

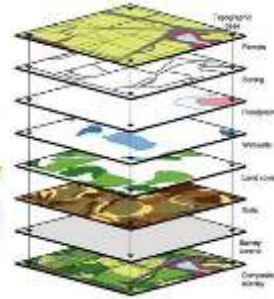
Cedar Rapids Iowa Regional Multi-Hazard Tournament

Presented by Harvey Hill, Ph.D. and
Jason Smith, P. Eng.,
U.S. Army Corps of Engineers
9th Annual Growing Sustainable
Communities Conference,
Dubuque, Iowa,
October 4, 2016



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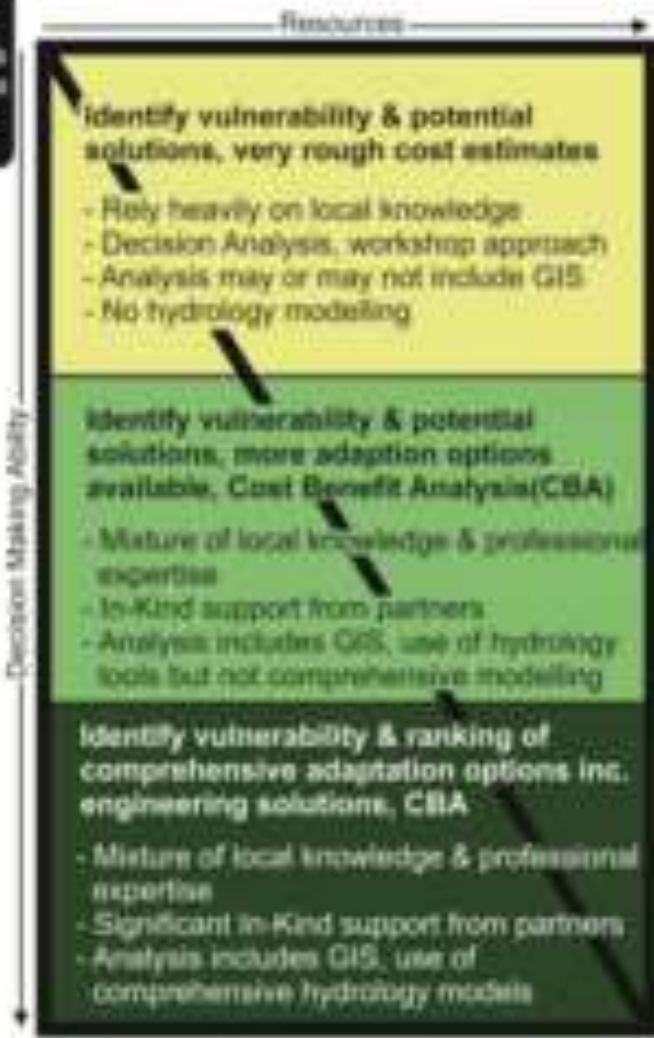
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Levels of Decision-Making

Low Resources
 - Low budget
 - Data constraints
 - Time constraints
 - Limited in-kind support

