FLOOD RISK MANAGEMENT – PLANNING CENTER OF EXPERTISE (FRM-PCX)

FRM-PCX WEBINAR SERIES #2

APPROPRIATE LEVEL OF DETAIL AND RISK REGISTER BEST PRACTICES

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9 May 2019

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FRM-PCX – WE'RE HERE TO HELP!!!

…BUT WE NEED YOUR HELP TOO!

- **The Goal:**
  - Timely webinars on specific topics that can help you and your FRM study RIGHT NOW!
  - Provide individual presentations/training to teams on specific topics relevant for your FRM study
  - Provide individual support to teams to help work through specific FRM challenges

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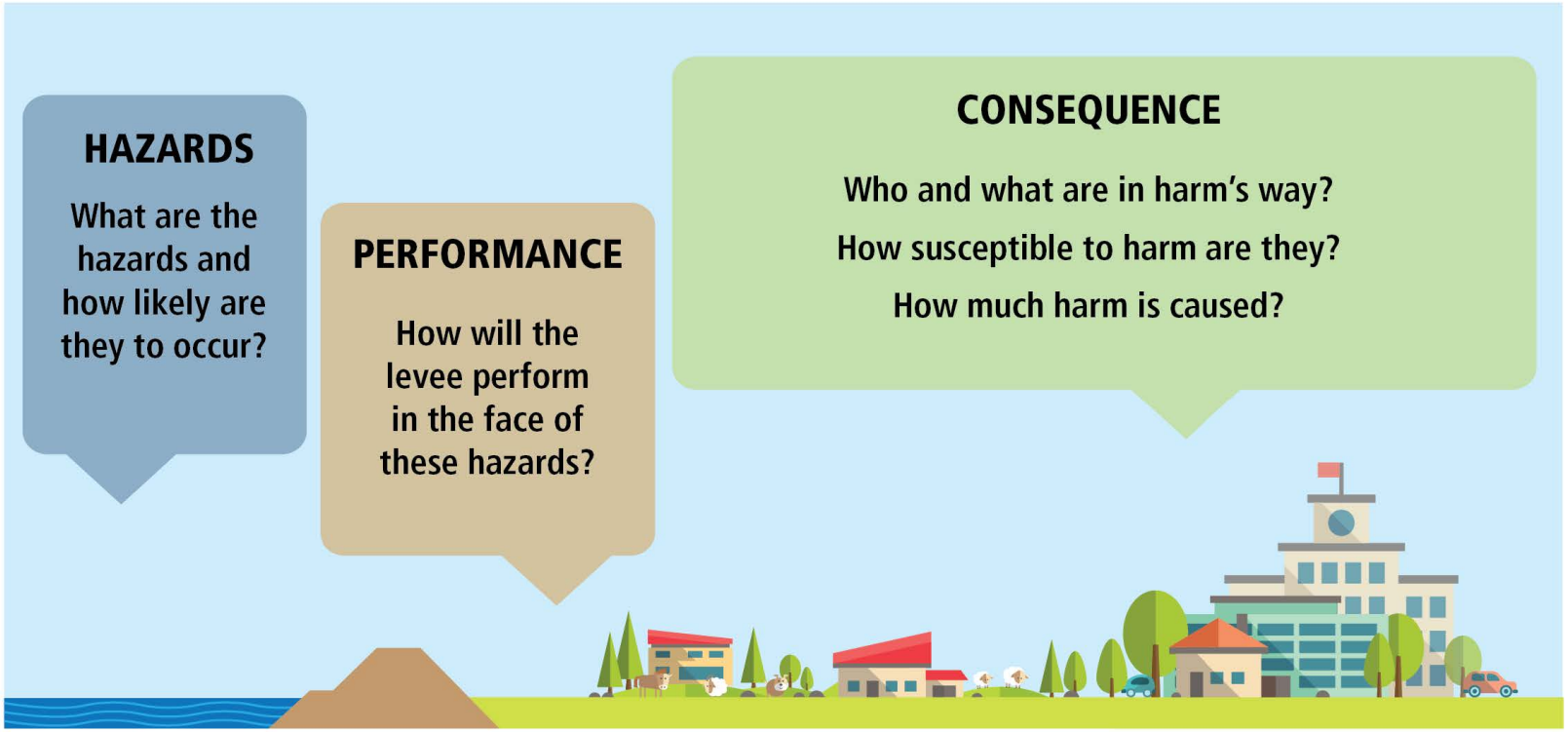
FLOOD RISK REVIEW



