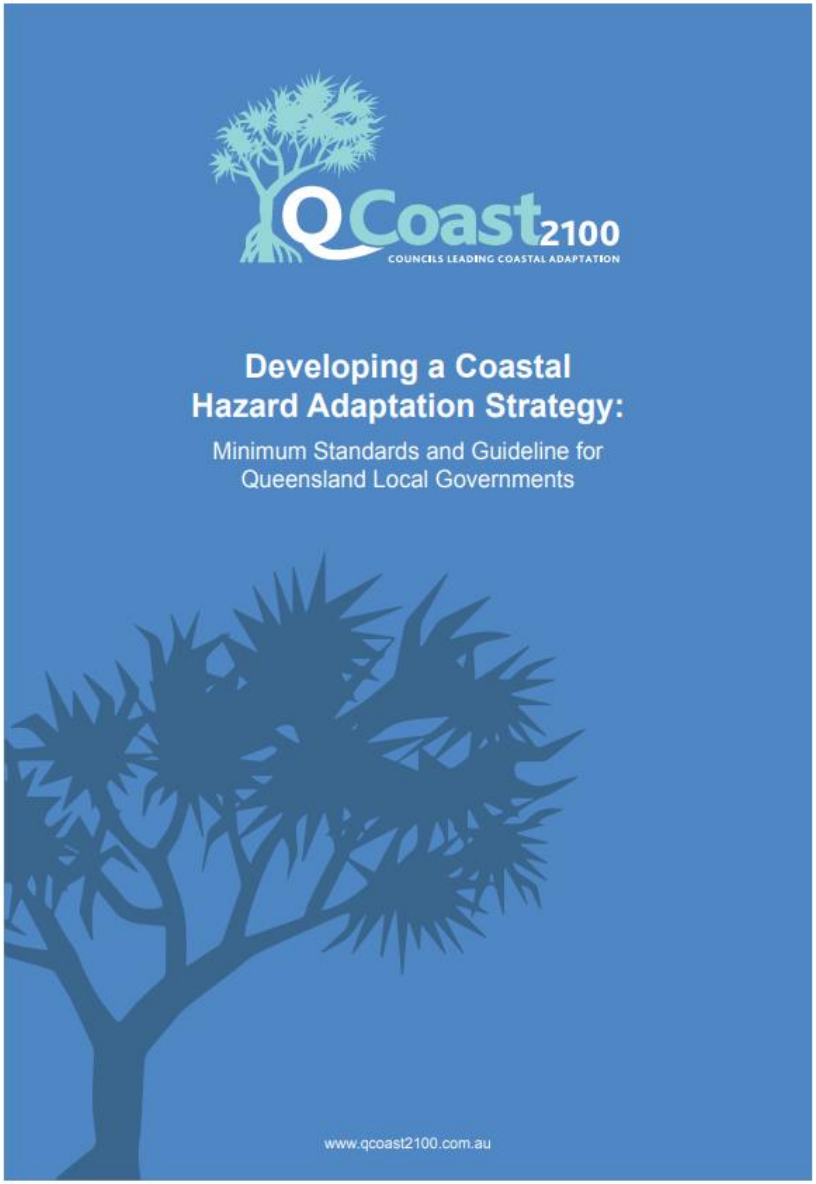
PHASE 5: Risk Assessment

Dr Mark Gibbs[1, 2, 3]

1) QUT
2) Green Cross Australia
3) Coastal Adaptation Solutions


QCoast2100
COUNCILS LEADING COASTAL ADAPTATION
Developing a Coastal Hazard Adaptation Strategy:
Minimum Standards and Guideline for Queensland Local Governments
www.qcoast2100.com.au

Fundamentals

- Many definitions of risk out there
- This causes unnecessary confusion….

