Competitive Drought Simulations:

From Development to Operations

Harvey Hill, Ph.D.,
Midwest DEWS-NIDIS Kickoff,
St. Louis, Mo.
February 11, 2016

https://www.youtube.com/watch?v=QsxV49pmnL8

Outline

- Where did this come from?
- What is it?
- So what and who cares?
- What has been done
- What needs to be done to make it sustainable?

Where did this come from?

Fig. 1. The Hydro-Illogical Cycle. P

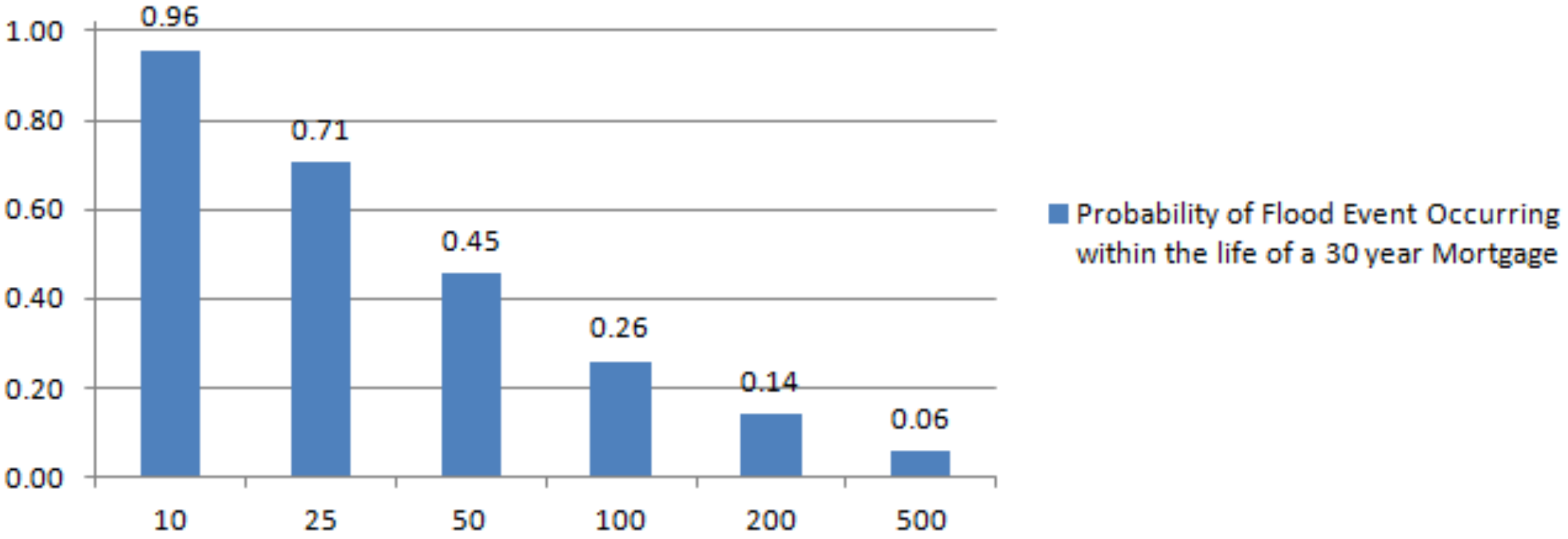
- What is something everyone seems to have some affinity for regardless of race, creed, intelligence quotient, education, or economic standing?

As far as I can tell it's SPORTS!






Probability of Flood Event Occurring within the life of a 30 year Mortgage For 1 in 10, 1 in 25, 1 in 50, 1 in a 100, 1 in 200 and 1 in 500



What Is It?

- Risk = Hazard(s) x Vulnerability
- It uses previously identified potential adaption options,
- It is constrained by budget, physical and institutional constraints.
- Innovation is allowed but must be realistic.

Pre-game background material,

Game Process

Outcomes

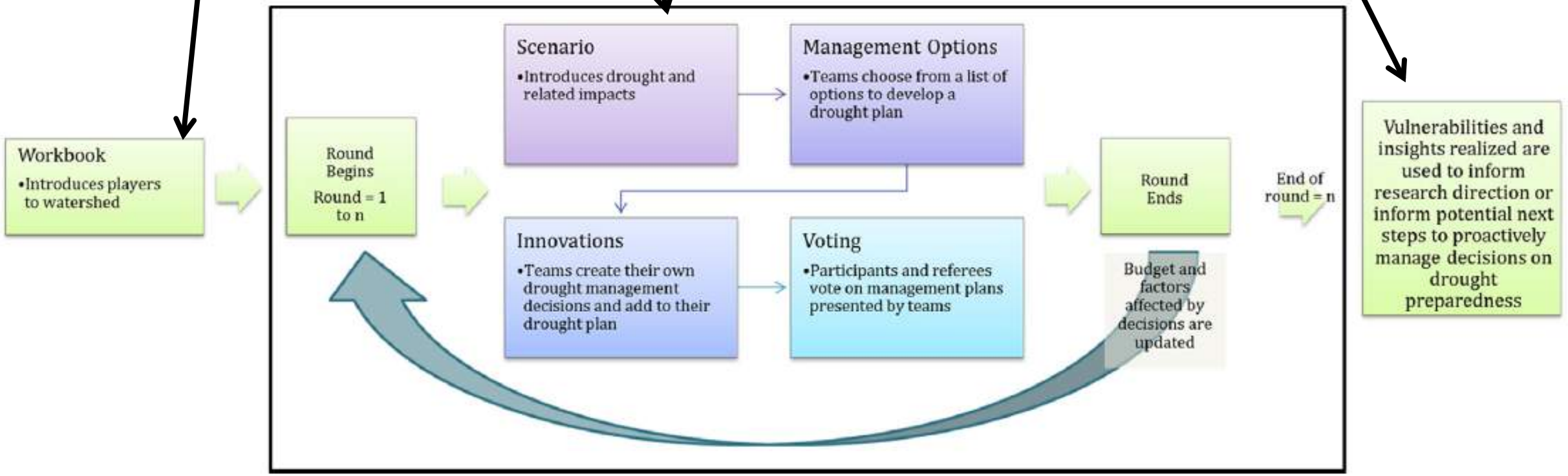


Fig. 2. The IDT Process. The IDT is an iterative process that uses a game format to arrive at an informed decision on next steps for proactive drought management research.

It is a way to help explore with a diverse group of sectors the risks in a watershed and the options to address the risks.

Facilitator

Teams

Referees

Tournament creators and implementers

The "Fans" (Obs ervers)

So why is this Framework different?

- The approach differs from shared vision planning as it is more participatory, intense and engaging.

- It captures the cross training of a workshop with the additional focus generated by competition.

- It challenges people to think systematically about adaptation tradeoffs within constraints,
- Benefits from concentrated technical development,
- Flexible can engage with a range of data models and issues.