RISK = f (HAZARD, PERFORMANCE, CONSEQUENCE)

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RISK INFORMED PLANNING OVERVIEW

Trigger
- An event
- Accumulation of information

Hazard
- The thing that can cause harm
- Or the opportunity for a potential gain

Harm
- Identify the specific harm(s) of interest
- Identify the specific gain(s) that could be achieved

Sequence of events
- Sequence of necessary events from hazard to harm
- Sequence of events from opportunity to gain

Uncertainty
- Identify key uncertainties
- Reduce uncertainty

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RISK INFORMED PLANNING OVERVIEW EXAMPLE

Trigger	Flood event(s), followed by a single purpose authority to study flood risk management in the County Floods A lot.
Hazard	Hazard starts at the .01 ACE event, economic damages and life loss occur
Harm	Infrastructure harmed, numbers of lives at risk, cultural resources
Sequence of events	What is causing the hazard at the .01 ACE - adjacent hydrology, rainfall, snow melt, climate change, faulty infrastructure
Uncertainty	What do we know about the population at risk? What do we know about the hydraulics of the area? What do we know about existing infrastructure? What do we know about the environment?

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RISK-INFORMED DECISION-MAKING BASICS

- Where there is uncertainty, there may be risk
- Risk-informed planners reduce uncertainty wisely and iteratively
- Everyone is a planner and a risk manager
- There is no such thing as “the number”
- Residual risk and assessing the risk of the TSP are focal points
- Tell effective stories, don’t just dump data

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WHAT DO YOU FIND TO BE THE MOST CHALLENGING?

RISK IDENTIFICATION

LEVEL OF DETAIL

RISK REGISTER

UNCERTAINTY

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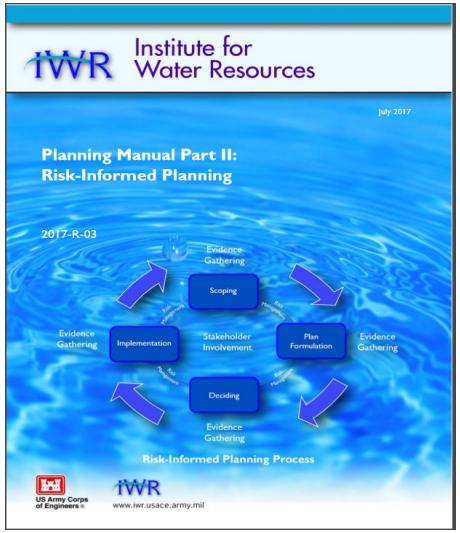
1ST ITERATION: KNOWLEDGE ON THE TEAM

Planning is iterative. We'll do the entire process.

We'll ID our biggest data gaps, plug 'em, then do it all again.



Within first 30 days

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HAVE YOU CONDUCTED A 1ST ITERATION?