Fundamentals

- THE definition of risk

- RISK = LIKELIHOOD × CONSEQUENCE


INTERNATIONAL STANDARD

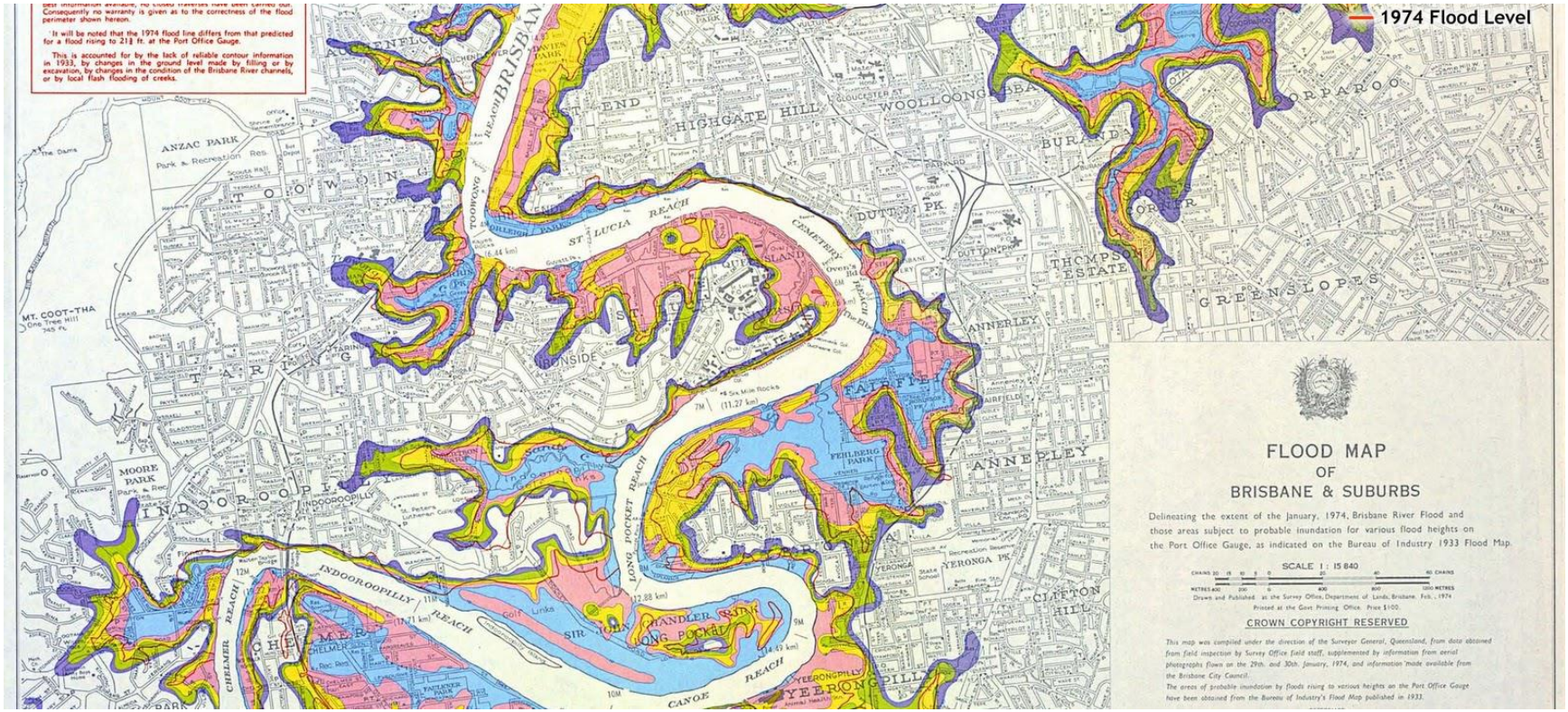
ISO 9001

Fifth edition
2015-09-15

Quality management systems — Requirements

Systèmes de management de la qualité — Exigences

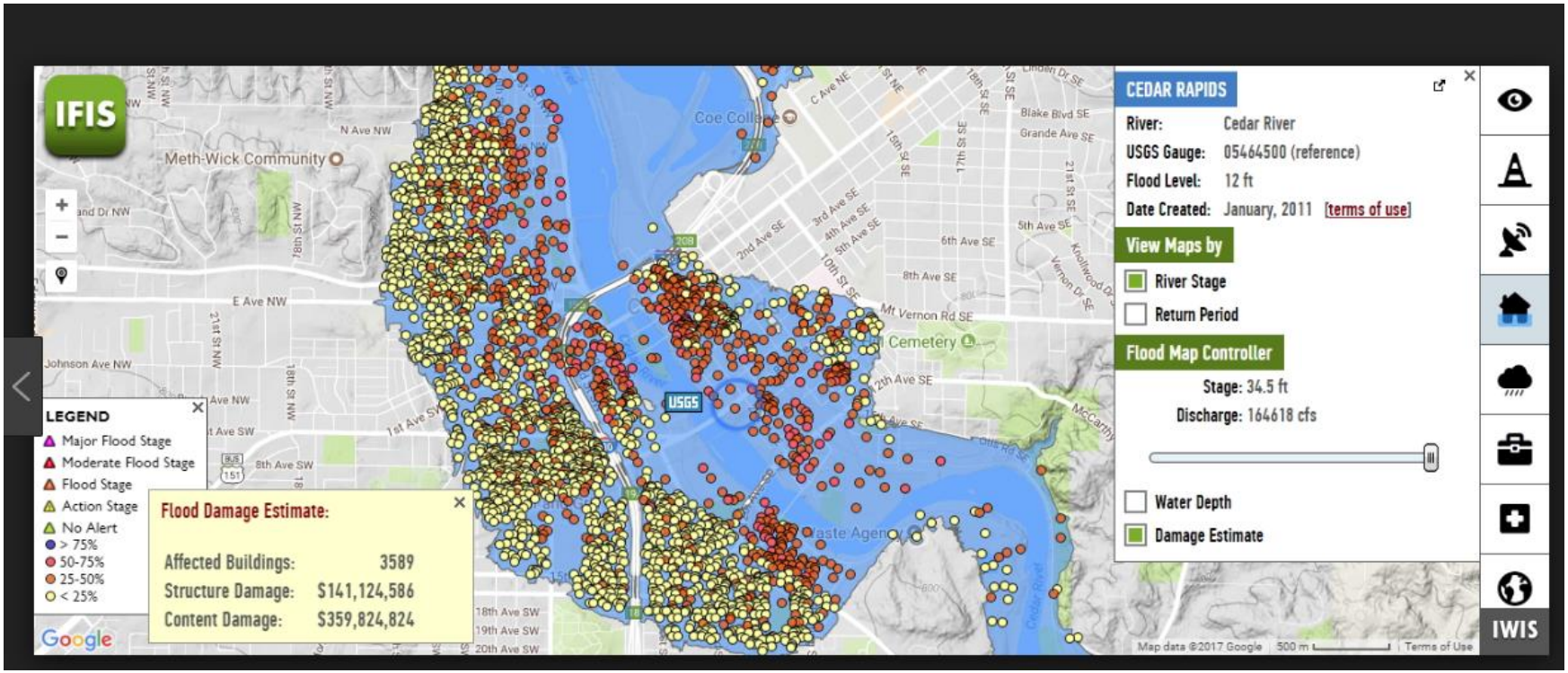
Consequences: Method 1 – Depth of Inundation



Consequences: Method 1 – Depth of Inundation

- In this approach the consequences are measured in terms of how deep particular buildings are inundated

Consequences: Method 2 – Simple Direct Damage Cost



Consequences: Method 2 – Simple Direct Damage Cost

- In this approach the consequences are measured in terms of the cost of repairing damage to the structure and contents

