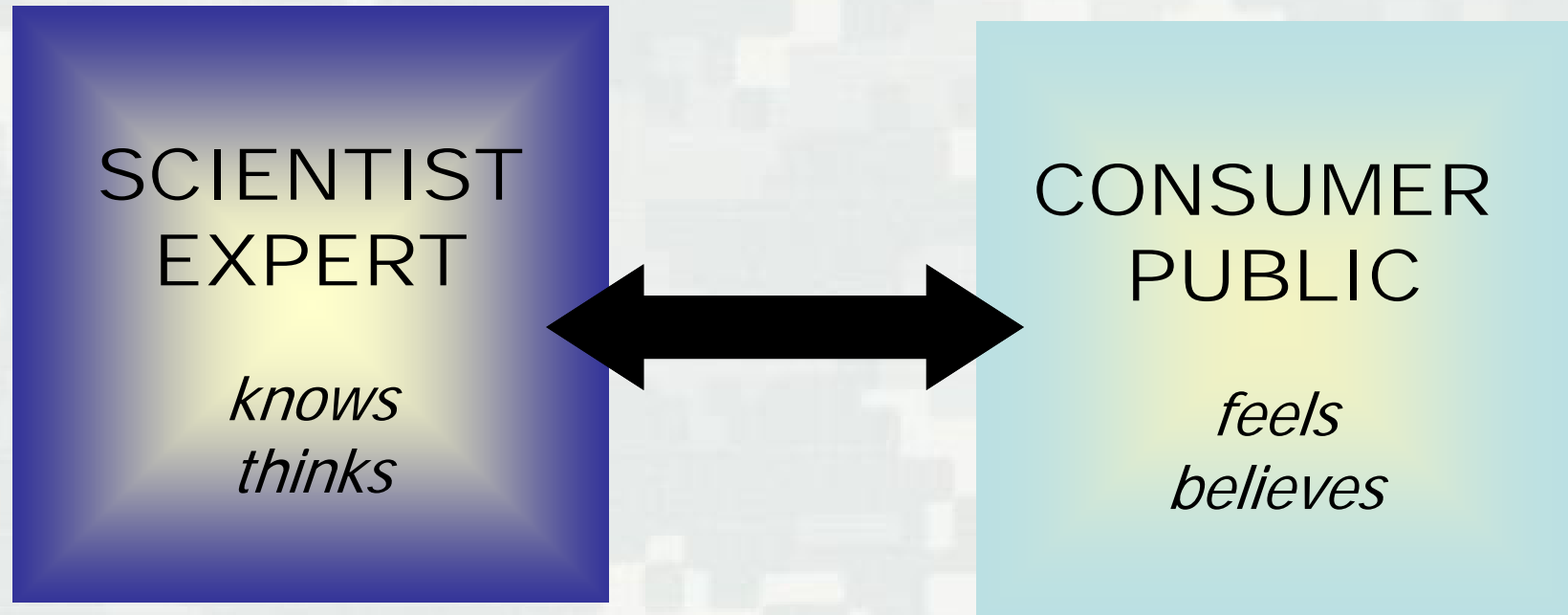


Risk Communication

- Why are we communicating?
- Who is our audience?
- What do our audiences want to know?
- What do we want to get across?
- How will we communicate?
- How will we listen?
- How will we respond?