Think of it as a Car Chassis

2010-2011,
1. First tournament in Calgary,
2. Chicago EPC - NIDIS

2011-2012,
1. Refined tournaments in Canada and NOAA Colorado,
2. System dynamics Models, 1st iteration (Wang and Davies,

2013,
1. WMO Geneva,
2. Independent tournament in Nepal, agent based model, (Janmaat et al., 2015).
3. CWRA-BC event

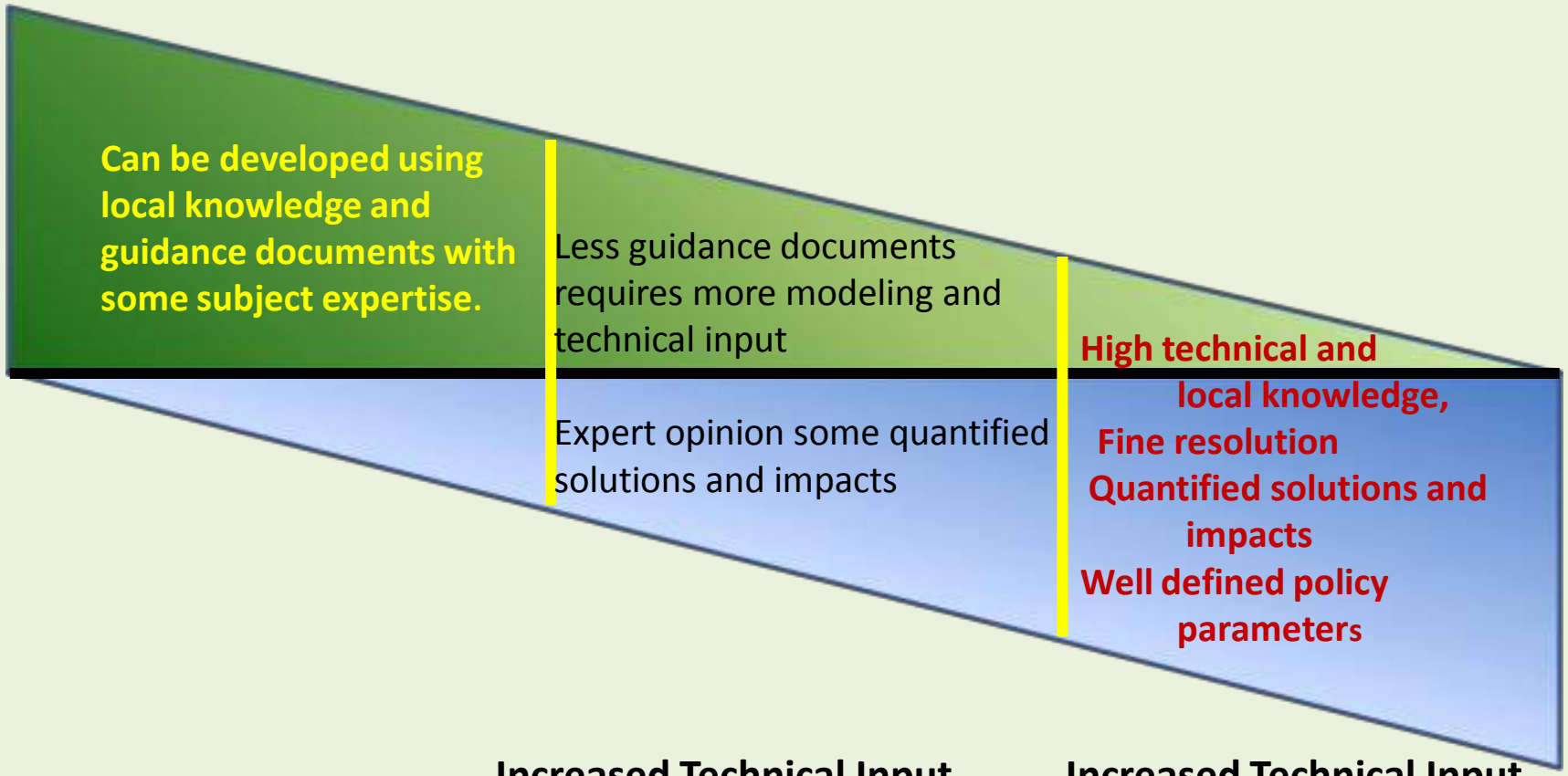
2014,
1. Oklahoma (Harding & Agget),
2. Czech Republic (Hayes)
3. Multi-Hazard tournament framework at IWR (MHT).

2015,
1. Electric Water Tournament (Simon Fraser)
2. 1st MHT, Texas, Iowa developing,
3. USACE Water Storage, Atlanta,
4. CIMH, St. Kitts-Nevis,
5. Mentioned for a European project (Solera et al., 2015)

2016
1. Texas Silver Jacket 2nd Iteration,
2. Norfolk Silver Jacket 1st Coastal,
3. Institutional Governance Tournament,
4. Water Treatment Plant Emergency,
5. Support USGS efforts in Texas and on the Rio Grande,
6. Designing a 4 year transition

Progressively more complexity for increasingly specific issues

Increasing quantification of Risks, Solutions, Impacts and Costs.



Low Technical
Risk and Risk Mitigation
Sensitization
Systems Thinking

Increased Technical Input
Systems Thinking
Better quantified risks, impacts, and risk mitigation options, costs , constraints, tradeoffs and feedbacks.

Increased Technical Input
Highly quantified risks, impacts, and risk mitigation options, costs, constraints, tradeoffs and feedbacks.

Iowa-Cedar·Multi-Hazard·Tournament¶

Scope·of·Work¶

¶

Purpose¶

The·purpose·of·this·document·is·to·provide·a·base·level·of·detail·for·the·tasks·that·will·be·conducted·as·part·of·the·Iowa-Cedar·Multi-Hazard·Tournament.·¶

¶

Tournament·Structure¶

The·Multi-Hazard·Tournament,·hereafter·referred·to·as·tournament,·is·composed·of·a·single·day·event·where·stakeholders·and·decision·makers·are·invited·to·participate·in·a·game·style·format·where·they·make·virtual·landuse·and·water·resources·decisions·related·to·flood,·drought·and·water·quality.·The·tournament·allows·for·participants·to·make·decisions·in·multiple·rounds·where·each·decision·point·is·evaluated·by·a·suite·of·different·models.·¶

The·participants·will·be·divided·up·into·tables·of·6-8·people·of·differing·education,·background,·and·water-related·responsibilities·and·interests·in·an·attempt·to·gain·a·balanced·cross-section·of·differing·ideas·on·how·to·address·the·water·resource·challenges.·The·tournament·has·a·primary·facilitator·along·with·individual·facilitators·for·each·table,·or·"team".·There·will·be·technical·experts·that·will·serve·as·referees.·Referees·and·other·teams·will·score·a·team·based·on·how·well·their·decisions·provide·short·and·long-term·solutions·to·water·resource·problems.·Prior·to·the·date·of·the·tournament·a·workbook·or·"Play·Book"·will·be·provided·to·all·invited·participants··that·will·explain·all·of·the·rules·and·provide·pertinent·background·information·that·will·be·needed·to·understand·the·starting·condition·of·the·

USACE, Iowa State, NOA

USACE

Turn 1 - Water Deficit (dry)

