

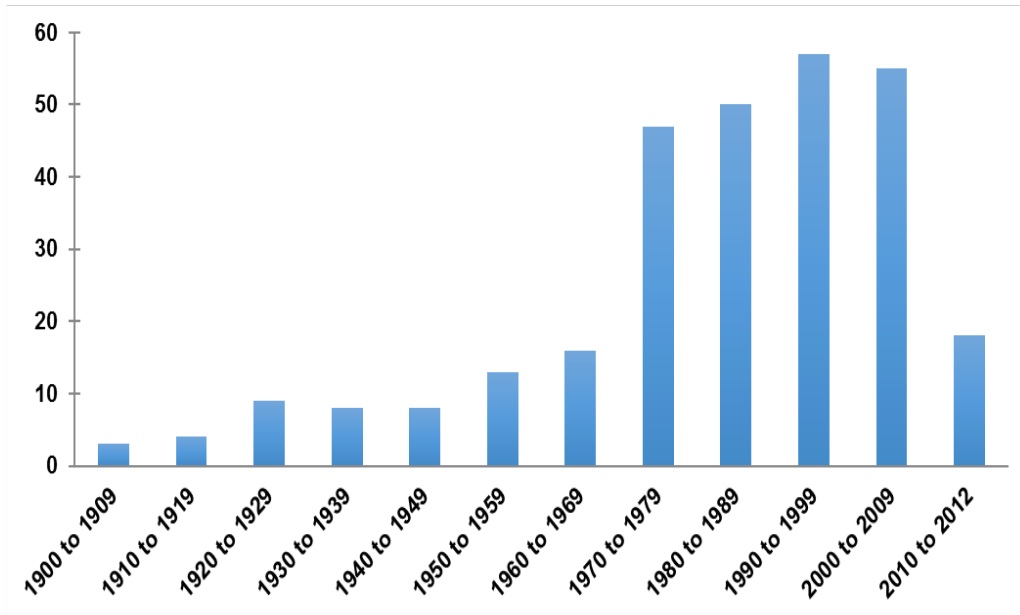
Flawed Decisions in Flood Management:

Why engineers should not be trusted.