Consequences: Method 3 – Simple Ranked By Asset Price

Consequences: Method 3 – Simple Ranked By Asset Price

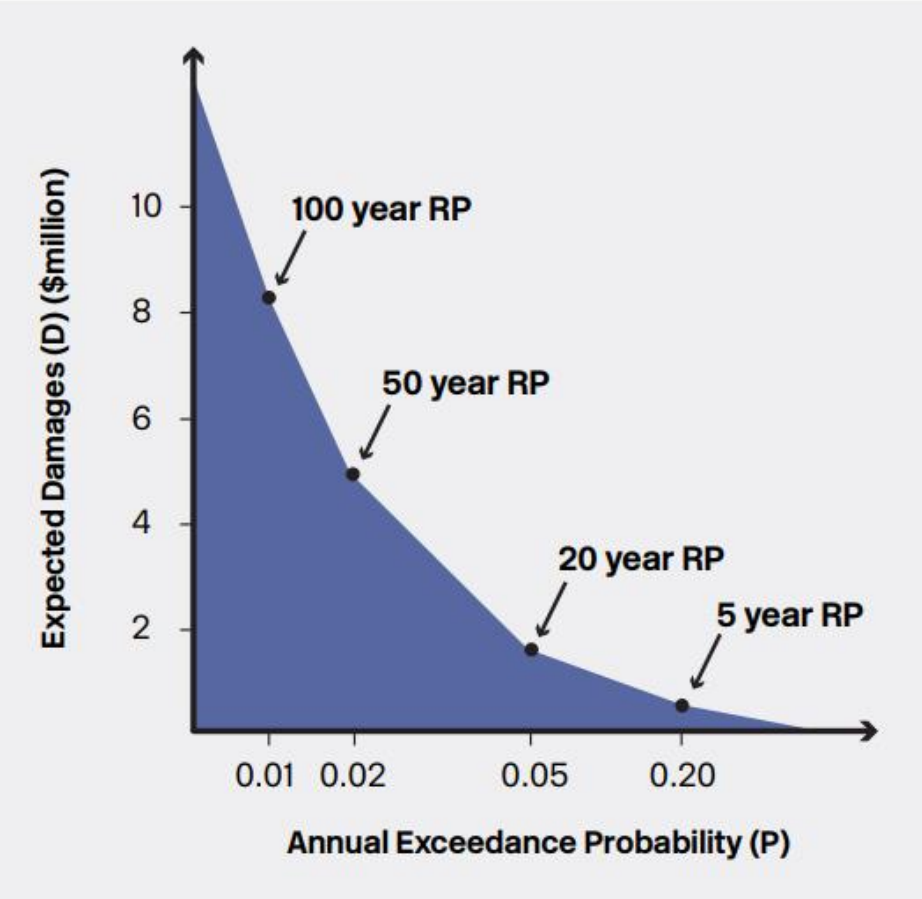
- In this approach the consequences are referenced to the market or replacement price of the asset
- Risk informed prices?

Consequences: Method 4 – Full Costs

Table 2: Overview of damage classes with examples. The table is based on Handmer et al. (2002) and Hammond et al. (2014)

	Direct loss	Indirect loss
Tangible	Structural damage	Disruption to transport
	Cars	Business interruption
	Infrastructure	Temporary housing of evacuees
	Livestock	Loss of industrial production
	Crops	
	Evacuation and rescue operations	
	Clean up costs	
Intangible	Lives and injuries	Stress and anxiety (PTSD)
	Diseases	Disruption of living
	Loss of memorabilia and pets	Loss of community
	Damage to cultural or heritage sites	Reduced land values
	Ecological damage	Undermined trust in public authorities
	Inconvenience	

Consequences: Average Annual Damages



Consequences: Average Annual Damages

In this approach the likelihood is also considered

Scanerio

Does highest risk = highest priority for adaptation?