Total Budget	$ 350,000
Total Spent	$ 205,000
Remaining	$ 145,000

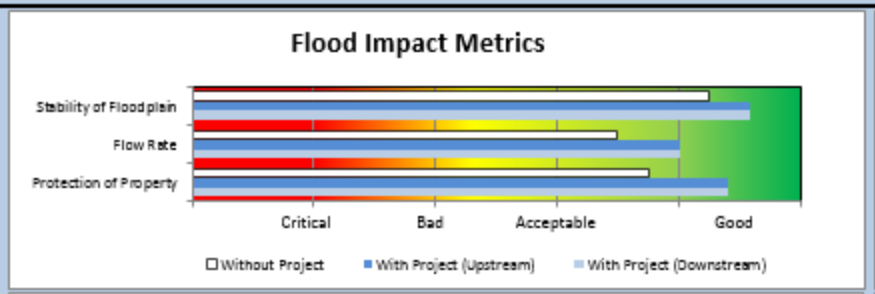
1) Select adaptation options from the drop-down lists on the left
2) Click the blue question mark for more information on the selected option
3) Choose the investment level for each option using the scroll bar
4) Create an "Innovation Option" in the text box on row 23, define impacts , cost
5) Refine selections and click the *Press Release* button when finished

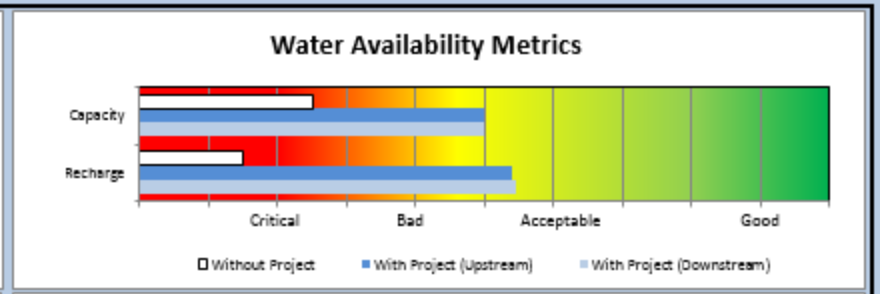
Hide Columns | Unhide Columns | Reset all Options

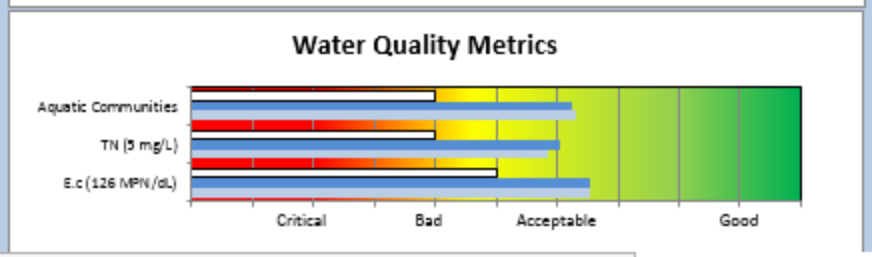
Adaptation Options

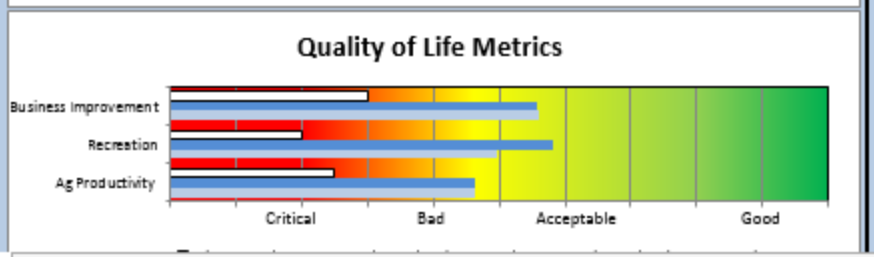
Select from list	Info	Unit Cost	Investment Level	Option Quantity	Cost for Option
Additional Wells		$ 500,000 per 100 Households		1.5 wells	$ 30000
Stream Restoration and NCD for Urban		$ 1,000 per linear ft		90 linear feet	$ 90000
Conservation		System Wide		1 System Wide	$ 35000
Zoning		System Wide		1 System Wide	$ 50000
					$ 0
					$ 0
					$ 0
<Enter User Defined Option>		Define Custom Option Impacts	0		$ 0

Press Release









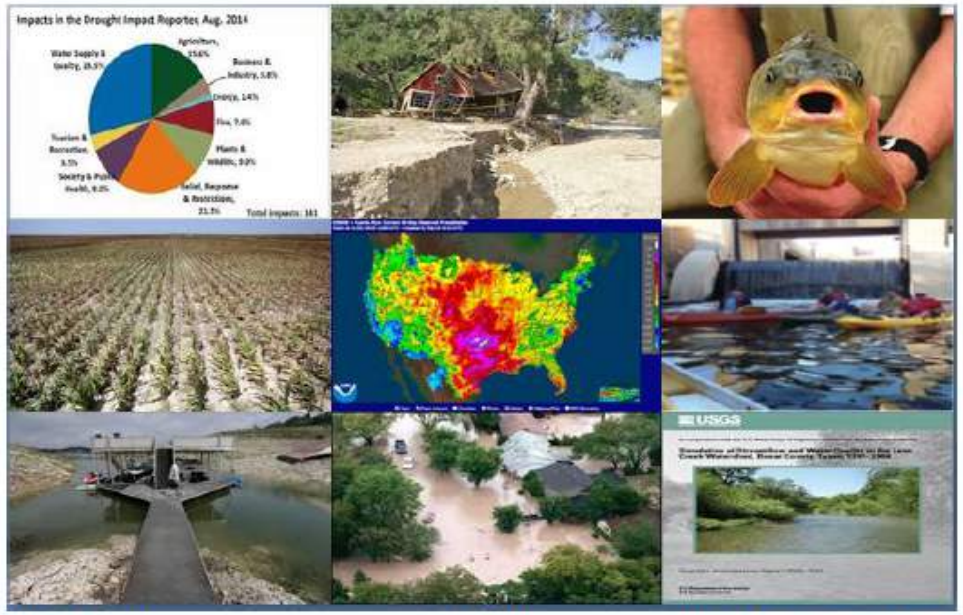
Instructions | Turn 1 Introduction | **Turn 1 Interface** | Metric Descriptors | List of Adaptation Options

			Value
Municipal Water Availability - Quality	Relevant Models	Cost of Option	Economic (Jobs, Production, Tax Revenues,
	SWAT		
	SWAT		
	SWAT		
o in the time frame available?			
	SWAT		
l level and anticipated outcome?			
h pond option?			
	SWAT		

“Playbook” for the San Antonio Watershed

Multi-Hazard Tournament

Version 1.0



DROUGHT FLOOD WATER QUALITY

- Game Play Instructions
- Watershed Overview
  - Hazard Descriptions
  - Basin Economics, Social, Policy
- Description of possible Risk Reduction Measures (Adaptation Options)
- Explanation of Adaptation Options, Costs, and Their Potential Effects