Yes

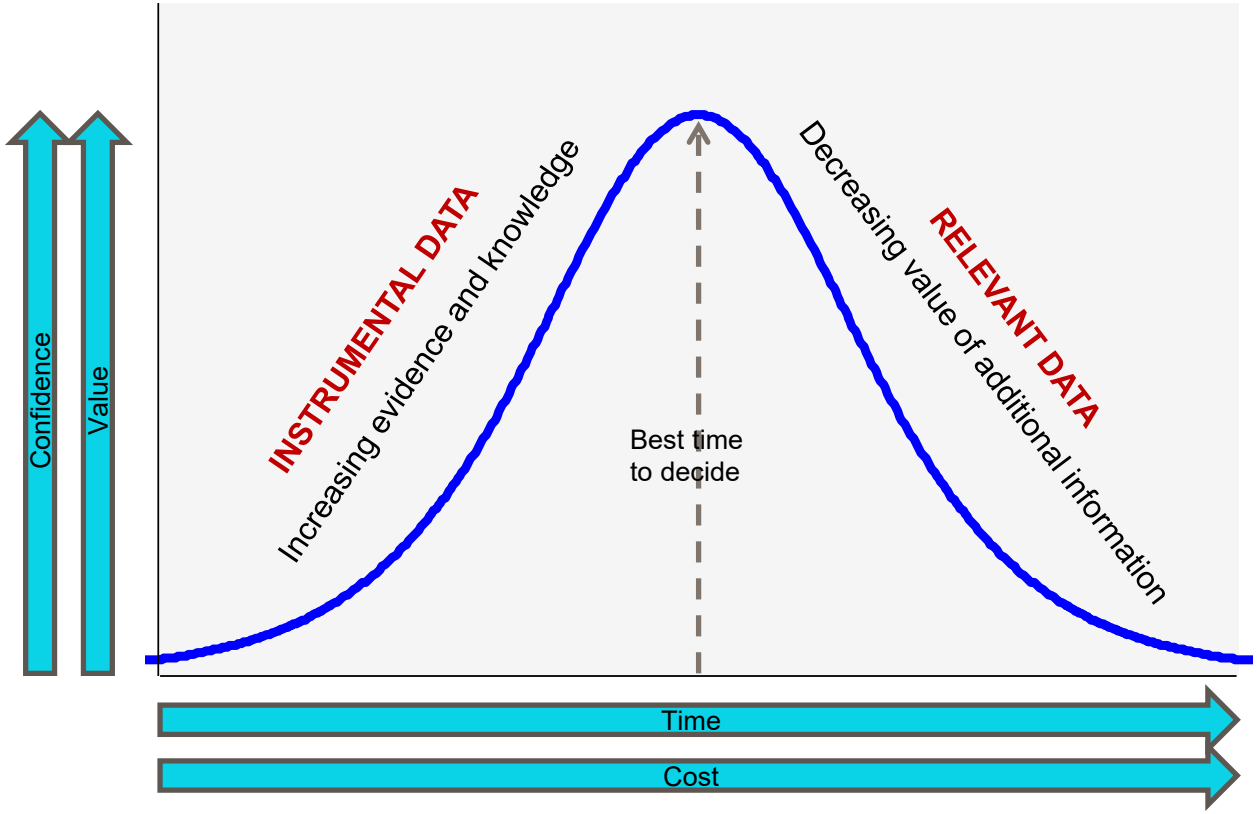
Not Yet

INFORMATION FOR FIRST ITERATION IN FRM STUDIES

- **Planning**: Recent floods? Past studies in the area? Any PL 84-99 actions? Trends in the area?
- **Economics**: Census data # of structures and population growth trends. Damageable property range? Available LST inventory data from HAZUS? Historical damages?
- **H&H**: Available floodplain maps (FEMA) and flood insurance studies. Available topography. Obvious flow constrictions?
- **Geotech**: Available LST results? Recent levee failures? PL 84-99 actions? Will levee performance worsen over time?
- **Environmental**: Existing NEPA/CEQA docs or BiOps for past studies in the area? General Plans/Local Baseline docs?

REDUCING UNCERTAINTY STRATEGICALLY

- **Instrumental uncertainty** refers to things that could affect the decision
- **Relevant uncertainty** refers to things people may care about but will not change the decision



- **Challenge of balancing time, effort, and expense of more evidence to reduce uncertainty vs. risks of making decisions**