Consequences: Political Implications

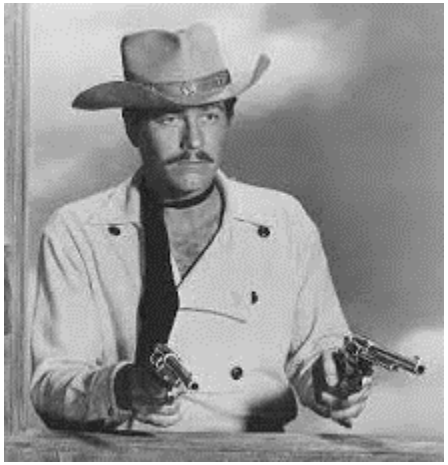
- All of the above approaches consider the buildings/assets and the price/cost/damage to them.

- However, we are not managing buildings, we are managing people

Consequences: Political Implications

Political risk is determined by how impacted parties perceive the threat NOW

We know that many potentially impacted parties perceive the risk of policy change to be greater than the inundation risk.



Consequences: Private vs Public

- Need to manage public assets and private assets differently…

Likelihood

- Risk is inherently forward looking…
- But we use historical information for predictive purposes….

Likelihood

- What is the engineering approach to assessing likelihood?

Likelihood: Scenarios

- 1 in 100 etc.
- ARI, AEP, Return Period….

the likelihood of occurrence of a flood of a given size or larger in any one year; usually as a percentage. For example, if a peak flood discharge of 500 cubic metres per second has an AEP of 5%, it means that there is a 55 risk (i.e. a probability of 0.05 or a likelihood of 1 in 20) of a peak discharge of 500 cubic metres per second or larger occurring in any one year. The AEP of a flood event gives no indication of when a flood of that size will occur next."

Likelihood: Scenarios

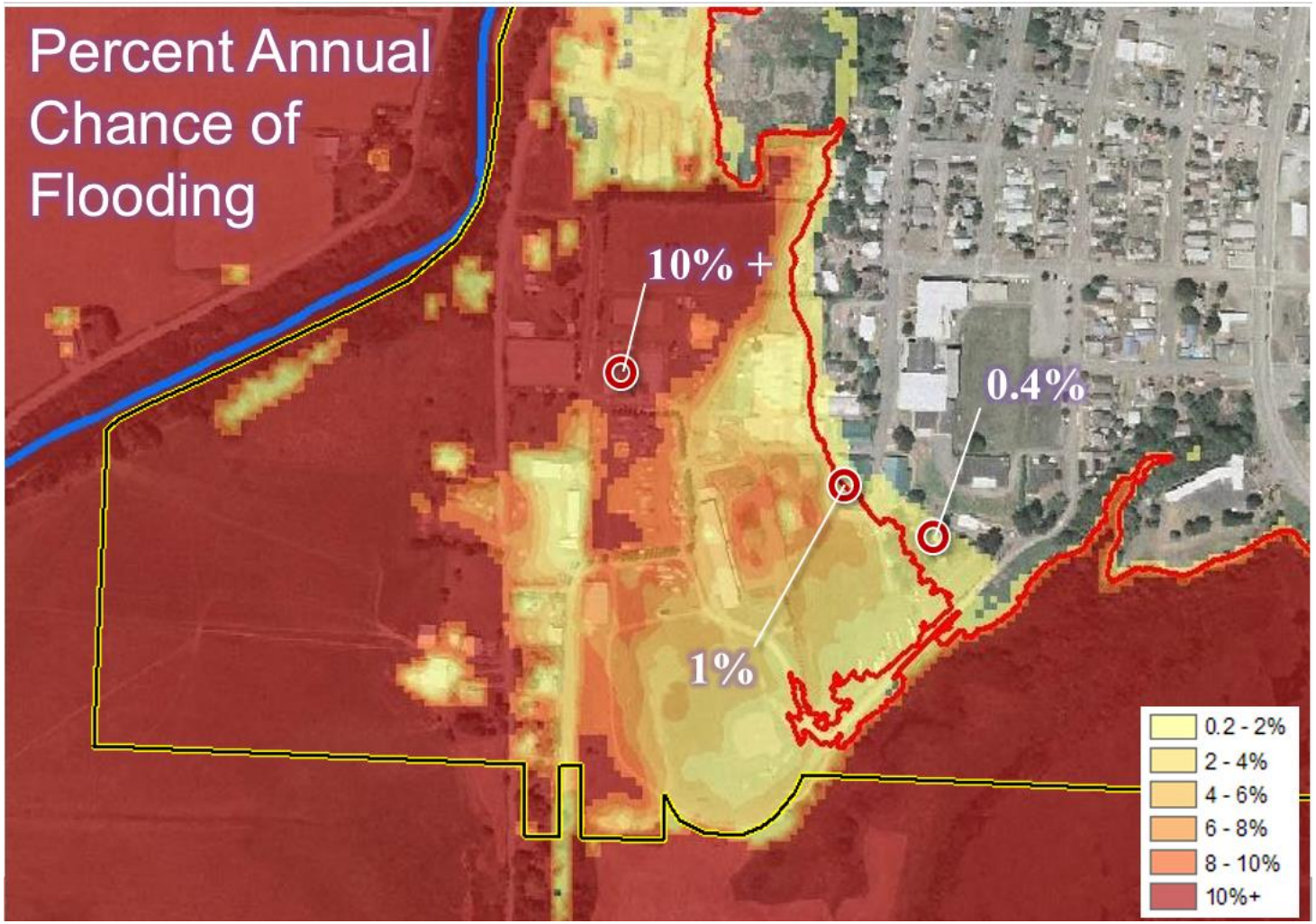
$$AEP = 1 - \exp\left(\frac{-1}{ARI}\right)$$