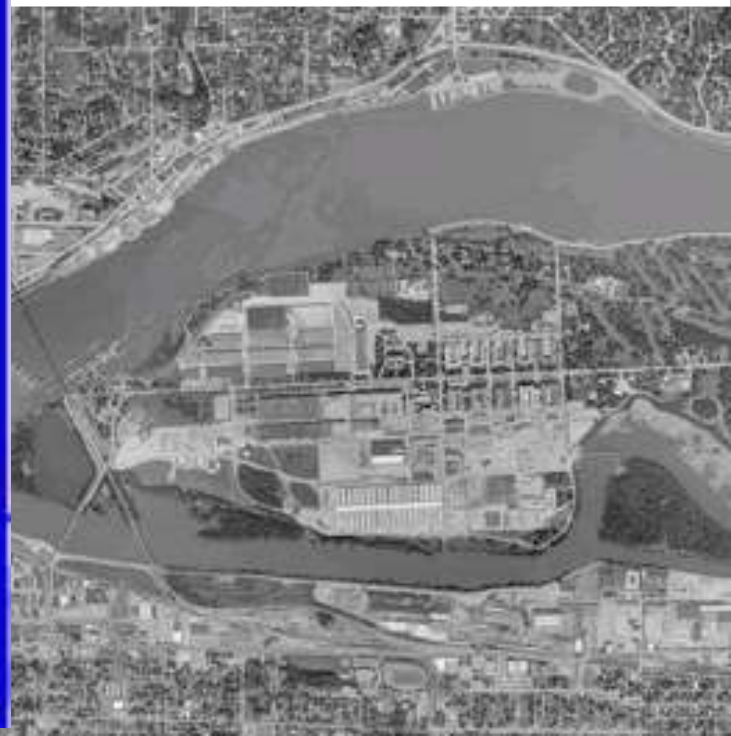
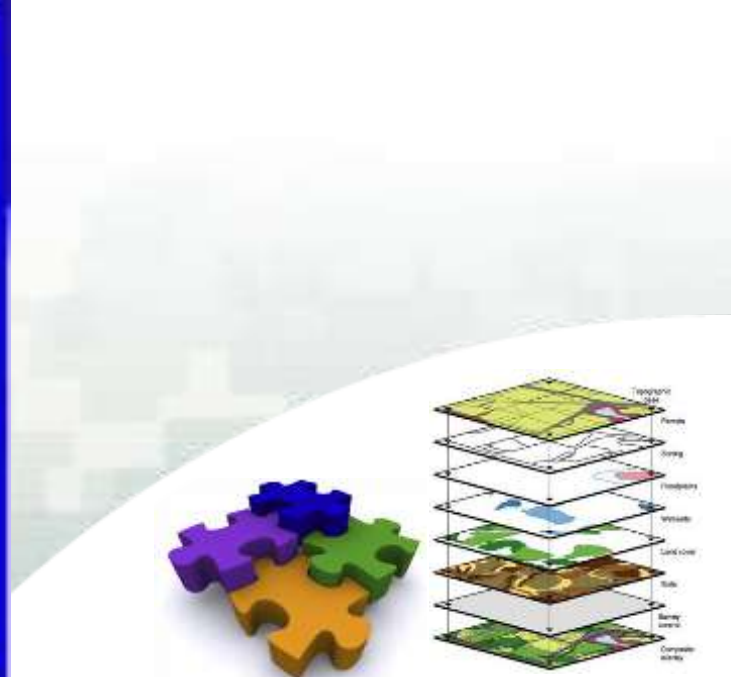


Step 1
More Qualitative

Step 2
Qualitative/ Quantitative

Step 3
More Quantitative

High Resources
 - Full budget
 - No data constraints
 - No time constraints
 - Significant in-kind