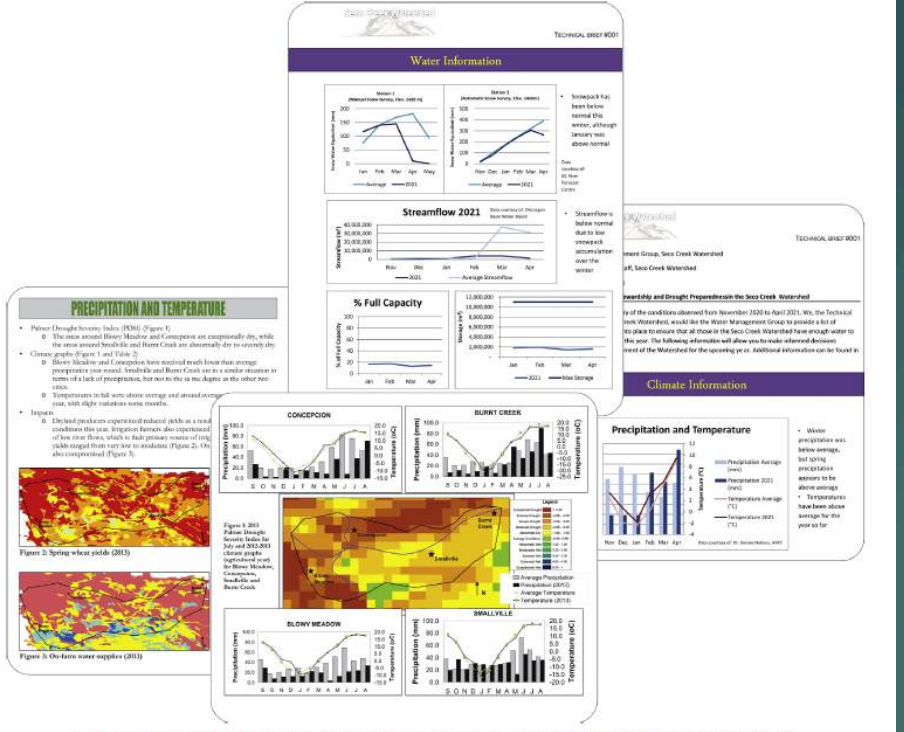


Fig. 4. Sample scenarios from two Invitational Drought Tournaments watersheds (the Oxbow basin [bottom] and Seco Creek [top]).

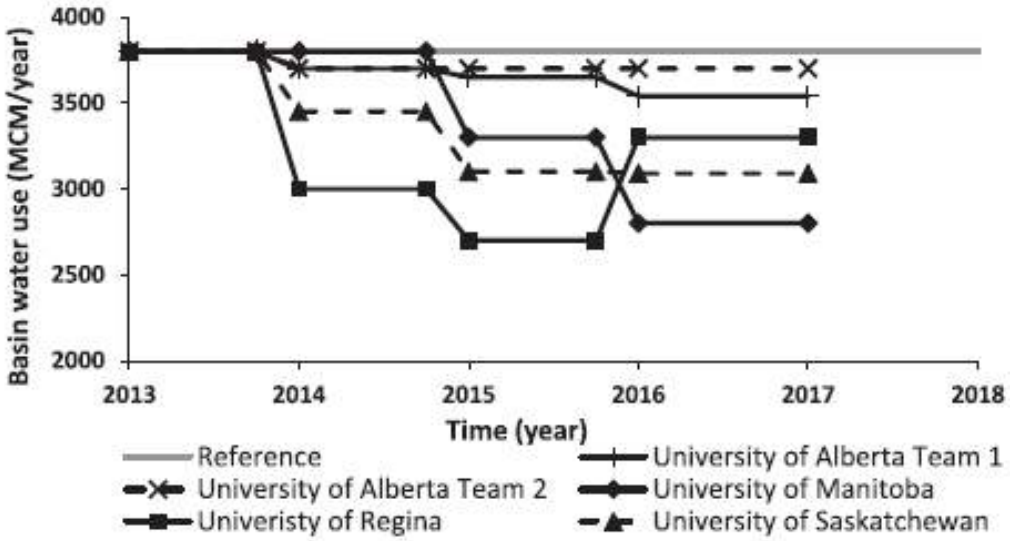


Fig. 12. Total basin water use in the Prairies IDT, Saskatoon 2011.

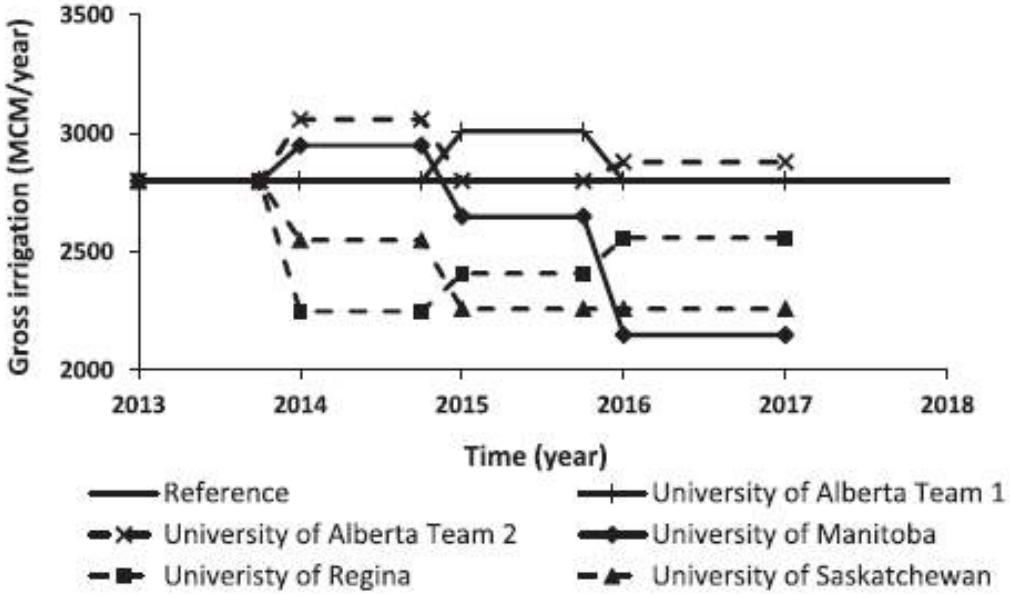


Fig. 13. Gross irrigation diversions in the Prairies IDT, Saskatoon 2011.