Scientist - Consumer Disconnect

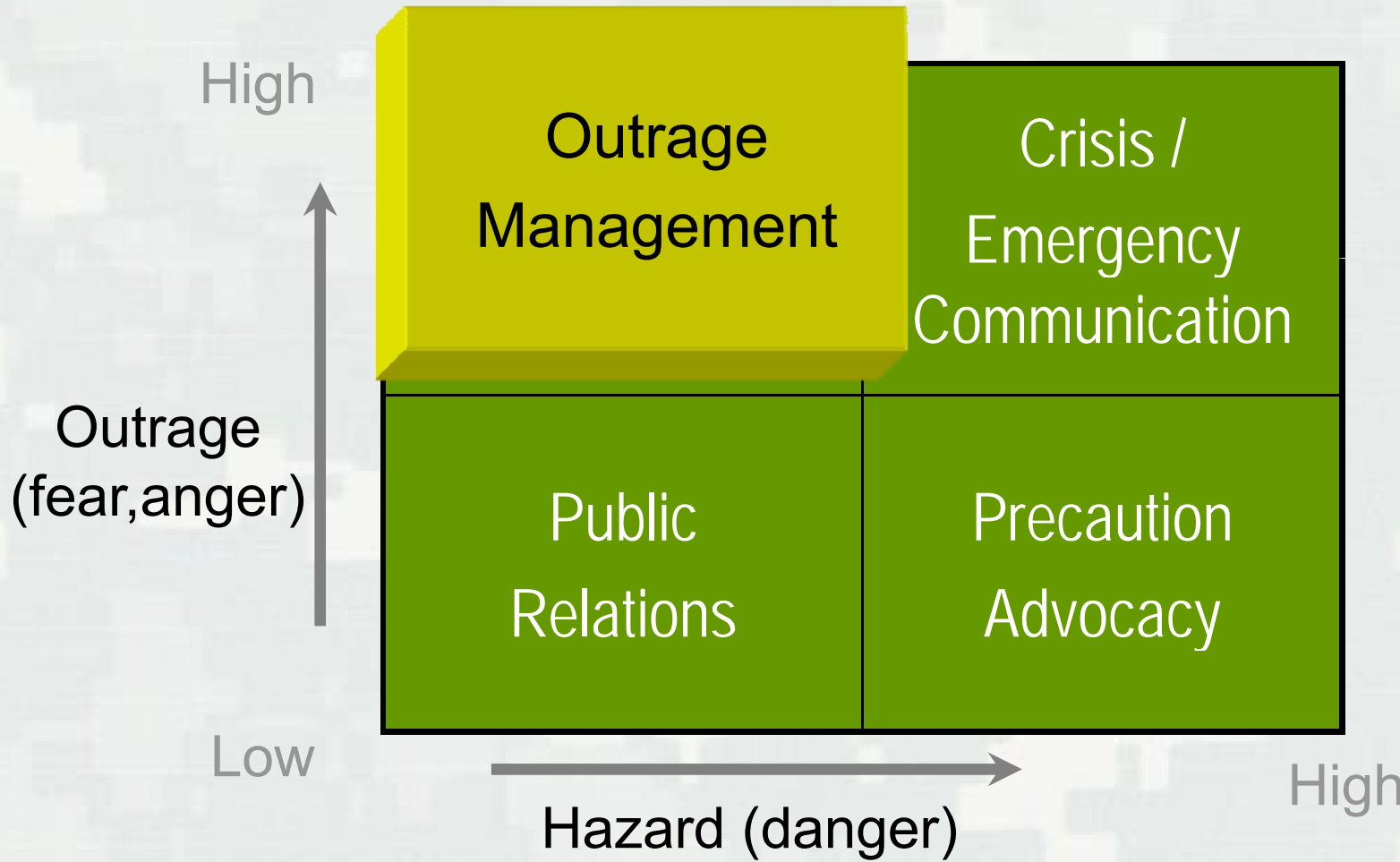


Fact-based:
hazard, probability

Value-based:
consequences, value



Goal: Reduce outrage so people don't take unnecessary precautions



RISK MANAGEMENT PROCESS

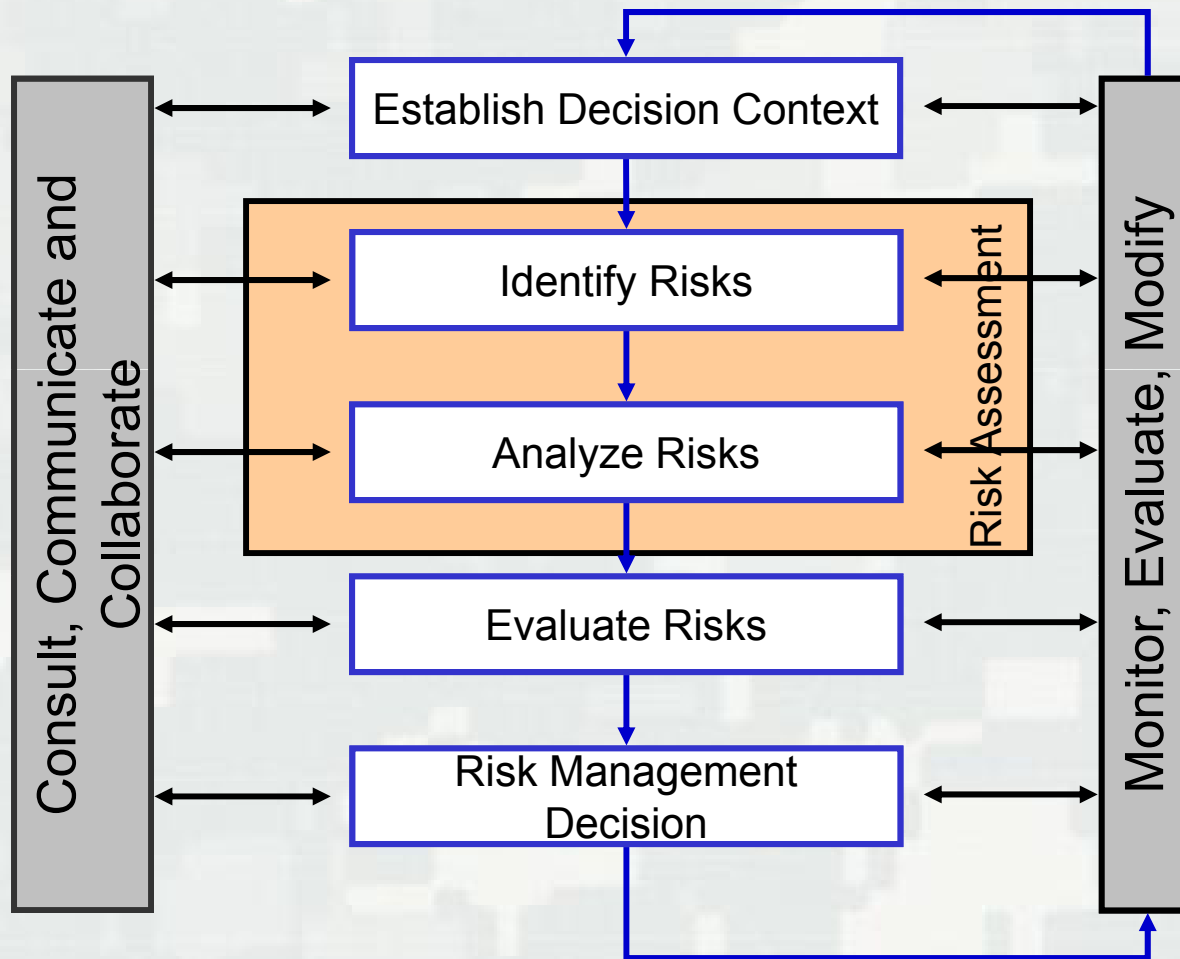


Corps Definition

- Risk management is the process of problem finding and initiating action to identify, evaluate, select, implement, monitor and modify actions taken to alter levels of risk, as compared to taking no action.



COE Risk Management



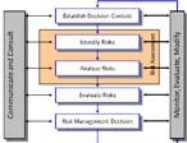
Establish Decision Context

- Something triggers RM activity
- Decision problem is defined
- Goals, objectives, and strategies of RM identified and articulated
- Decision criteria explicitly considered so appropriate information is gathered
- Stakeholder and public involvement begins



Decision Context Outputs

- A written problem statement
- A written statement of the activity's objectives
- A written list of management information questions
- A written list of the decision criteria
- A written list of the key uncertainties



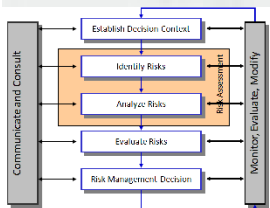
Risk Identification Task

- Start of risk assessment when one is done
- Identify
 - ▶ Presenting/existing risks
 - ▶ Risk reductions
 - ▶ Residual risks
 - ▶ Risk transformations
 - ▶ Risk transfers
- Ask and answer (scenarios)
 - ▶ What can go wrong?
 - ▶ How can it happen?
- Methods depend on nature of activity, process, or asset
- Stakeholder and public involvement



Identify Risks Outputs

- A narrative description of the risks or significant uncertainties of concern to this risk management activity.
- A decision whether or not to pursue a risk assessment.