CWRABC Conference, November, 2015

Tamsin Lyle, P.Eng | Principal | Ebbwater Consulting

Floods are an important issue

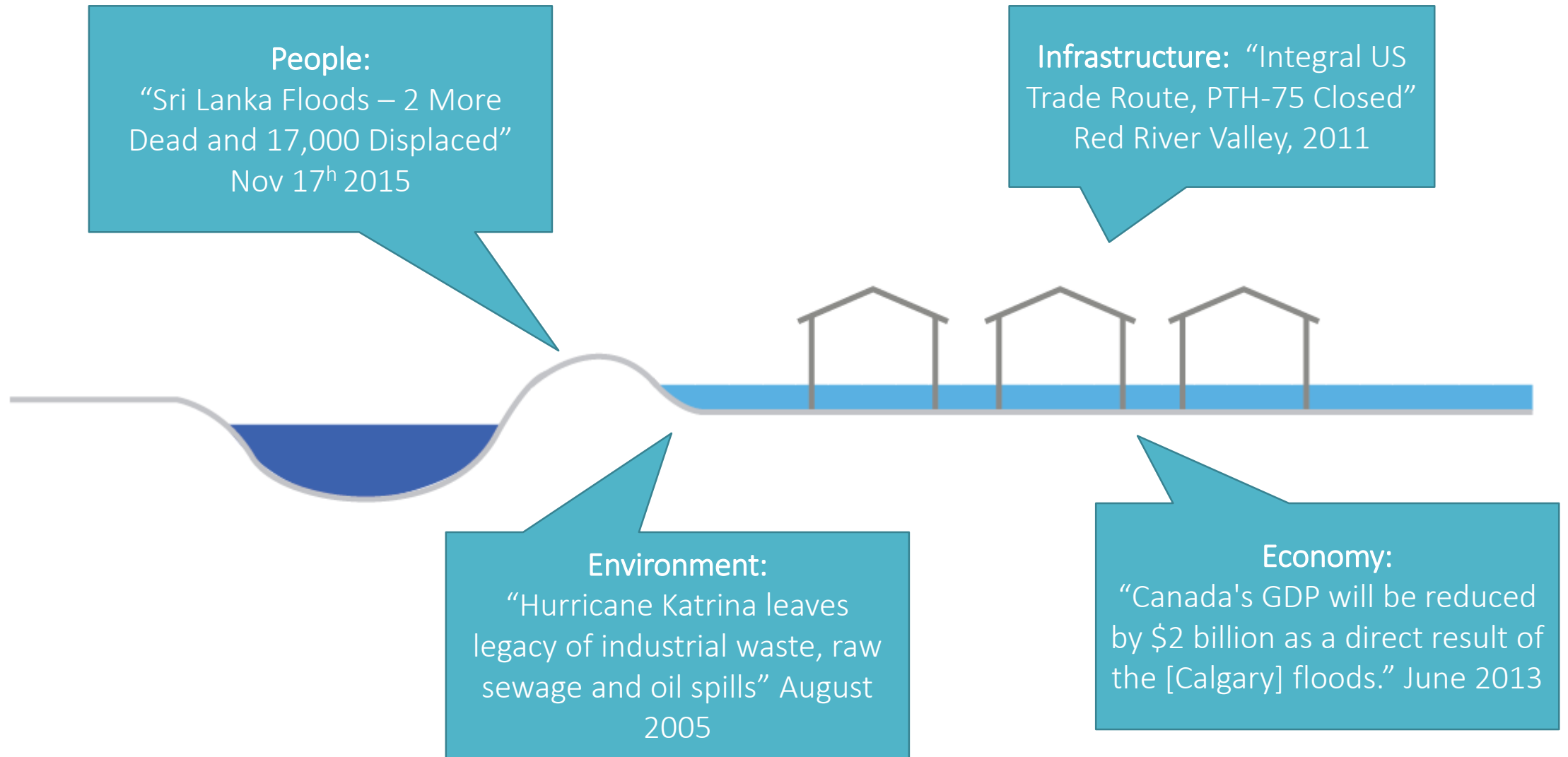


Flood Disaster Occurrences in Canada 1900-2012
(Canadian Disaster Database)

\$7-\$10 Bn

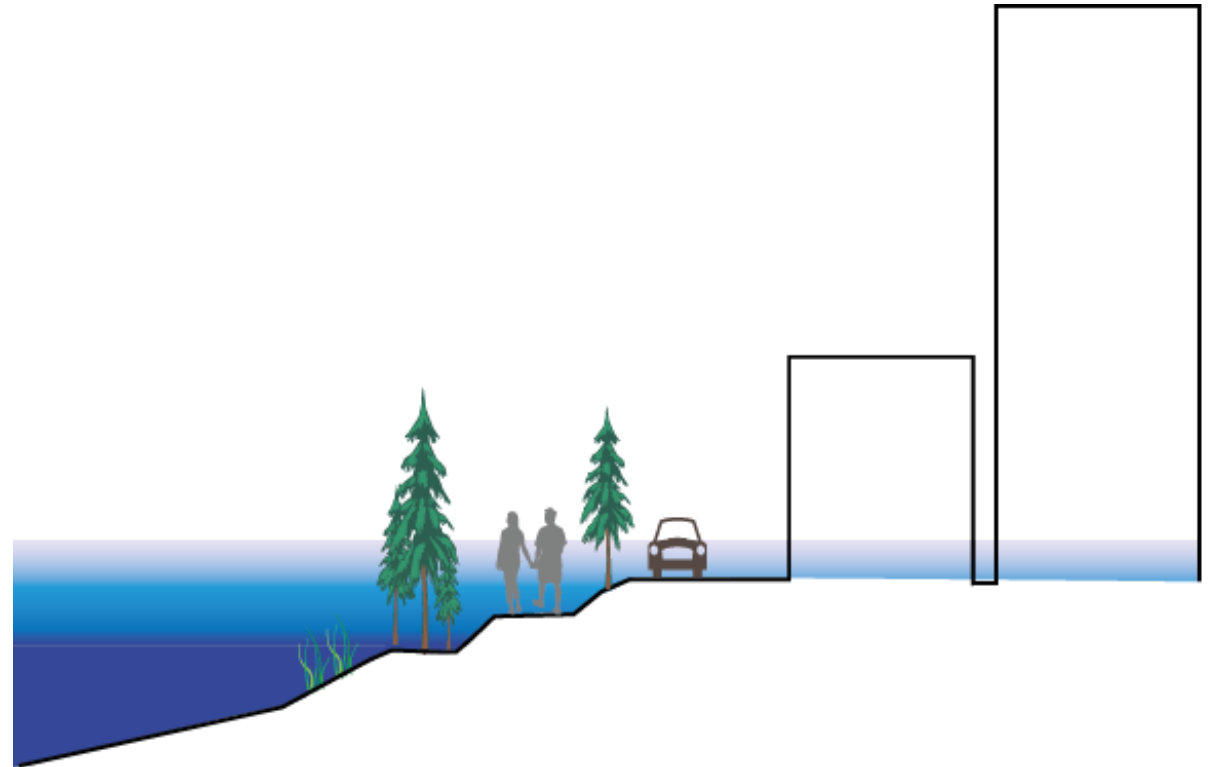
Loss Estimate for Catastrophic Flooding in BC
(ICLR and SwissRE 2010)