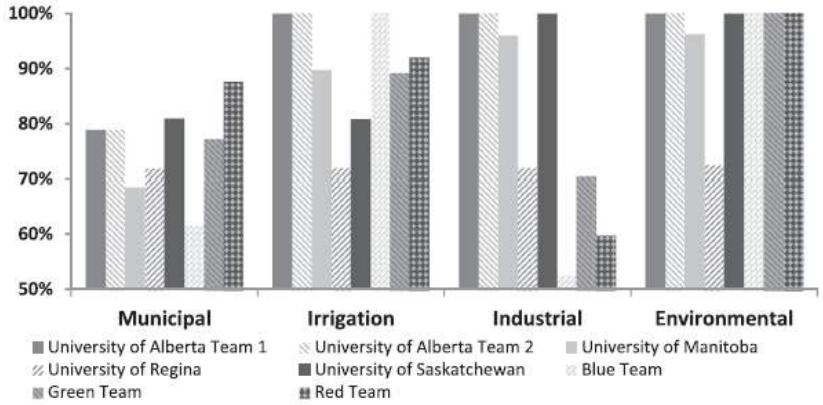
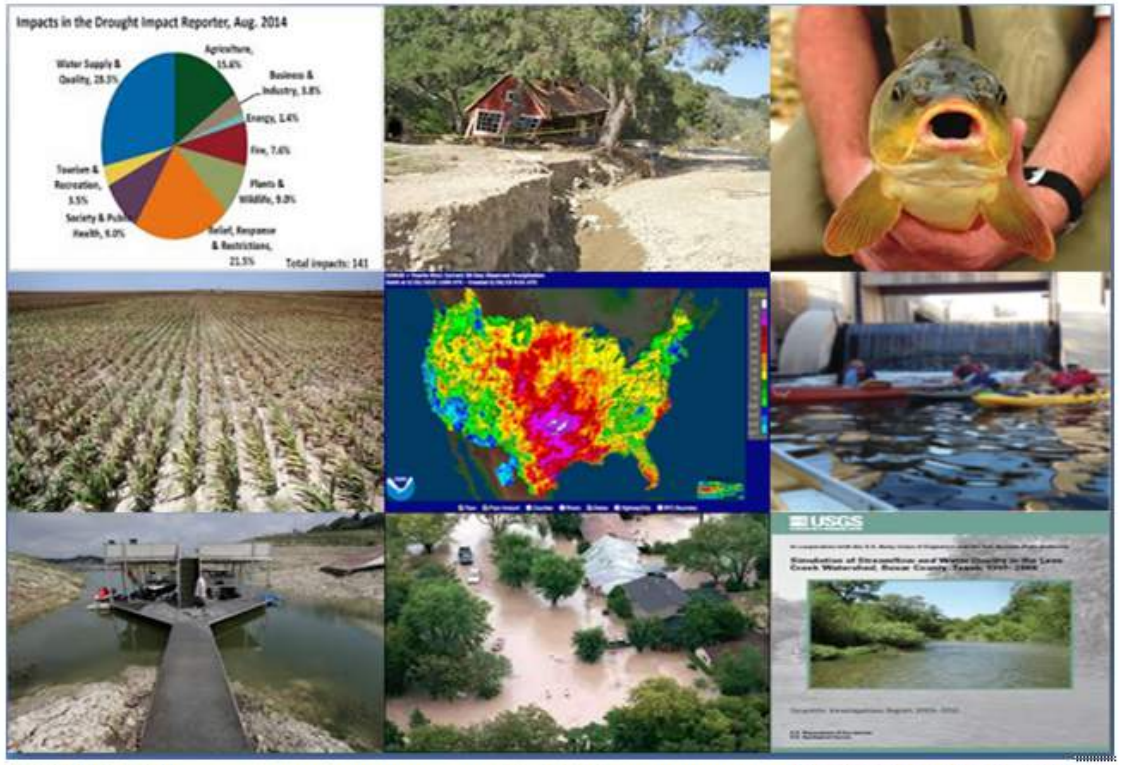


Fig. 14. Team water rationing as a percentage of the reference case water allocation for the eight Prairies IDT teams, where the University teams played in the 2011 IDT, and the color teams played in the 2013 IDT.