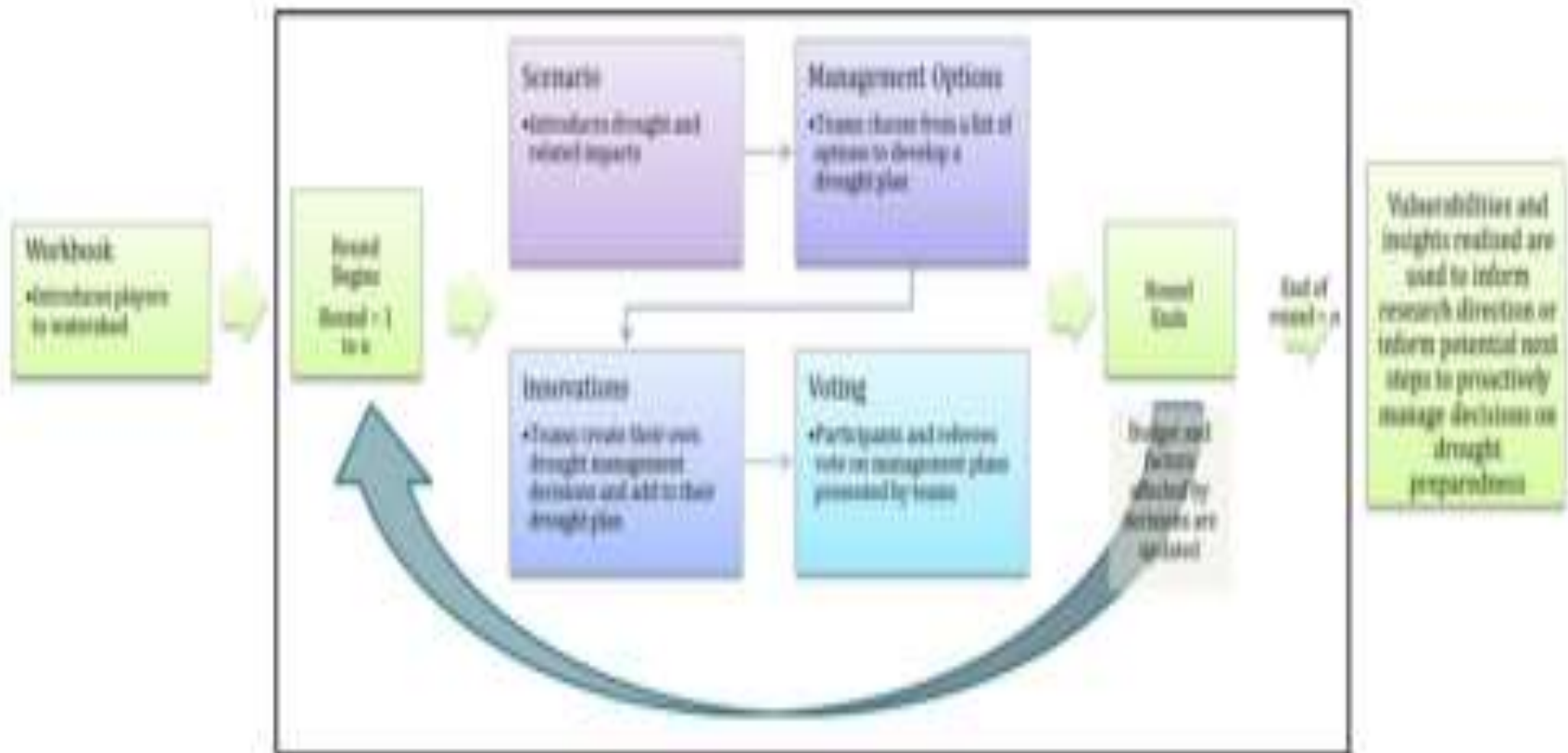


Fig. 2. The IDT Process. The IDT is an iterative process that uses a game format to arrive at an informed decision on next steps for proactive drought management and research.



Okanagan Invitational Drought Tournament



Drought Tournament (gaming exercise)

November 16, 2012

Working on the Following Projects

- Community Rating System Score Improvement tournament Norfolk
- Damage center Master Plan event with San Antonio River Authority
- A 3 island event in Caribbean
- Kansas water supply NOAA



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Lessons Learned

- It does support systematic thinking
- It does foster cross discipline learning
- There comes a point where you have to
- Go to a high level of communication to capture the more complex events value
- We are now identifying how to link it to programs, funding and metrics that inform both communities, states and the nation.

