

# 3 Waters Resilience Guideline and Opportunity to improve

Presenter:

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# Outline

- Background
- What is Infrastructure Resilience?
- Underlying Philosophy for Improving 3 Waters Resilience
- Key Factors for 3 Waters Resilience Assessment
- Benefits of Resilience Assessment in Asset Management





# Background

## Canterbury Earthquake Sequence 2010-2011



# Consequences

- Loss or reduced level of service over extended periods
- Social disruption
- Damage to sanitation and water supply elevates risk of outbreak of disease
- Capacity for firefighting compromised
- Elevated long term operational costs (reduced residual asset life, Inflow & Infiltration)
- Capital costs for repair and timeframe to complete





# What is Infrastructure Resilience?

*“Infrastructure resilience is the ability to reduce the magnitude and/or duration of disruptive events.”*

US National Infrastructure Advisory

## **Focus:**

Performance

Vulnerability

Functionality

Adaptability

Consequence

Cost

# Three Waters Resilience Guideline

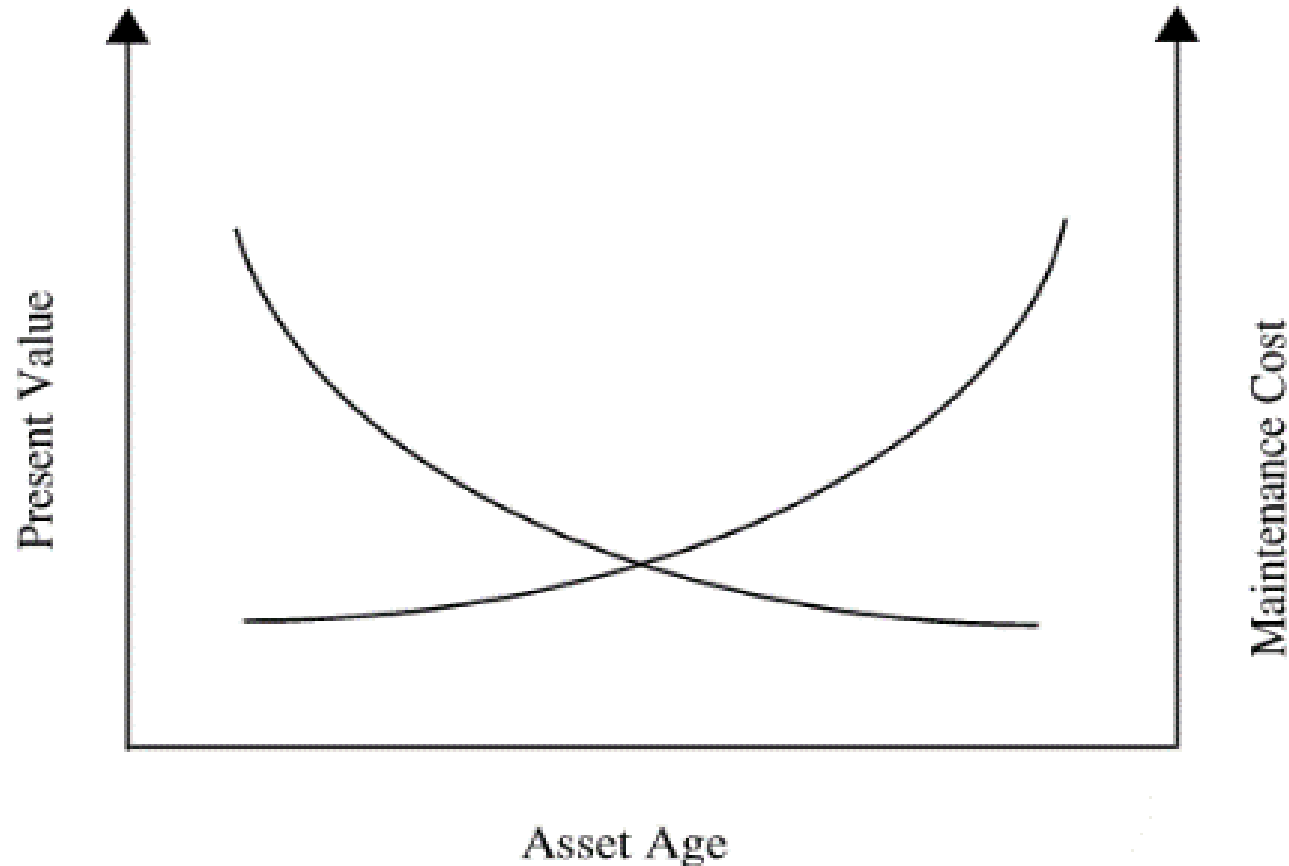
- Evidence Based Investment Decision Making process for the Three Waters Pipe Network Programme.