"Playbook" for the San Antonio Watershed

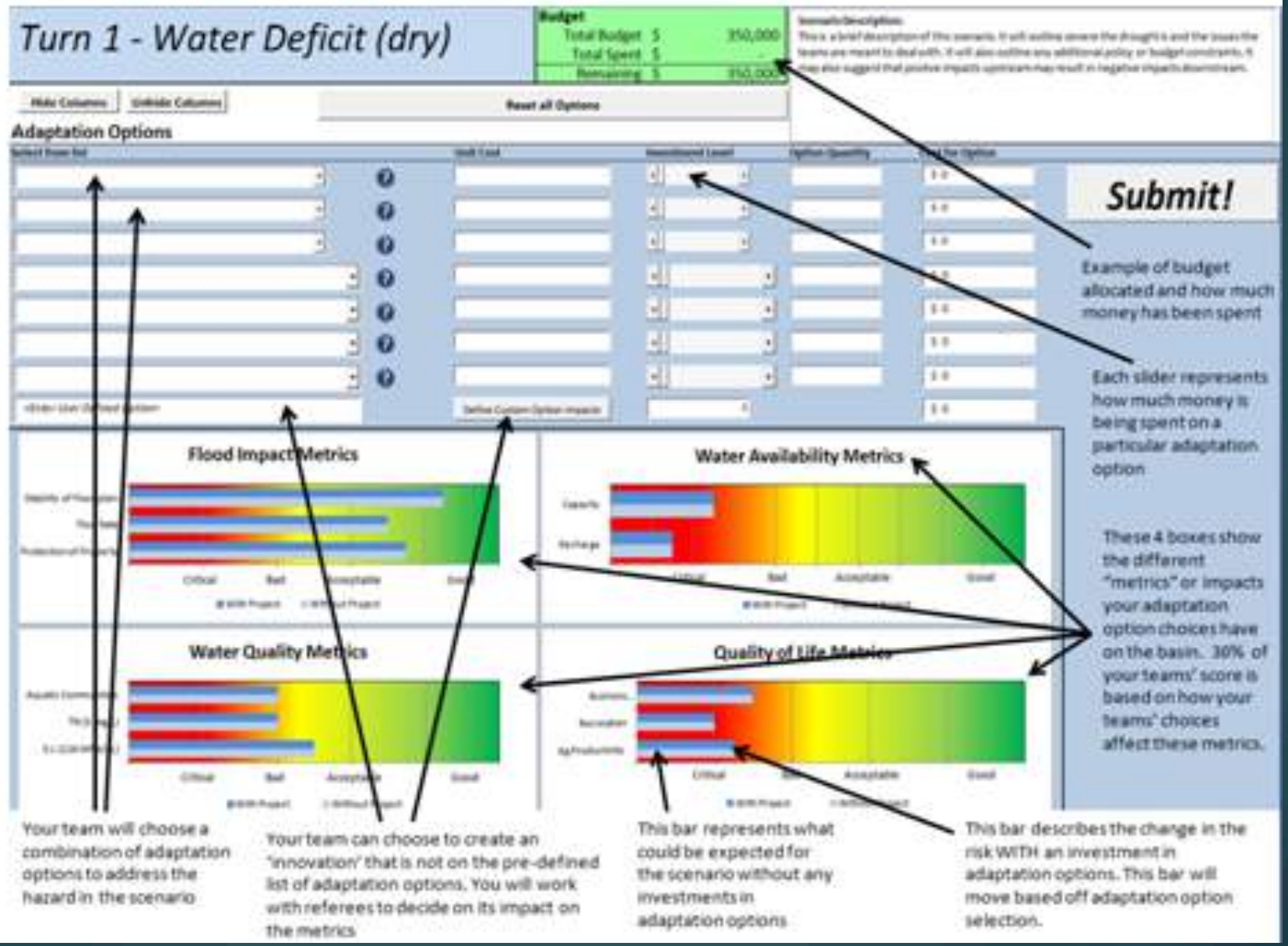
Multi-Hazard Tournament

Version 1.0

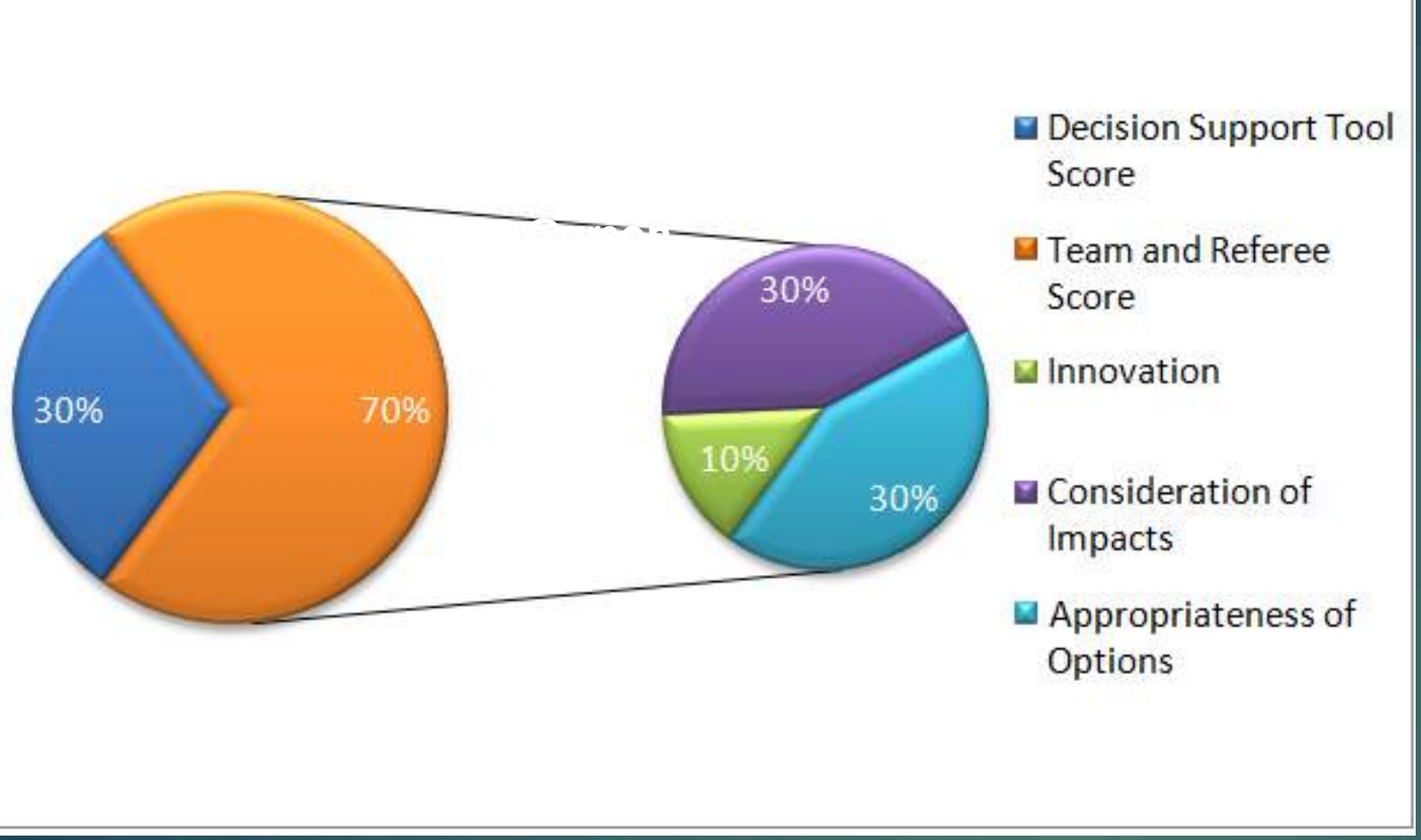


- DROUGHT ..... FLOOD ..... WATER QUALITY

Figure 4 Example of Elements of the Decision Support Tool Interface. Note: Minor modifications may be made to this interface prior to the tournament.



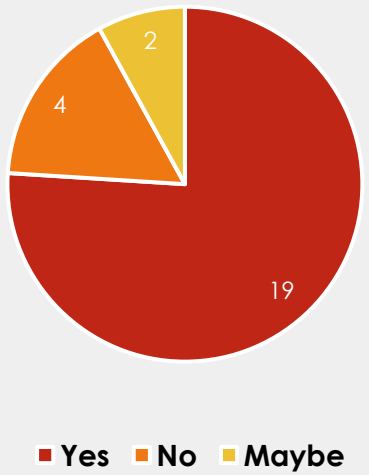
Picture 6: Teams making decisions with their table facilitators



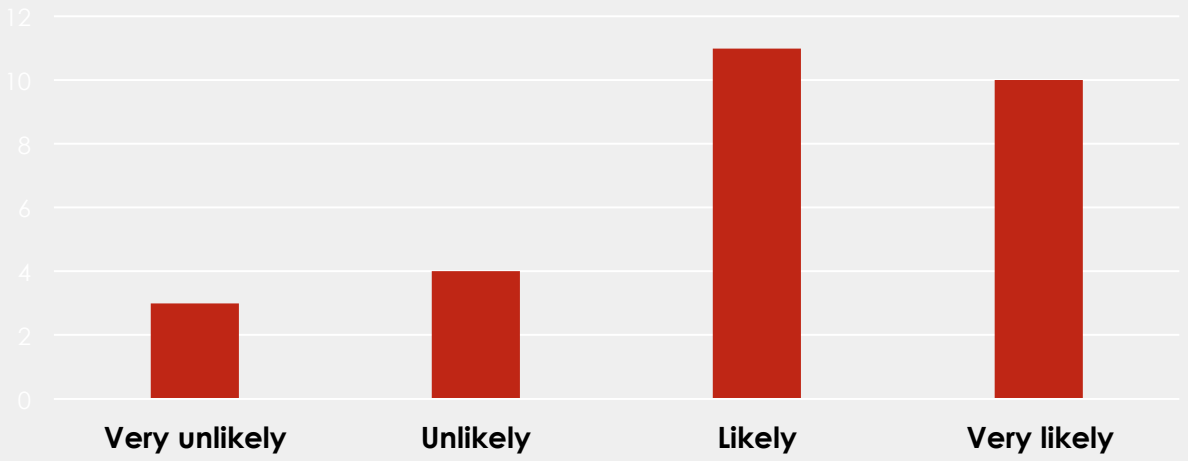
In future would like to add a score for the balanced resilience of the overall watershed versus the individual stakeholders

Note the Decision Support tool was automatically calculated based on the estimated improvement the teams' decisions made relative to the baseline.

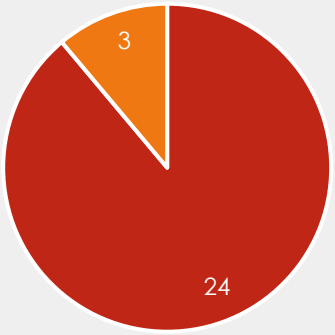
Would you make different decisions after being involved in the tournament?



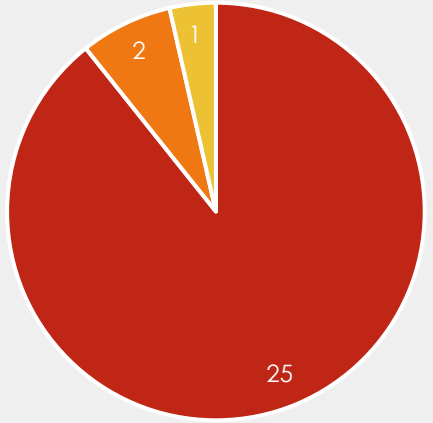
Likeliness to use information learned from the tournament



Changes in Participant's understanding of the different interests between upstream and downstream users?