That affect many things

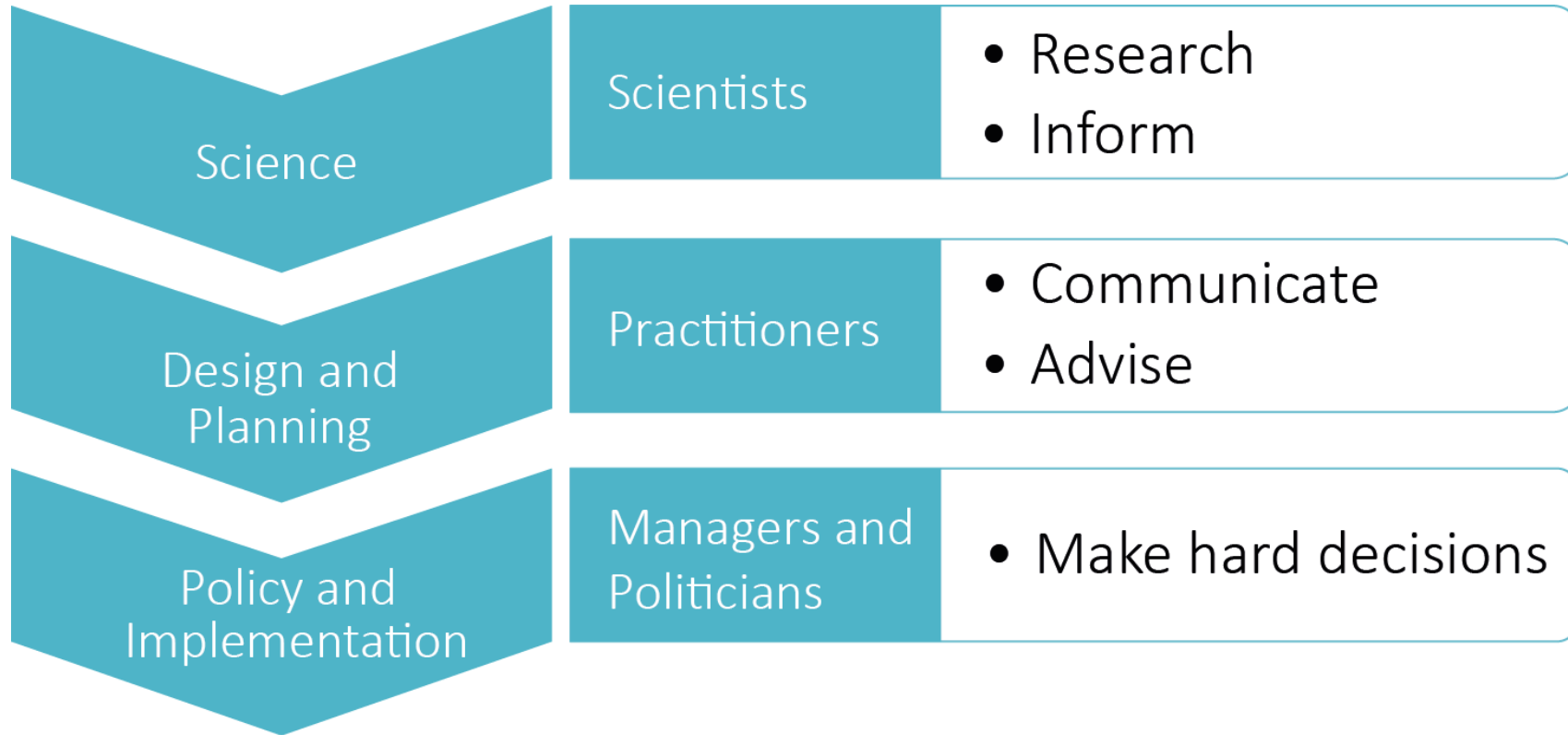


But...flood management is a wicked problem

- High degree of technical complexity
- Multiple dimensions of uncertainty
- Multiple objectives
- High stakes, high emotions
- Intense political scrutiny
- High expectations for quality and transparency
- Limited resources in terms of time, money and personnel.