- Theme of “system resilience” identified as key area for programme
- Purpose to promote wider understanding of the susceptibility of Three Waters Networks.
- Beca commissioned to draft the **Three Waters Resilience Guideline** for this work

# Underlying Philosophy for Improving 3 Waters Resilience (1)

- Maximising the value of existing assets



# Underlying Philosophy for Improving 3 Waters Resilience (2)

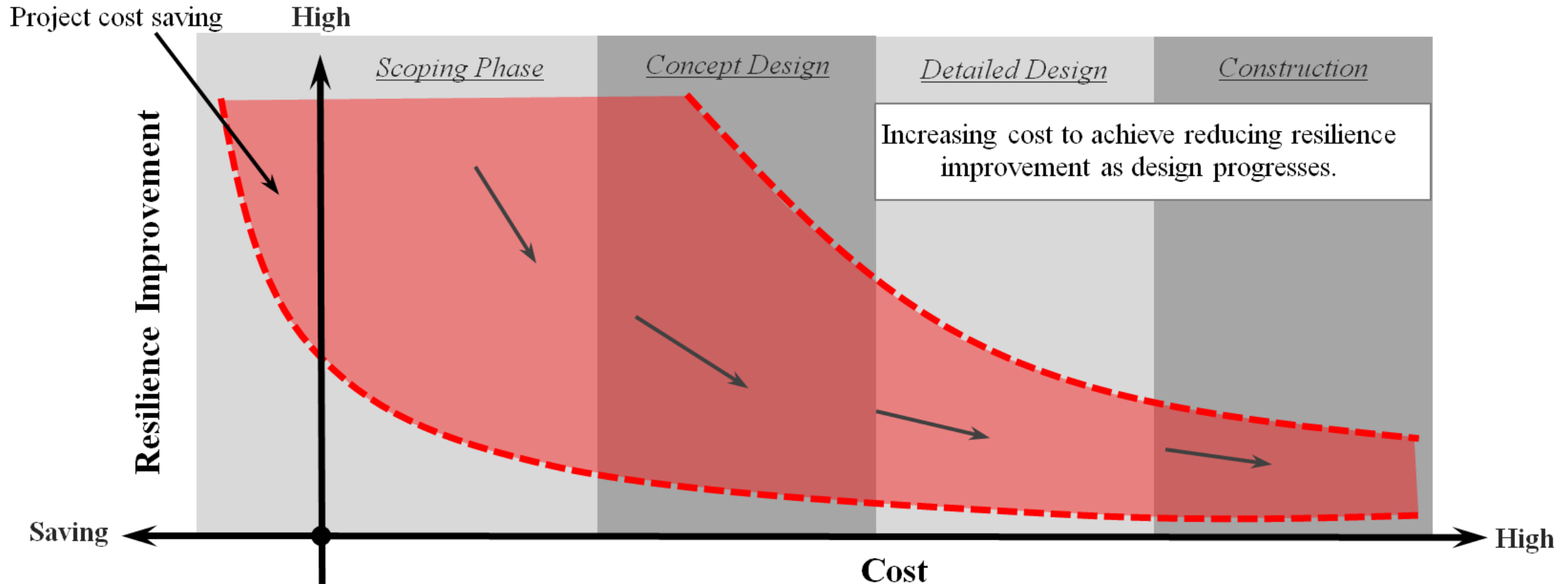


Assessment by both engineering judgement and analysis.