which results in the following conversion table:

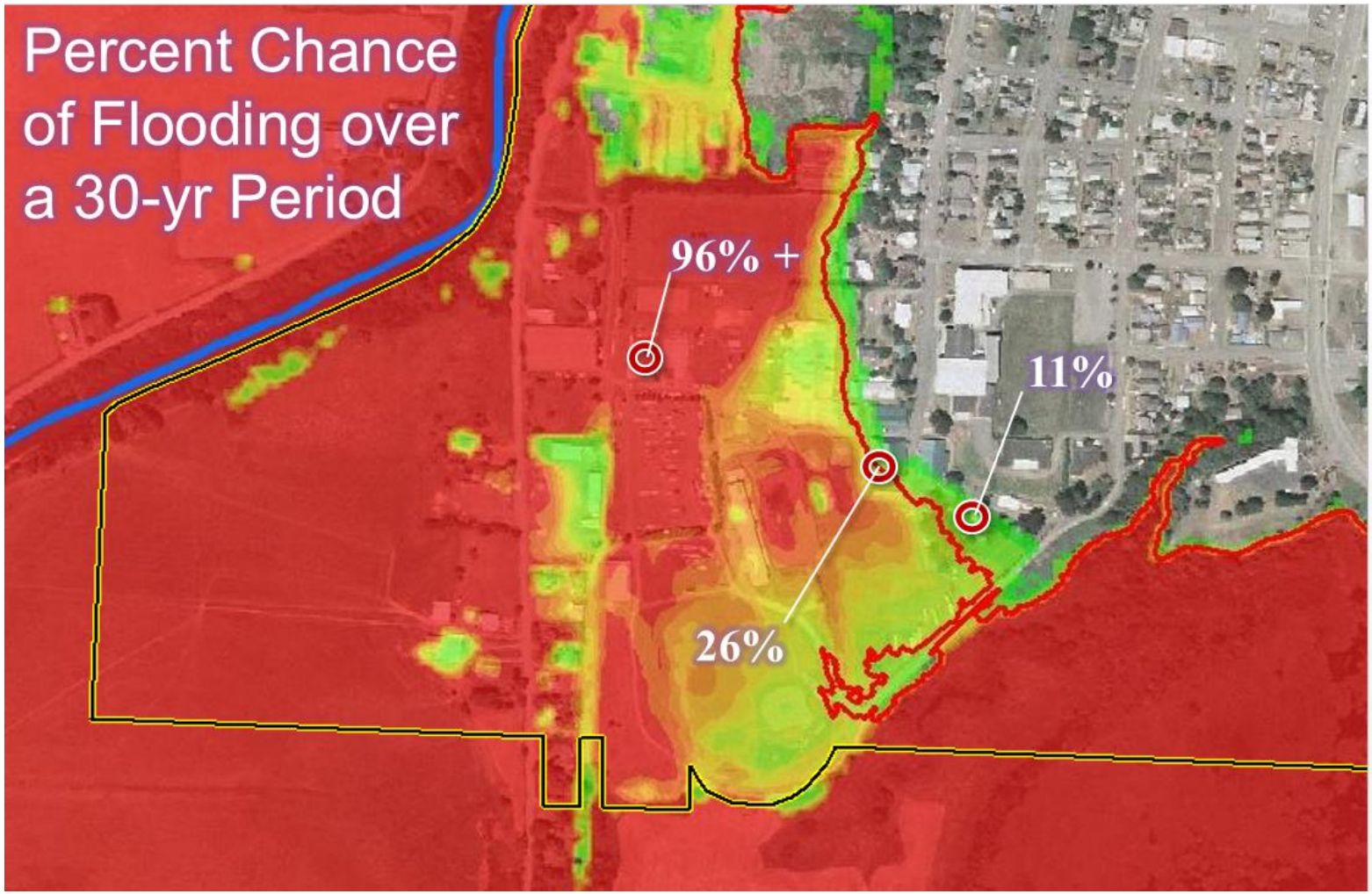
ARI (years)	AEP
1	0.632
2	0.393
5	0.181
10	0.095
20	0.049
50	0.020
100	0.010