We all have a common goal of risk mitigation



Flood Management

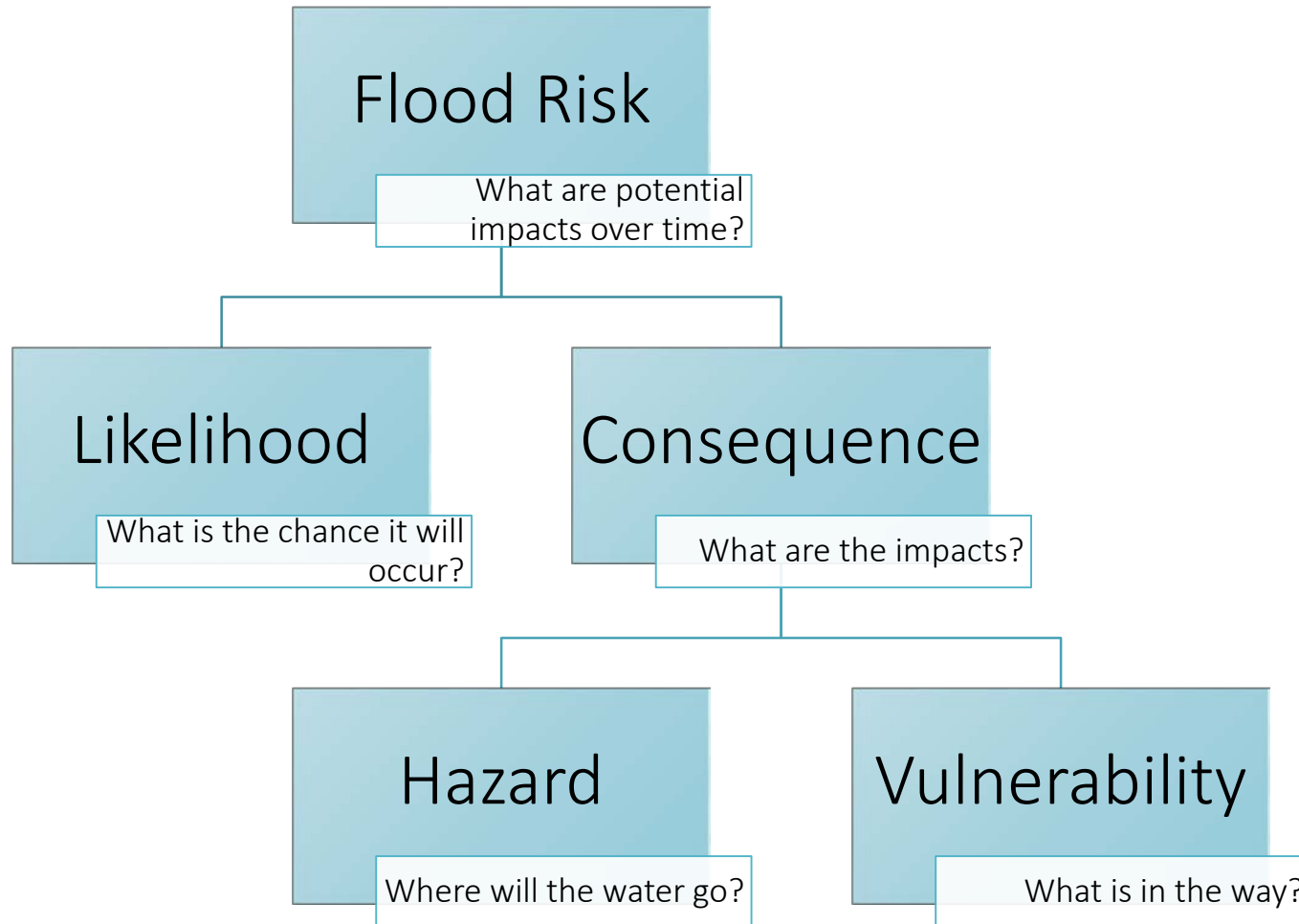
Tackling a “Wicked Problem” with good decision making informed by good science