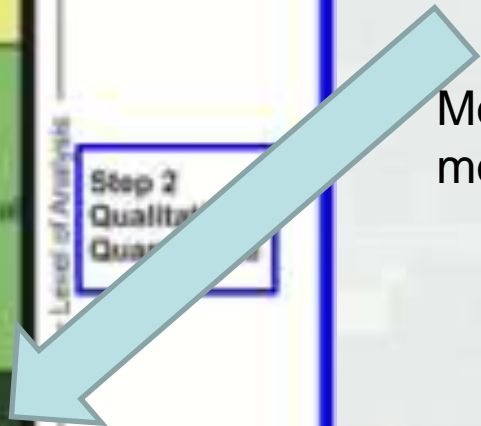
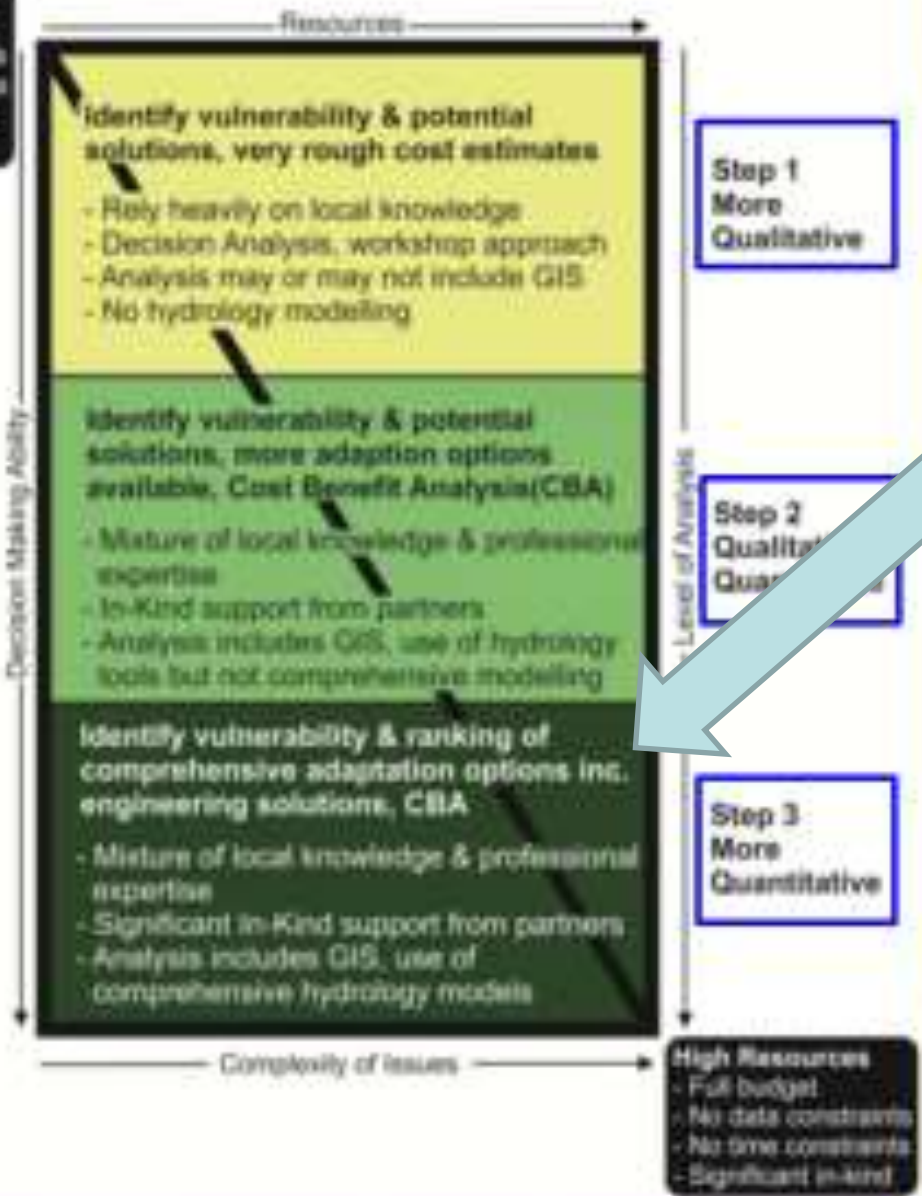
Desired Outcome

- Participants better understand how actions may affect potential adverse impacts of water resources hazards (floods, droughts, water quality).
- Participants better understand the trade-offs (Econ, Social, Environ) between actions



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Most Ambitious and most challenging



Why Here, Why Now

- Flood, Drought and Water Quality Hazards in the Cedar River Watershed
- Building on previous work in the Upper and Middle Cedar River basins. “More technical Information”



Hazard Problems

- Cedar River Flooding
 - ▶ Homes and Businesses
 - ▶ Water, Waste Water, and Power Plants
- Cedar River Drought
 - ▶ Threatens Water Supply
 - ▶ Corn Ethanol Fuel Supply
 - ▶ Nuclear Power Cooling Water
- Nitrate Concentration
 - ▶ Threatens Water Supply



Tournament Steps

- Interagency Technical Working Group
 - ▶ Brainstormed possible actions (local and watershed based)
 - ▶ Identified evaluation metrics.
- Technical Modeling Team
 - ▶ Developed various models and ran scenarios through model to determine their effectiveness based on the evaluation metrics.