ARIs of greater than 10 years are very closely approximated by the reciprocal of the AEP.

Likelihood: Scenarios



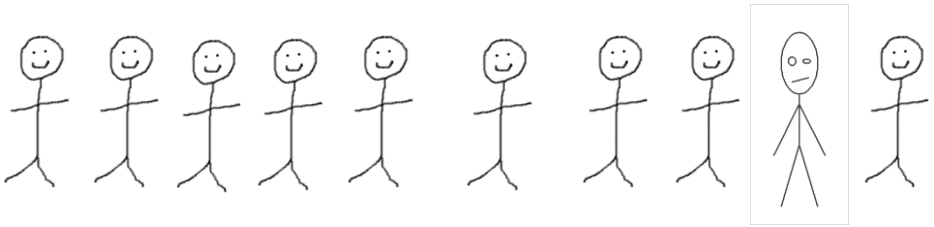
Likelihood: Scenarios



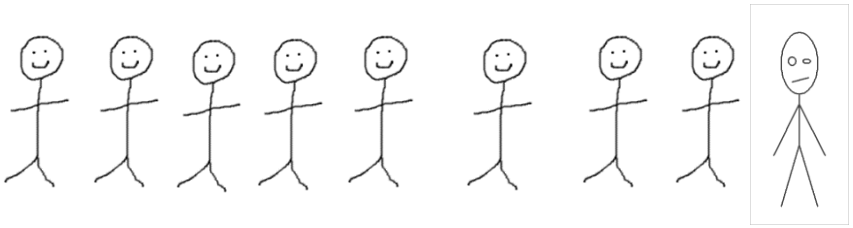
Likelihood: Challenges

- Flood Frequency Analyses based on historical data) often short time series).
- Uncertainty in future climate regimes
- General lack of understanding on probability…

Likelihood: Perspectives- Ensemble



Likelihood: Perspectives- Temporal



Year 1

Year ?

Key Messages

- Understand the methods being applied
- Foresee the response
- Be clear on the roles of local/State Government.