Image stolen from Walluck.com

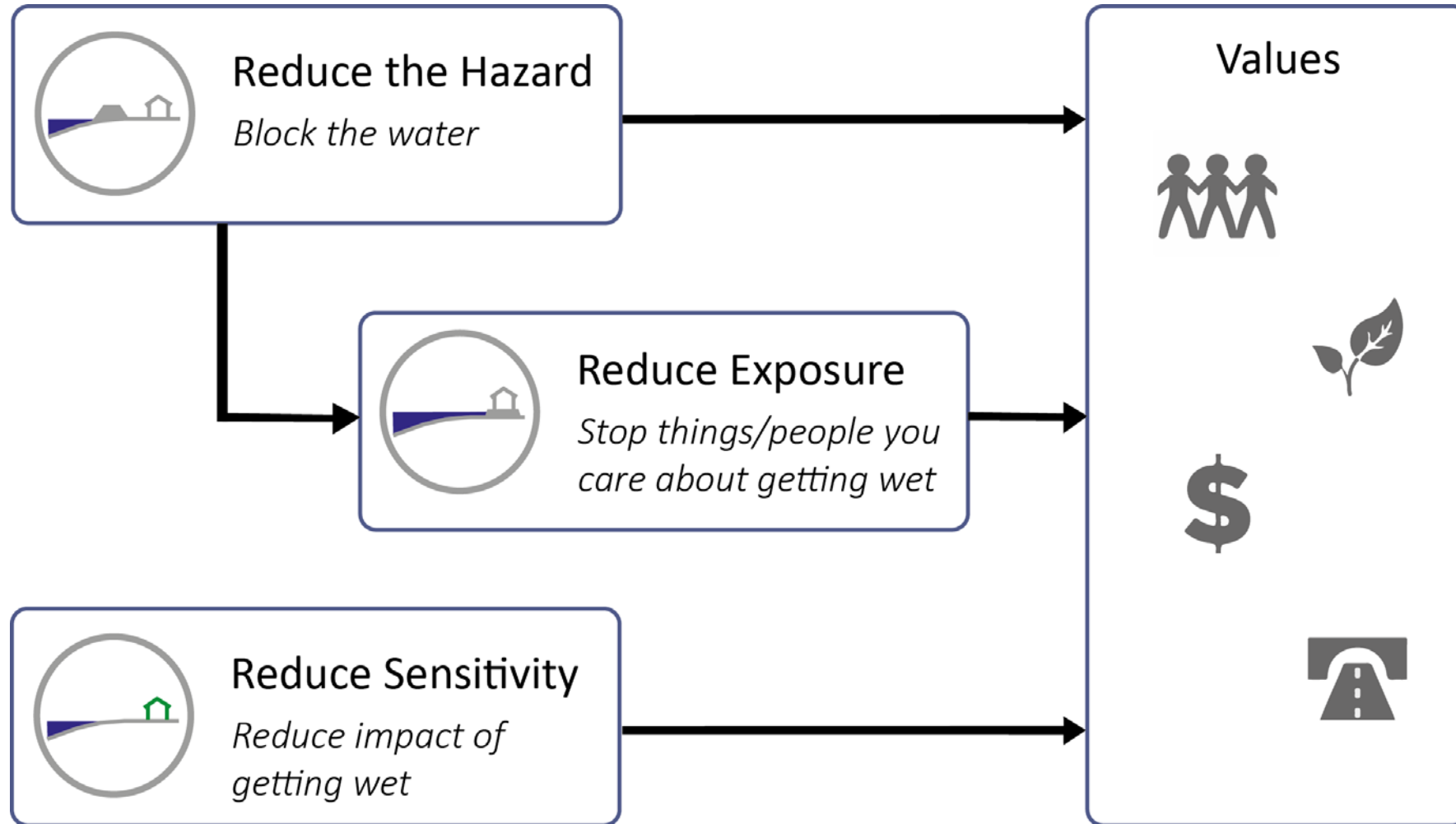
Are you an Ostrich or a Meerkat?