# Underlying Philosophy for Improving 3 Waters Resilience (3)

## Integrating System Resilience at the Early Stage

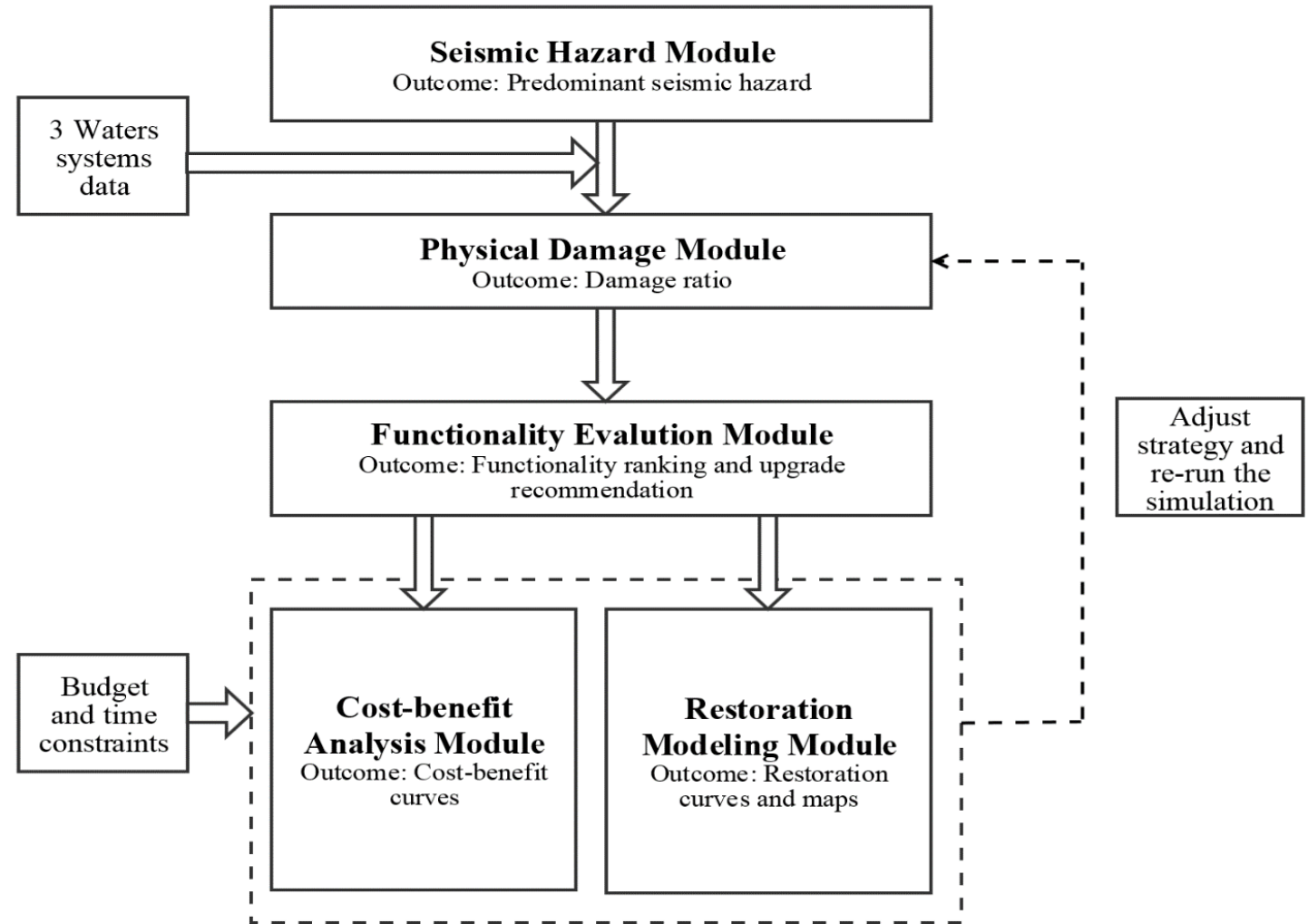


- Biggest steps in resilience for small cost early in project cycle – design philosophy.
- Early consideration of resilience can facilitate cost saving through optimisation.
- Detailed design and construction phases – small potential steps in resilience improvement for high cost.