Have you increased your knowledge of risk to various hazards and their impacts?



Phase 1: ***Refinement And Planning*** (2016-2017),

Phase 2: ***Training Material and Tool Development*** (2016-2018),

Phase 3: ***Training And Dissemination To USACE Divisions And Districts*** (2017-2019), and

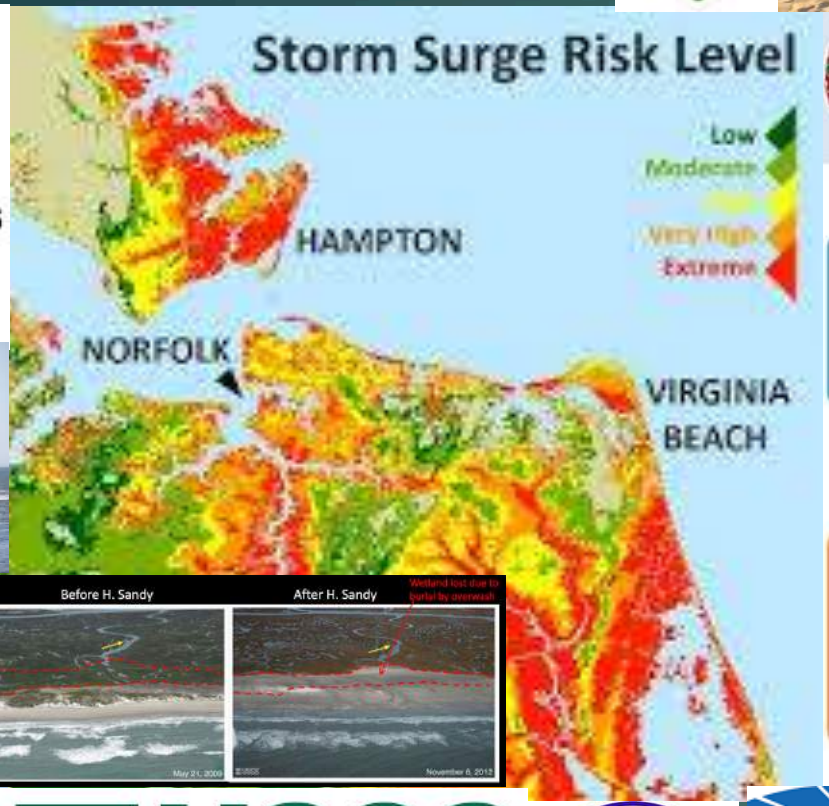
Phase 4: ***Operational Application, Ongoing Training, Integration and Development*** (2019- onwards)

Linking the right people and Institutions

Why Norfolk?

SAGE

US Army Corps of Engineers ®
Norfolk District



USGS
science for a changing world

VIRGINIA DEPARTMENT OF EMERGENCY MANAGEMENT

OFFICE OF THE SECRETARY OF PUBLIC SAFETY & HOMELAND SECURITY

D³M

Resilience – a Whole of Commonwealth Approach

- Commonwealth Chief Resilience Officer
- Homeland Security and Resilience Staff Group
- Intergovernmental Pilot Project
- Virginia Area Maritime Security Committee

Collaboration & Coordination

- HUD-NDRC

Funding

Policy

- Secure Commonwealth Panel
- NGA/DoE Energy Assurance
- Climate Change and Resilience Commission
- Joint Legislative Subcommittee for Recommendations to Address Flooding

Technology

- Resilience Dashboard
- NOAA's Port of Tomorrow
- VDEM/USACE 2-year Hurricane Study

COMMONWEALTH OF VIRGINIA

SILVER JACKETS
Be Risk Aware!

Conflict Resolution & Public Participation
USACE

Dominion®

SCIENCE & TECHNOLOGY POLICY FELLOWSHIPS
AAAS

NORFOLK, VA
100 RESILIENT CITIES INITIATIVE

Virginia Coastal Zon
MANAGEMENT PROGRAM

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

Ready
York County
VIRGINIA
Plan, Prepare, Stay Informed

Virginia Cooperative Extension
Virginia Tech • Virginia State University

COOPERATIVE EXTENSION
1914-2014
100
SMITH-LEVER ACT
EXTENDING KNOWLEDGE CHANGING LIVES

DHR
Department of Historic Resources

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Linking to Institutional Objectives and Policies