Meerkats Plan for Risk not Hazard



Meerkats Consider Values

Try to think like an anti-engineer



Meerkats Listen

Focus on what matters, not what you know

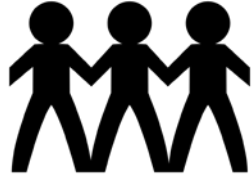


Talk to people; not just those you like

Image sources: West Coast Environmental Law

Meerkats Think and Understand Their Power

What is measured is what matters



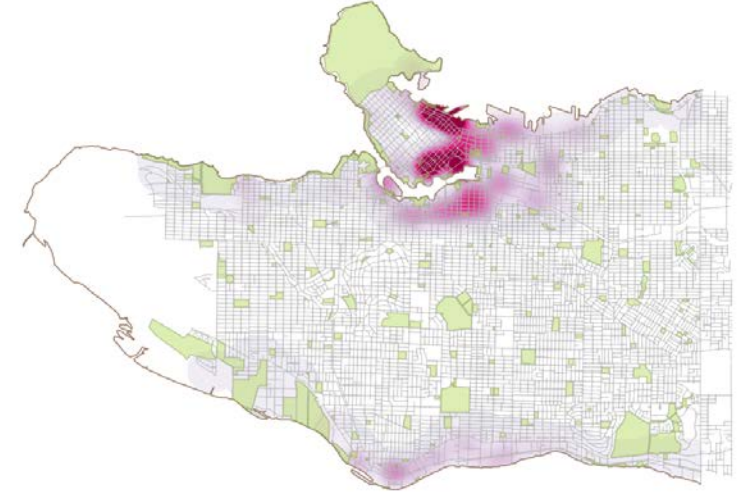
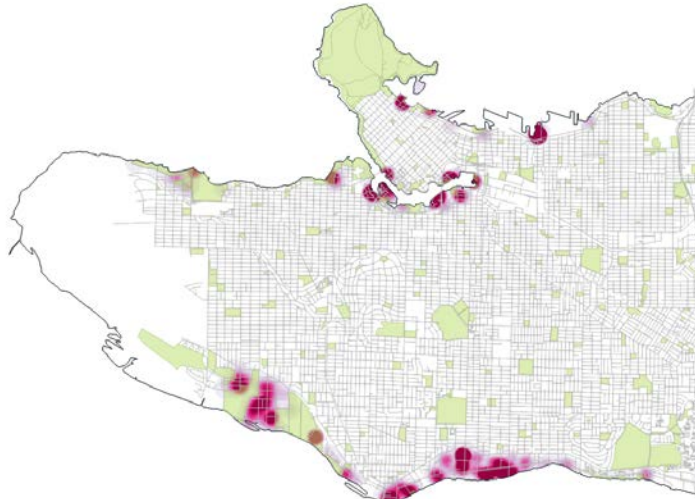
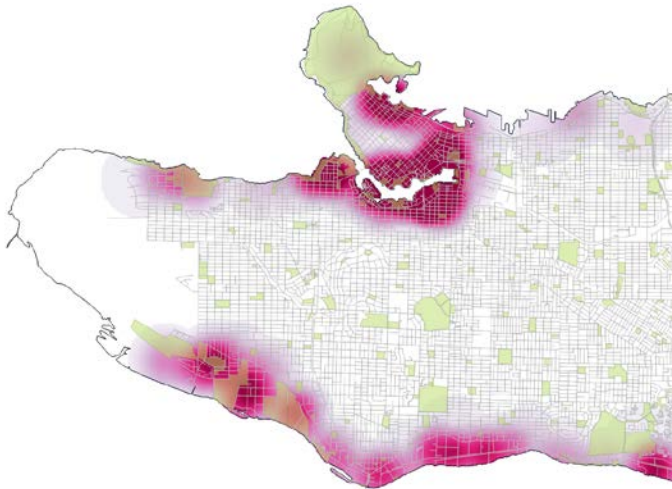
Shelter Needs