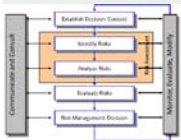
Analyze Risks

- Complete the risk assessment
- Each individually identified risk is characterized
 - ▶ Risk estimates (qualitative or quantitative)
 - ▶ Risk descriptions
 - ▶ Evaluate and compare RMOs
 - ▶ Account for uncertainty that could affect decision making



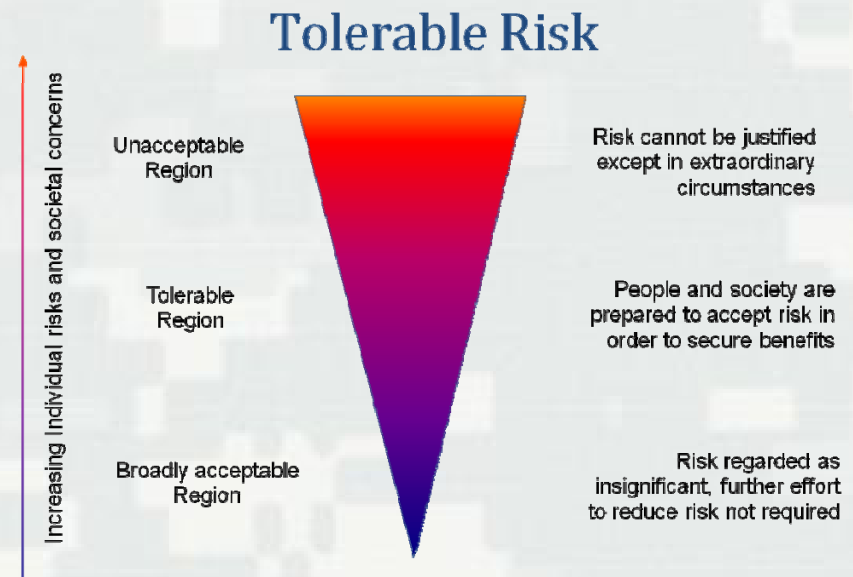
Analyze Risks Outputs

- Written answers to the risk managers' questions with a focus on relevant uncertainties
- Risk characterization of each significant risk with a focus on relevant uncertainties
- Descriptions of formulated alternative risk mitigation strategies
- Formal risk assessment if required



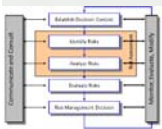
Evaluate Risks

- Is the risk acceptable?
- With stakeholder and public input reduce unacceptable risks to a tolerable level
- Tolerance is based on trade-off among residual risk, cost of risk reduction and other factors



Evaluate Risks Outputs

- An effective summary or display of the uncertainties most relevant to the risk manager's decision
- Display of the varying contributions of the risk management options to the risk management objectives and other social values considered in the decision process
- Accept risk or identify TLR



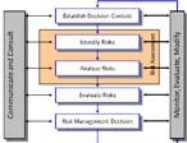
Risk Management Decision

- Take tolerable and acceptable risks
- Reduce unacceptable risks to TLR
 - ▶ Combinations of options may be needed
- RM plan should identify mitigation measures, responsibilities, schedules, expected outcomes, and measurements associated with mitigation strategy
- It's critically important to identify desired outcomes of RM strategy prior to implementation



Risk Management Decision

- Selection of the best risk management option
- Identify a measurable desired outcome to monitor the option's success
- When appropriate, an adaptive management plan
- An implementation plan
- An implemented plan



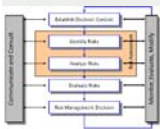
Communicate, Consult and Collaborate

- Keep all stakeholders informed about
 - ▶ Process
 - ▶ Findings of risk assessment steps
 - ▶ Nature of risk and its associated benefits
 - ▶ Deliberations that lead to risk management decision
 - ▶ Their role in implementing the solution
- Continual communication among participants to minimize misunderstandings and surprises at the end of the process



Communicate, Consult and Collaborate Outputs

- Preparing and executing a public involvement plan including provisions for risk communication.



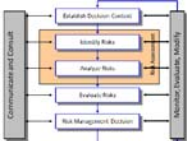
Monitor, Evaluate, Modify

- Implication of uncertainty is RM is evolutionary decision making
- Assure decision is having desired outcome
- Monitoring-gather information that measures progress toward desired outcome(s)
- Information is evaluated to determine if adequate progress is being made toward outcomes
- If outcomes are not satisfactory changes are needed
- A mechanism for change, e.g. adaptive management plan, is part of best practice



Monitor, Evaluate, Modify Outputs

- A plan for monitoring, reviewing and modifying the implemented solution
- Implementation of that plan



Take Away Points

- Risk analysis comprises three tasks—risk assessment, risk management, and risk communication
- Risk management is decision making under uncertainty that depends on
 - ▶ Science
 - ▶ Values important to stakeholders
- Risk communication will vary with the circumstances of the risk



The background of the slide is a close-up, slightly blurred image of the American flag, showing the stars and stripes. In the lower right quadrant, there is a silhouette of a castle with two prominent towers, rendered in a golden-yellow color.

Questions?

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