# Underlying Philosophy for Improving 3 Waters Resilience (4)

- Applying Different Levels of Sophistication for Assessment

- Simplified assessment
- Intermediate assessment
- Advanced assessment



# Key Considerations for 3 Waters Resilience Assessment (1)

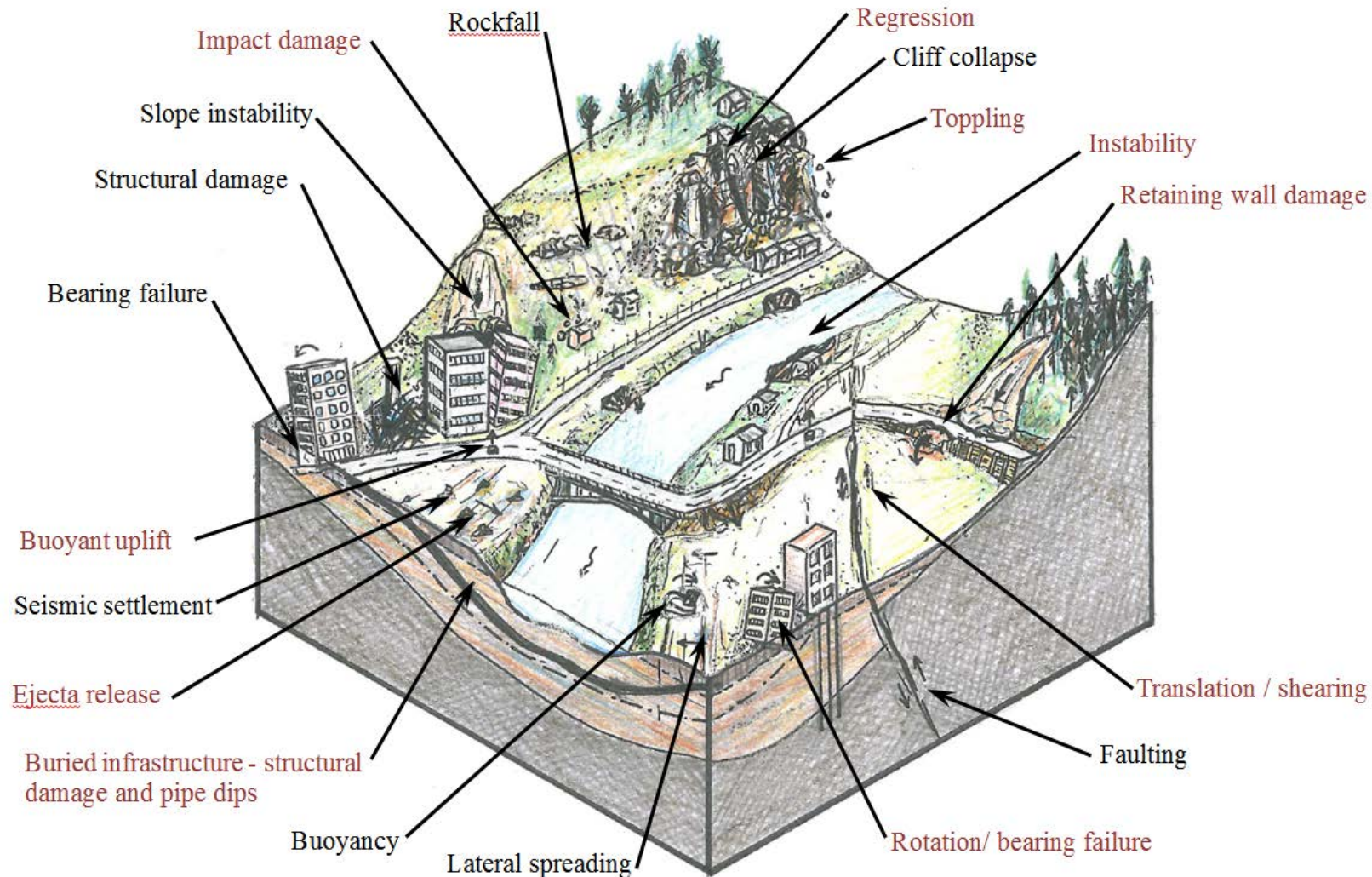
- Data documentation and management
  - Material
  - Diameter
  - Depth
  - Installation date
  - Failure mechanism
  - Restoration operation
  - Etc...