Building Damage



Employee Disruption



Meerkats Communicate Uncertainty

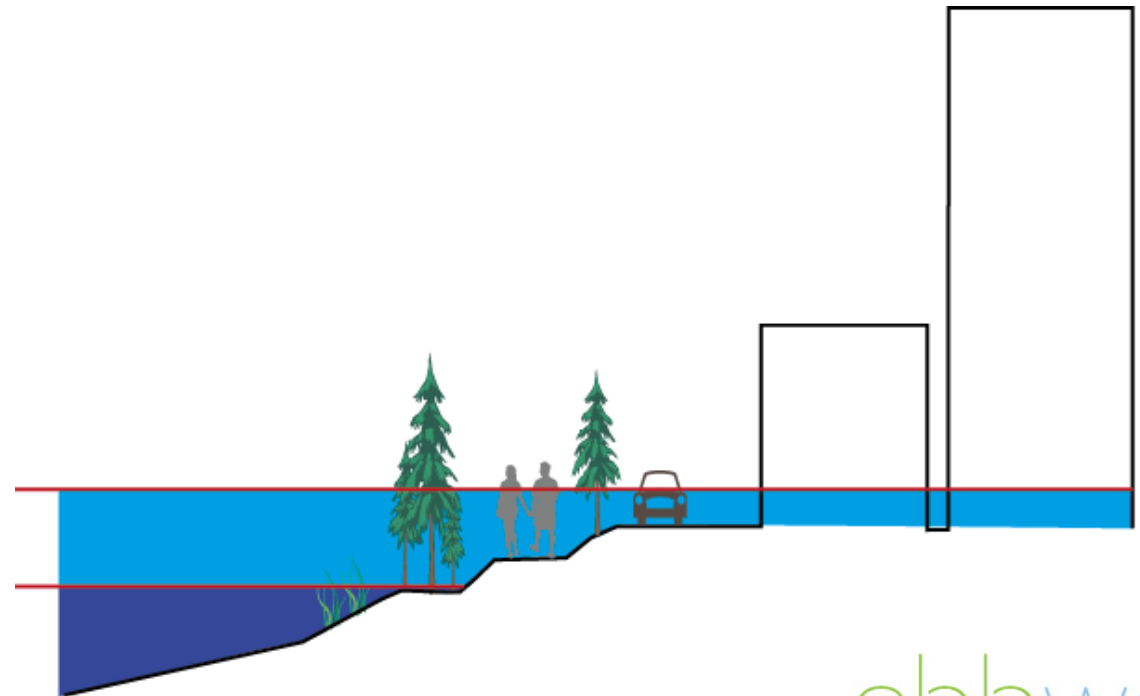
Provide ranges, provide options – explain the risks of the number being wrong

High end of range:

Overinvestment in protection

Low end of range:

Potential catastrophic impacts

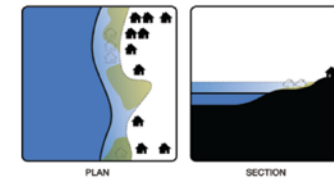


Meerkats Consider Focus on the decision process not the solution

False Creek
Location: **Impacts by Flood**
Scenario

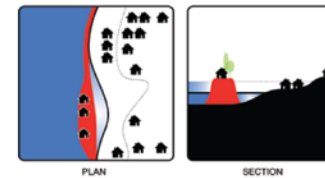
	Scale		PROTECT Dir Sea Barrier	PROTECT Raised Seawall	PROTECT Partial Dike	ADAPT Planning Tools
PEOPLE						
People Displaced - Flood Events	# of people displaced	L	Best	Best	Worst	Worst
People Displaced - Permanently	# of people displaced	L	Best	Best	Worst	Worst
at risk' people impacted	SVI weighted displacement	L	Best	Best	Worst	Worst
Park and Recreational Amenity Value	Value-weighted area affected per event	L	Best	Best	Worst	Worst
Loss of critical services	# of pieces of infrastructure impacted	L	Best	Best	Worst	Worst
Aesthetics	-2 to 2	H	Best	Best	Worst	Worst
ENVIRONMENT						
Risk of Contaminant Release	# of sites w/ potential contaminants	L	Best	Best	Worst	Worst
Environmental Benefits	-2 to 2	H	Best	Best	Worst	Worst
ECONOMY						
Damage to Infrastructure	Value-weighted km of roads impacted	L	Best	Best	Worst	Worst
Damage to buildings	\$M	L	Best	Best	Worst	Worst
Business disruption	# employees in impacted businesses	L	Best	Best	Worst	Worst
Loss of inventory	\$M	L	Best	Best	Worst	Worst
Emergency response costs	\$M	L	Best	Best	Worst	Worst
IMPLEMENTATION						
Capital Costs	\$M	L	Best	Best	Worst	Worst
Maintenance costs	\$M	L	Best	Best	Worst	Worst
Adaptability	1 to 4	H	Best	Best	Worst	Worst
Ease Of Implementation	1 to 5	H	Best	Best	Worst	Worst

Best performance
Worst Performance

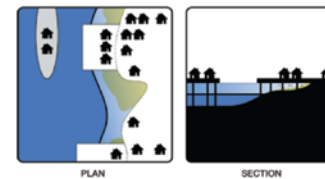


Scenario Building
(Institute of Civil Engineers 2010)

RETREAT?