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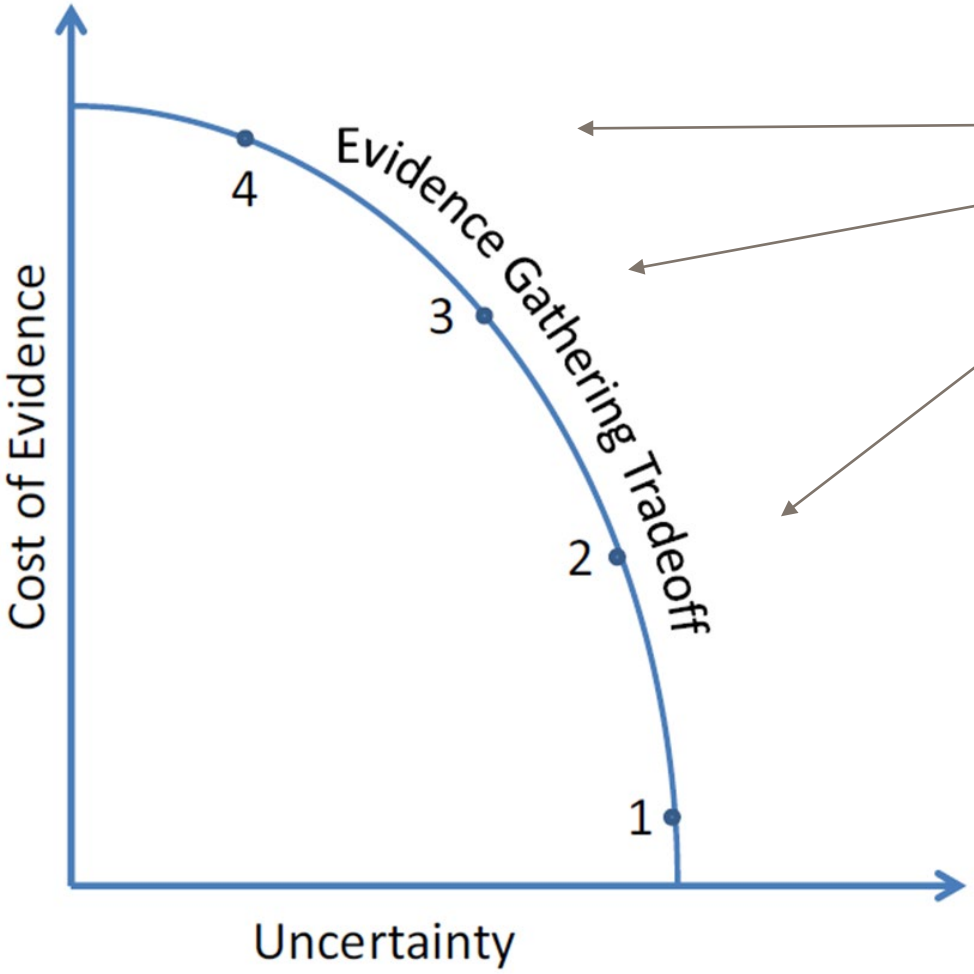
THE TRADEOFFS OF EVIDENCE GATHERING



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WHERE'S THE SWEET SPOT?

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1ST ITERATION – LEVEL OF DETAIL CHECKPOINT

- What data do you already have?
- Have you determined your instrumental risks?
- Is there any data acquisition that needs to start now?
- Who might have the data that you need?
- Assign team members the responsibility to ask for the data needed

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TYPICAL FRM UNCERTAINTY

- No recent structure inventory for the study area
- Unknown Hydrology
- Existing topographic information may not reflect current conditions
- Unknown effect to T&E species
- Future land use changes
- Unknown cultural resources/tribal concerns
- Solution may have greater residual risk than expected
- Project benefits may decline over time due to climate change

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Knowledge

Awareness of Risk	KNOWN	UNKNOWN
KNOWN	• Structure inventory • Population • Critical infrastructure • Annual peak flow • Land use	• Endangered species • HTRW • Cultural • Regional sea level Rise • Current water – surface elevations
UNKNOWN	• Existing infrastructure • Soils • Tribes • Borrow areas • Public opinion	• Political views • Future laws and regs. • FWOP conditions • Climate change

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THE AGE OLD QUESTION - HOW DO WE FIND THE LEVEL OF DETAIL THAT'S "JUST RIGHT?"

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LEVEL OF DETAIL DURING EVIDENCE GATHERING FOR EACH PLANNING ITERATION

- Identify the next planning decision(s)
- Identify the metrics necessary to make the decision(s)
- Assess the information you have
- Is it good enough to make the decision(s)?
- We have tools to help us – the risk register and decision management plan

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HAVE YOU USED A RISK REGISTER?

Never…

Once or twice…

Yes..

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RISK REGISTER

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BASICS OF THE RISK REGISTER

- Risks and their causes.
- Consequences of risk.
- Likelihood of the risk occurring.
- Confidence of the risk consequences and likelihood of its occurring.
- Multiple recommendations on how to manage the risk.

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THE RISK REGISTER – BLUF

- Completing the Risk Register is less important than **using it**
- You identify **instrumental risks** so you can manage them
- Management options should reduce uncertainty and typically should include more than one option
- Actively manage every H and M risk to keep undesirable consequences from developing
- Monitor L risks to make sure they do not progress
- Every risk has a manager

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1ST ITERATION RISK REGISTER EXAMPLE

- Issue: No recent structure inventory for the study area
- Decision: Initial screening of measures/alternatives for **AMM**

Scoping	Risk and Cause	Consequence	Likelihood	Management Options
Utilize 15yr old structure inventory to quantify damages	The old structure inventory may underestimate damages because we know urbanization has increased over the past decade.	Medium for AMM. Could incorrectly screen alts. Data is likely good enough for AMM, but may need for TSP.	Medium. Identifying the incorrect plan is possible because urbanization has occurred, but its unknown whether it is in vulnerable areas that incur damages	Conduct windshield surveys in newly urbanized areas only Conduct random google street view samples Wait for more detailed H&H

1ST ITERATION: QUESTIONS

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2ND ITERATION: KNOWLEDGE OF OTHERS

Now that we've gathered more information, let's do another full iteration!