Tournament Steps

- Tournament Play Team
 - ▶ Developed Playbook
 - ▶ Developed rules for scoring
- Decision Support System Tool Team
 - ▶ Developed relational database
 - ▶ Correlated budget investments per turn with their outcome relative to other investment strategies.

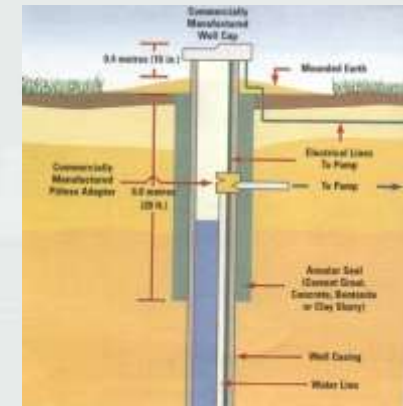


Technical Details

- Landuse Scenarios – ACPF on 10m hDEM
- Hydrologic Simulation – SWAT
- Flow Probability – HEC-SSP
- Hydraulic Simulation – HEC-RAS (CR only)
- Economic Evaluation – HEC-FIA, Stage - Damage relationships, Temp, Ethanol
- Social Evaluation – Stage - Impact relationships
- Environmental Evaluation – TNC Invest, Stage – Impact relationships
- DSS – NHD+ framework with custom interface 

Practice Details – Localized Alternatives

- **Water Supply Protection**
 - ▶ Well Platform Raise
 - ▶ New Deep Well
 - ▶ Nitrate Removal Equipment
- **Structural**
 - ▶ Levees
- **Non-Structural**
 - ▶ Elevate Structures
 - ▶ Relocate Structures



Practice Details – Watershed Alternatives

- Land Cover Change

- ▶ Grassland Based

- Riparian Buffers
 - Grassed Waterways
 - Contour Buffer Strips

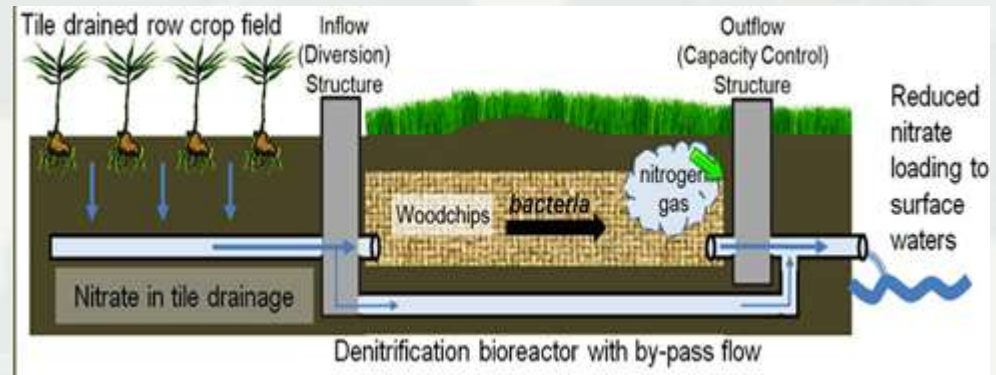
- ▶ Wetland Based

- Restored Wetlands
 - Constructed Wetlands



Practice Details – Watershed Alternatives

- Land Management Change
 - ▶ Nutrient Management
 - ▶ Cover Crops
 - ▶ Denitrifying Bioreactor



Evaluation Metrics

■ Economic

- ▶ Private Infrastructure Damages
- ▶ Critical Infrastructure Damages
- ▶ Public Infrastructure Damages
- ▶ Energy Production Damages
- ▶ Municipal Water Supply Damages
- ▶ Farm Income

■ Social

- ▶ Private Infrastructure Impacts
- ▶ Critical Infrastructure Impacts
- ▶ Public Infrastructure Impacts
- ▶ Municipal Water Supply Impacts

■ Environmental

- ▶ Habitat Quality
- ▶ Clean Water Act Compliance



Decision Support

- What are best short term actions locally?
Watershed?
- What are best long term actions locally?
Watershed?
- What are best flood hazard actions?
- What are best drought hazard actions?
- What are best water quality actions?
- Do any of these actions benefit multiple hazards?