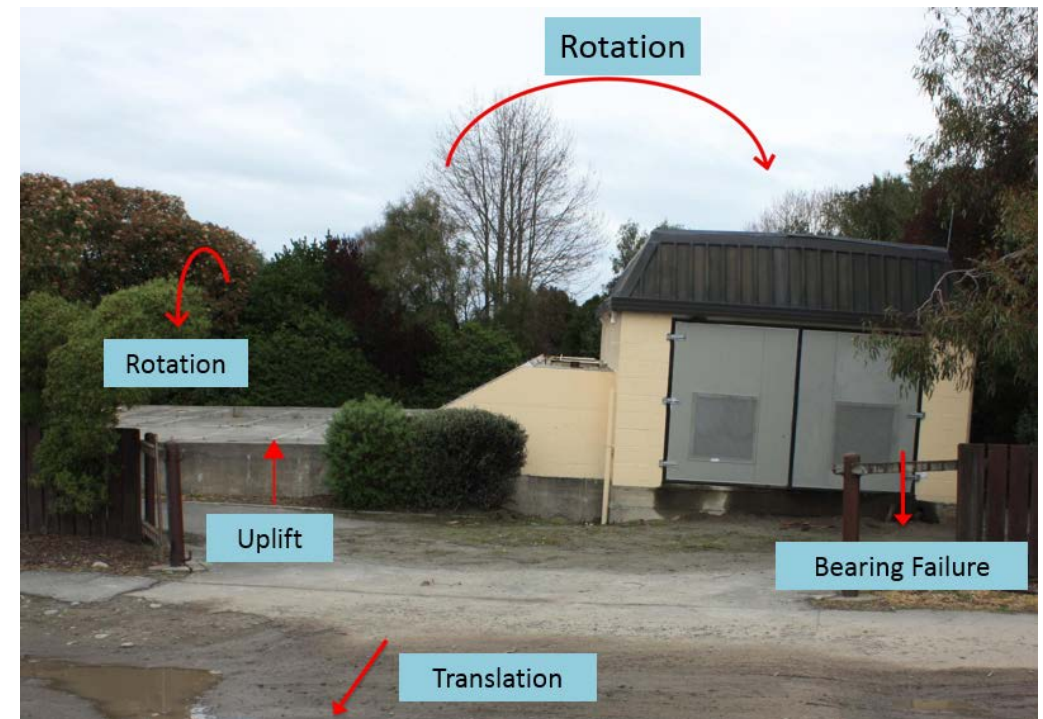
# Key Considerations for 3 Waters Resilience Assessment (2)

- Understanding of Ground Condition or Geotechnical hazards



# Key Considerations for 3 Waters Resilience Assessment (3)

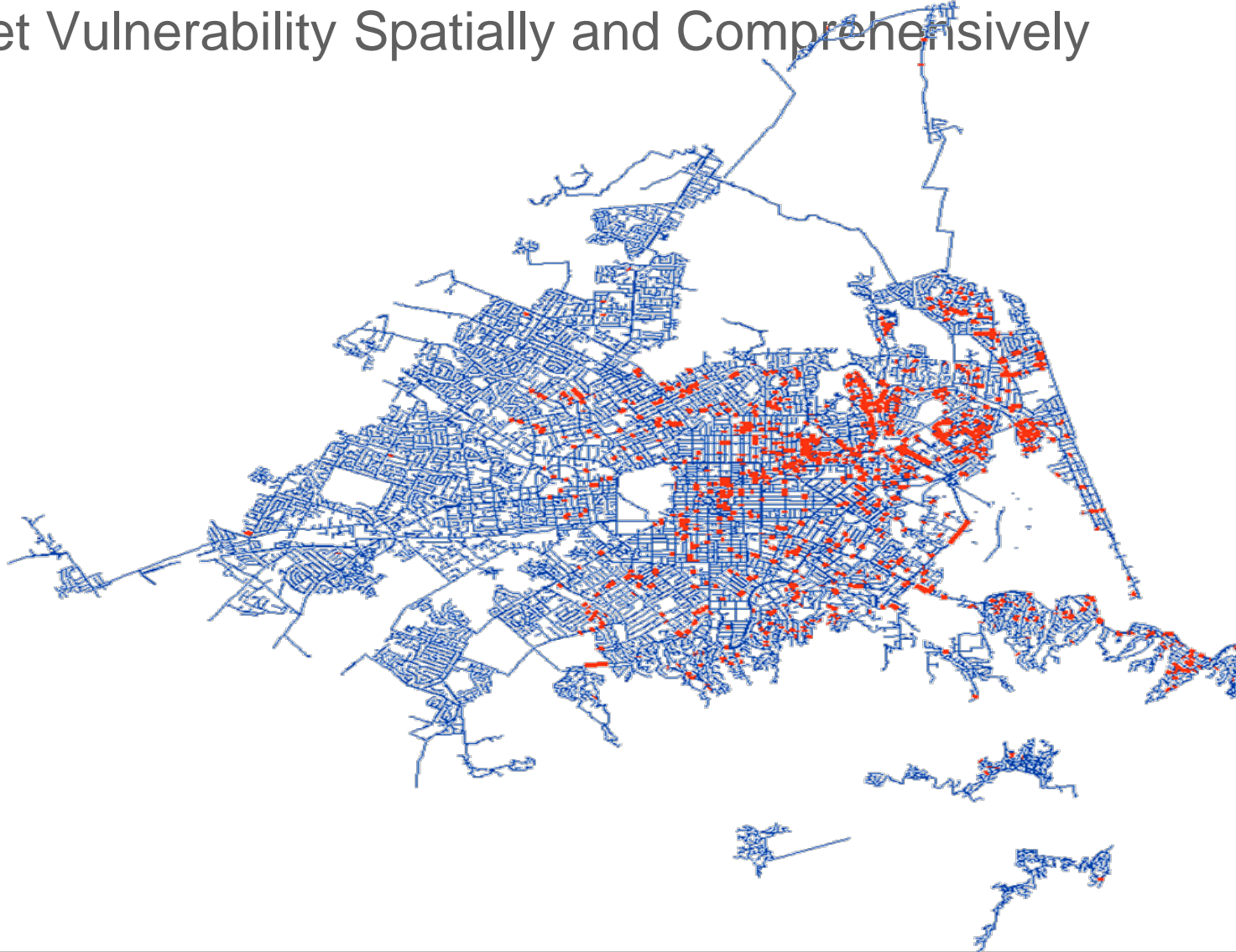
- Understanding of Pipe Material and Failure Mechanism
- Damage to critical elements (reservoirs, pump stations, treatment plants, wells etc)
- Structures:
  - damage to connecting infrastructure
  - structural failure
  - differential settlement /rotation
  - buoyant uplift
- Pipes:
  - structural failure
  - pull out
  - pipe dips
  - blockage
- Loss of critical supporting infrastructure (e.g., electricity)