DEFEND?



ATTACK?

Example Structured Decision Making Consequence Table
(For City of Vancouver 2015)

Meerkats Consider

Focus on the decision process not the solution

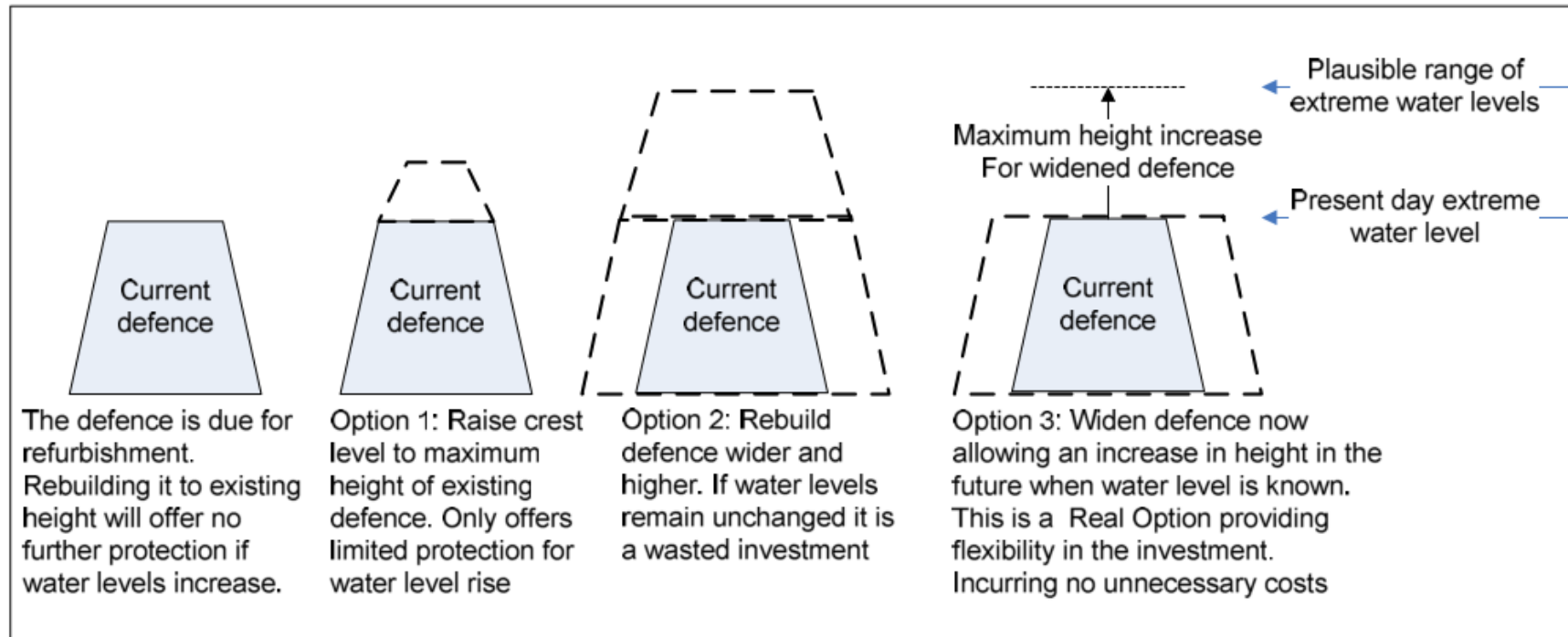


Figure 1 - Description of a flood risk management Real Option

Real Options Analysis

(Woodward et al. 2009)

Meerkats Acknowledge Bias

- There is an inherent feeling that the present is more important than the future
- We like our own disciplines; engineers will favour engineering solutions, CFOs will favour cheap solutions
- Dikes make money for engineering companies who do the analyses

Be a Meerkat!

Make Good Decisions



1. Plan for risk not hazard
2. Focus on what matters
3. Listen
4. Think and understand power
5. Communicate uncertainty and fallibility
6. Consider Decision Process
7. Acknowledge Bias

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