We need to know what you know…and what you think!

Let's come up with an array of alternatives and choose which one's are the most promising!

Within the first 90 days

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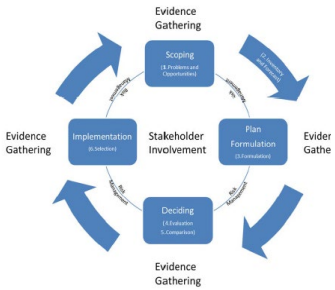
HAVE YOU CONDUCTED A 2ND ITERATION?

Yes

Not Yet

CHANGES FROM FIRST ITERATION



- **Planning**: Planned sponsor activities in the study area? Land use predictions? Development plans? Possible LPP? Can we refine the study area? SLC impacts? Site visits with locals for all disciplines.
- **Economics**: Local development plans? Geospatial assessor data? Critical infrastructure and key inventory? Economic Impact Area delineation discussions w/ H&H/Geotech/Planning. Risk drivers? Risk assessment methodology?
- **H&H**: More detailed topo? Upstream watershed urbanizing? Gage data? Assess different possibilities for flood initiation. Existing levee breach location possible flood impacts? What/where is likely to cause the worst flooding?
- **Geotech**: Local levee performance data? Flood fighting? Identify levee reaches? Locations for borings? Failure modes?
- **Environmental.**: Site visits/preliminary biological surveys with resource agencies? ESA Recovery Plans?

2ND ITERATION – LEVEL OF DETAIL CHECKPOINT

- Ask for the data you don't have and will need

- Always ask what assumptions were used in the generation of the data you receive from others
- Assess the risks of using provided data or assumptions
- Identify the metrics, and associated uncertainty, the PDT will use to evaluate and compare the final array

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LEVEL OF DETAIL - BASIC DATA NEEDS FOR FRM ECONOMIC (AND LIFE LOSS) EVALUATIONS

- Hydrology (assumptions, model selection, factoring in future development, climate change)
- Hydraulics (in channel stage-flow or stage-freq, floodplains)
- H&H uncertainty parameters (exceedance probability, rating curves)
- Geotech – Assumptions for existing levee performance, levee performance curves
- Structure Inventory (assumptions, sources, valuation, first floor elevations, population, uncertainties)
- Other damage/benefit categories - automobiles, environmental cleanup, traffic disruption, etc.

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RISK REGISTER EXERCISE – GOOD OR NOT?

Scoping Choice to be managed	Risk and its cause	Management options
Hydraulic Modeling	The topography in the study area is relatively flat	Study schedule does not allow for proposed risk management options

Nailed it | Needs some work

Nailed it | Needs some work

Nailed it | Needs some work

2ND ITERATION RISK REGISTER EXAMPLE

- Issue: Sponsor has existing/available 1D Hydraulic model
- Decision: Will 1D modeling be sufficient for **TSP selection** (need lead time)

Scoping	Risk and Cause	Consequence	Likelihood	Management Options
Utilize a 1D HEC RAS model to determine stage frequency curves FWOP conditions and alternative evaluations	The risk of using a 1D model is it may not sufficiently document how inundation moves into the relatively flat study area	High. One dimensional modeling may not accurately represent actual flood patterns. Damages could be over or underestimated	High. The area has had moderate life loss during other flood events and is a flashy system	Utilize 1D, but increase uncertainty parameters in Econ model. Create 2D model that shows direction of flow

2ND ITERATION: QUESTIONS

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3RD ITERATION: WHAT DO WE NEED TO KNOW?

Let's look at the Risk Register and see where to focus gathering more data.

What information is instrumental to decision making? And what's the most efficient way to get it?

Do we have enough resolution to identify a TSP?

Can some of this detail be done in Feasibility Level Design or PED?