# Key Considerations for 3 Waters Resilience Assessment (4)

- Identifying Asset Vulnerability Spatially and Comprehensively

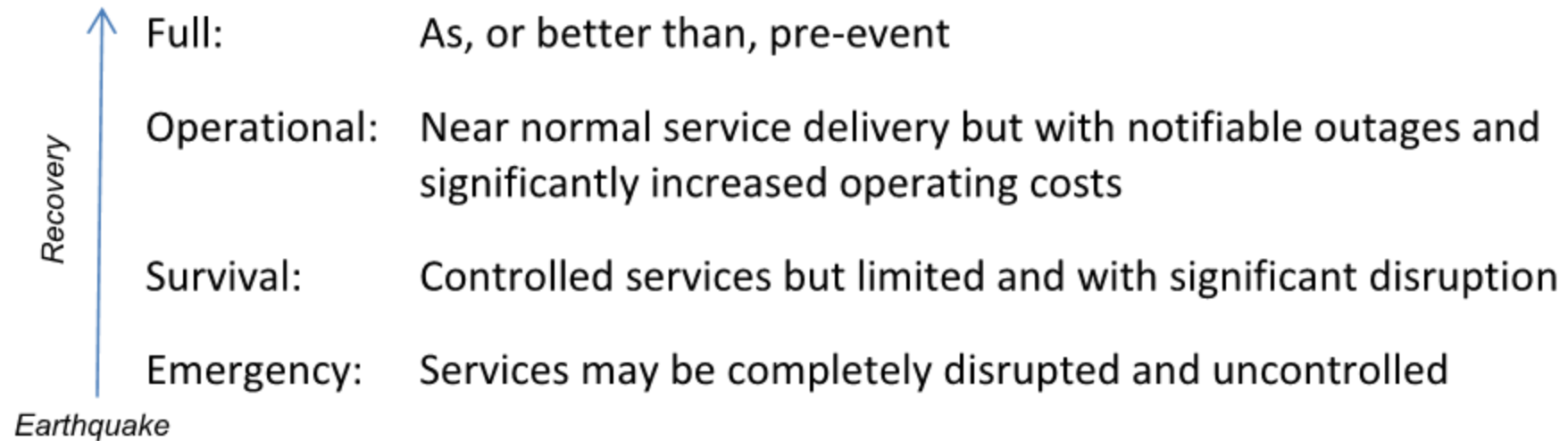




# Key Considerations for 3 Waters Resilience Assessment (5)

- Identification of Acceptable Level of Service

Four operating stages have been defined in regards to the road to recovery. These are:



# Key Considerations for 3 Waters Resilience Assessment (6)

- Recoverability
- Time
- Resource
- Funding
- Etc...



# Benefits of Resilience Assessment in Asset Management

- Assess compliance with local government legal obligations to provide post disaster functionality
- Inform asset management strategies
- Support economic business case for asset renewals
- Inform selection of system type/ materials
- Demonstrate resilience improvement and cost benefit with time to ratepayers
- Focus earthquake response and estimate scale of damage/ cost
- Social responsibility



- Questions ?



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