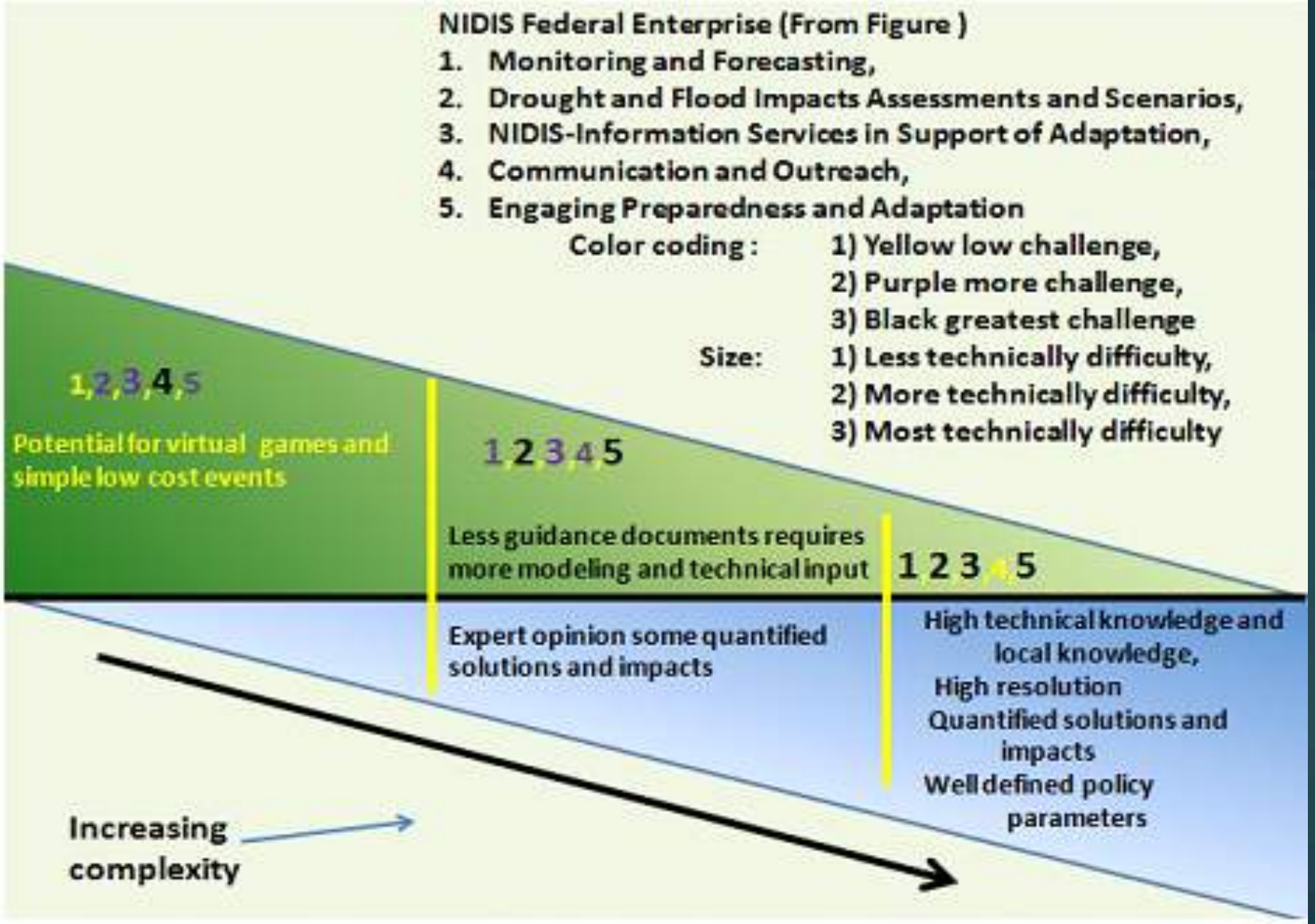


Figure 6: Preliminary Estimation of Relative challenge to integrate NIDIS elements by tournament complexity.

Objective 1a: *Ray Alexander*

Support the Combatant Commands' security activities, and the efforts of other U.S. government agencies around the globe, to advance our Nation's interests.

Action 1a2: Engage and Integrate USACE Capabilities to achieve JIIM effects

Apply USACE capabilities / enablers so CCMDs, ASCCs, and interagency partners achieve strategic effects through vertical / horizontal alignment.

Priority Action 1a2

End State: USACE optimizes engagement / integration opportunities with CCMD, ASCC, and interagency partners through vertically / horizontally aligned strategy, resources, processes, and systems.

Lead: Sheryl Lewis

2015 – 2016 Outcomes / Metrics / Targets

Outcome 1a2.1: Vertically Aligned Strategic Engagement and Situational Awareness: USACE conducts deliberate vertically aligned engagement informed by situational awareness that leverages enterprise strategic engagement

1a2.1.1 MSC	% assigned action officers for Regional and Functional MSCs have completed PROSPECT Training Course 224, "Strategic Engagement Planning".	1Q: ■ ≥20%, ■ 19-19%, ■ >10% 2Q: ■ ≥50%, ■ 49-19%, ■ >20% 3Q: ■ ≥70%, ■ 69-49%, ■ >50% 4Q: ■ ≥90%, ■ 89-69%, ■ >70%
1a2.1.2 HQ, MSC	% Theater Security Cooperation, Security Assistance, Support to Others activities / engagements into GTSCMIS	1Q: ■ >40%, ■ 39-21%, ■ <20% 2Q-4Q: ■ >80%, ■ 41-79%, ■ <40%
1a2.1.3 HQ, MSC	HQ, and each MSC, FOA, Center, Lab have completed an aligned SE/RM Plan IAW (ES 28100) Strategic Engagement.	■ Yes; ■ No
1a2.1.4 HQ, MSC	Number of account plans that each HQ, MSCs, FOAs, Centers, Labs have completed for strategic stakeholders.	■ ≥3; ■ 2; ■ ≤1

Outcome 1a2.2: USACE delivers small Theater Security Cooperation (TSC) projects that are cost effective and achieve CCMD, SCC, or interagency desired effects

1a2.2.1 MSC	% small TSC projects (≤$1M) w/ P&D/S&A costs ≤19% total project cost	■ >90%; ■ 75-90%; ■ <75%

Outcome 1a2.3: Full suite of USACE capabilities integrated into CCMD / ASCC operational / contingency / theater security cooperation plans.

1a2.3.1 HQ, MSC	% required CCMD/ASCC plans that include USACE capabilities.	■ ≥90%, ■ 89-70%, ■ >70%

2017 – 2019 Outcomes / Metrics / Targets

Outcome 1a2.4: Vertically Aligned Strategic Engagement: USACE communicates the right message

1a2.4.1	% MSC, District, Lab, Center, FOA Theater Security Cooperation / Assistance, Support to Others activities / engagements input in GTSCMIS NLT 2Q each FY.	■ >80%, ■ 79-41%, ■ <40%
1a2.4.2	% HQ, MSCs, FOAs, Centers, Labs, Districts implementing SEPs annually.	■ ≥ 90%, ■ 89-70%, ■ >70%
1a2.4.3	% HQ, MSCs, FOAs, Centers, Labs, Districts update SEPs NLT 4Q each FY.	■ ≥ 90%, ■ 89-70%, ■ >70%

Outcome 1a2.5: USACE capabilities and enablers are applied to support CCMD

1a2.5.1	% MSC, District, Lab, Centers, and FOA international activities directly supporting CCMD, ASCC, & interagency partner security cooperation rqmts.	■ >75%; ■ 74-50%; ■ <50%

Not sure if this is relevant, Possible ways to support **could** by simulation gaming as we exploring with the USACE Water treatment plant in D.C. and the Collaborating Corporation's Governance chalenge,

Not sure if Decadal Climate Primer/WISDM effort relevant or

The strategic thinking paper on linking systems to resilience

Existing and Potential USACE Programs and Initiatives

	Programs	Initiatives and Tools
Programs	1. CPCX 2. SAGE 3. Silver Jackets Flood 4. Asset Management 5. ICI-WARM UNESCO HELP 6. Planning	1. Resilience 2. Charettes 3. Integrated Watershed Management 4. Coastal risk reduction 5. Drought and resilience regarding CC
Potential	1. P3 Green infrastructure 2. Water Storage 3. Risk Management 4. Regulatory 5. CMEP 6. Recreation	1. Future Directions

Existing and Potential National and International Links With USACE and External Organizations

	National	External
Existing	1. USACE 2.USGS Climate Science Centers and Risk Assessment Unit 3. NOAA 4. National Drought Mitigation Center 5. The National Integrated Drought Information System (NIDIS) 6. Department of Energy 7. San Antonio River Authority (SARA) 8. City of Cedar Rapids	1. Caribbean Institute for Hydrology and Meteorology 2. Millennium Challenge Corporation 3. Universities of Saskatchewan, Alberta,British Columbia and Nebraska
Potential	1. Landscape Conservation Collaboratives 2. Norfolk Silver Jacket Coastal Risk Reduction MHT project 3. Kansas State Water Office 4. USACE Water Storage potential being explored 5. P3 Green Infrastructure is being explored	1. World Meteorological Organization 2. World Bank 3. Organization of East Caribbean States (OECS) 4. Mexico

America Competes Act

Opportunity?

Distance Playing maintains quality but reduces costs of bringing people together, allows for community of Practice to develop

How do we know When it Makes A Difference?

Knowledge Increased

Stakeholders understand:

1. Their risks,
2. Risk mitigation options and
3. Potential sources of technical and financial support to initiate risk mitigation

Action Taken

1. Adaptations are implemented starting with easiest and over time more complex

Results

1. Post hazardous event damage costs and recovery times are measurably declining in the community and nationally


TERN
MARTIN