Within the first year

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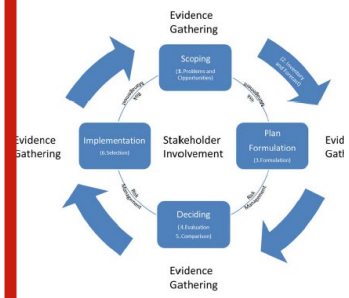
ARE YOU READY FOR YOUR 3RD ITERATION?

Yes

Not Yet

AFTER THE THIRD ITERATION



- **Planning**: Refine study area. Climate and SLC impacts? Develop detailed writeup of all FWOP assumptions.
- **Economics**: Analytical analysis. Refine inventory (field work). Develop and run econ analysis. Estimate FWOP damage ranges. Benefit-Cost frontier curve. Evaluate SLC scenarios. Refine risk drivers.
- **H&H**: Analytical analysis. Frequency analysis (gage data). HMS model development? Peak flows and hydrograph assessment. HEC-RAS model for stage driven reaches. Simple 2-d model for floodplain development/refinements.
- **Geotech**: Evaluate new levee data (i.e. borings). Work with Econ/H&H to ID reaches and evaluation methodology. Develop levee performance curves for Econ analysis.
- **Environmental**: GIS or field survey inventory of habitat? Resource agency database search for past occurrences of listed species? Water quality conditions?

3RD ITERATION: WHAT DO WE NEED TO KNOW

For FRM here are the basics:

- Structure replacement value
- Water surface elevations
- Geotechnical
- Costs for solutions
- Costs for real estate
- Potential mitigation costs

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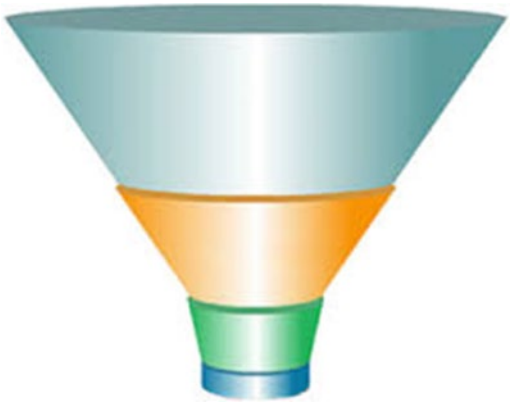
3RD ITERATION – LEVEL OF DETAIL CHECKPOINT



- Have you addressed all your instrumental risks?
- Does the data you're using have an equal application to all alternatives?
- Have you accounted for all expected project costs?
- Assess the risks of the TSP changing during feasibility level design with an increased level of detail
- Save the finer details for the feasibility level design of the TSP

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RISK COMMUNICATION

- Make sure that your instrumental risks are clearly described and what you did to address them.
  - Discuss at each Milestone

- Participate in the Cost Schedule Risk Analysis (CSRA) – make sure you are onboard with the assumptions your team is making

- Include all your assumptions and confidence levels used in your analysis in the main report – be transparent!

- Document your decision criteria. Don't confuse NED with BCR.

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3RD ITERATION RISK REGISTER EXAMPLE

- Issue: Future with-project may have greater residual risk than expected
- Decision: Identification of the **TSP**

Scoping	Risk and Cause	Consequence	Likelihood	Management Options
Future with project conditions floodplain use assumptions	New levee system may induce growth in the floodplain	High. Residual Damages could increase and benefits may be overestimated. Wrong NED. May cause incremental life loss increase.	Medium. The sponsor does not have proper zoning in place but does have a master plan that does not show future development	Sensitivity analysis of with-project(s) urbanization to determine residual risk Discuss with PCX Work with sponsor on risk communication to public/USACE

COMMON RISK REGISTER ISSUES

- Confusing the scoping choice/event with the risk

"Lack of subsurface information from city projects"

- Managing implementation risks during the study
- Risk rated "high" when team doesn't have information
- Laundry list that isn't useful

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3RD ITERATION: QUESTIONS

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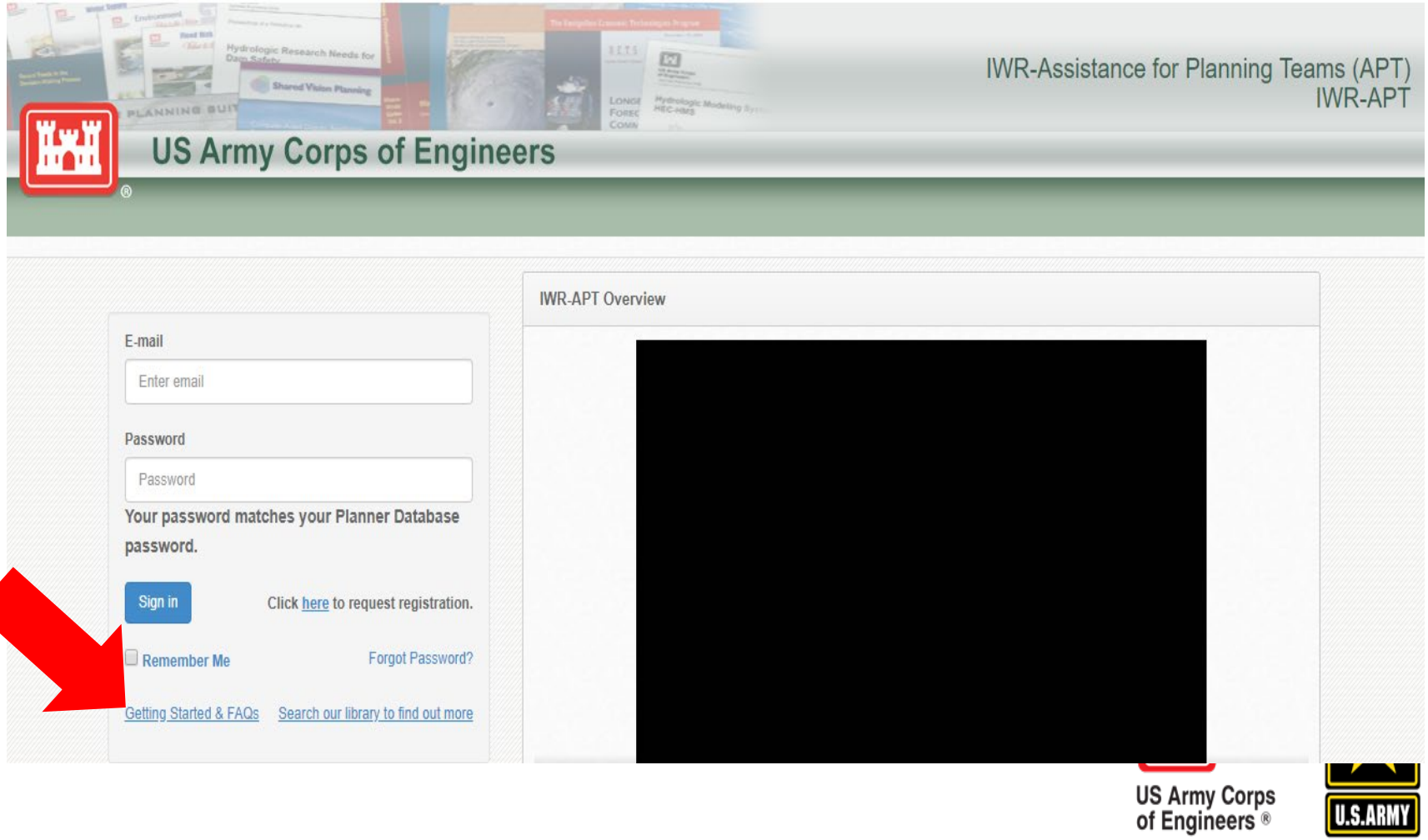
IWR-APT ONLINE RISK REGISTER

https://iwr-apt.planusace.us/login



IWR-APT ONLINE RISK REGISTER DEMONSTRATION

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SUMMARY OF RISK REGISTER

- Use It!!
- You identify risks so you can manage them efficiently and transparently – don't just check the box.
- Use the risk register to assess your risks and communicate your risk management strategy
- Actively manage H and M risks while monitoring L risks

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NEXT STEPS

- Concurrent Review will likely bring change to Level of Detail
- Additional iterations as necessary to re-confirm TSP selection
- Feasibility Level Design
  - Instrumental Risk
    - Including residual risk
  - Certified Cost Estimate (Level 3)
  - Benefits refinements?
  - Optimization

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QUESTIONS / FEEDBACK?

- Was this helpful?
- Too much information for one webinar?
- Recommendations for improvement?

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

This webinar will be posted to the Planning Community Toolbox:
http://www.corpsplanning.us

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