



# Integrated Flood Risk Management

WaSH and Water Futures Conference

17 February 2023

**William Prentice, Water Technology**  
Principal Engineer – Planning, Resilience and Expert Services  
National Practice Lead – Resilience and Adaptation  
[william.prentice@watertech.com.au](mailto:william.prentice@watertech.com.au)



# Purpose

- Introduction
- Context
- Integrated flood risk management
- Application of integrated FRM

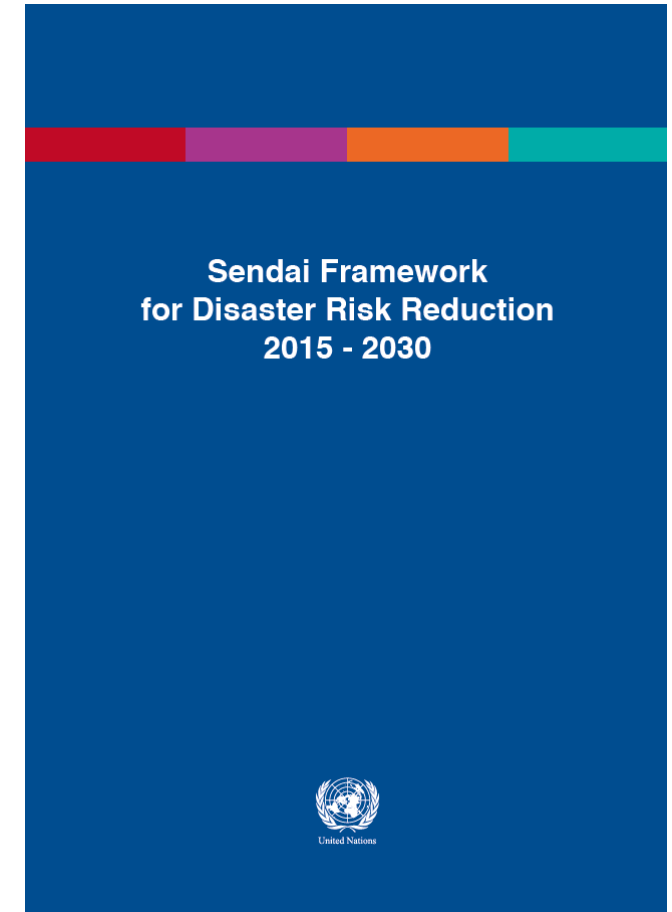
# Sendai Framework for Disaster Risk Reduction

- Vision:

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

- Goal:

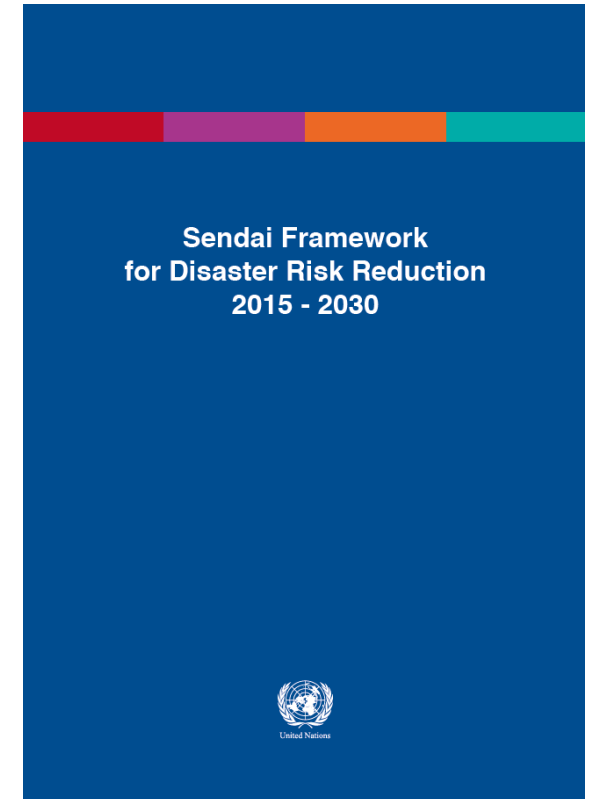
**Prevent new and reduce existing disaster risk** through the implementation of **integrated** and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that **prevent** and **reduce hazard exposure** and **vulnerability** to disaster, **increase preparedness** for response and recovery, and thus strengthen resilience.



# Sendai Framework for Disaster Risk Reduction

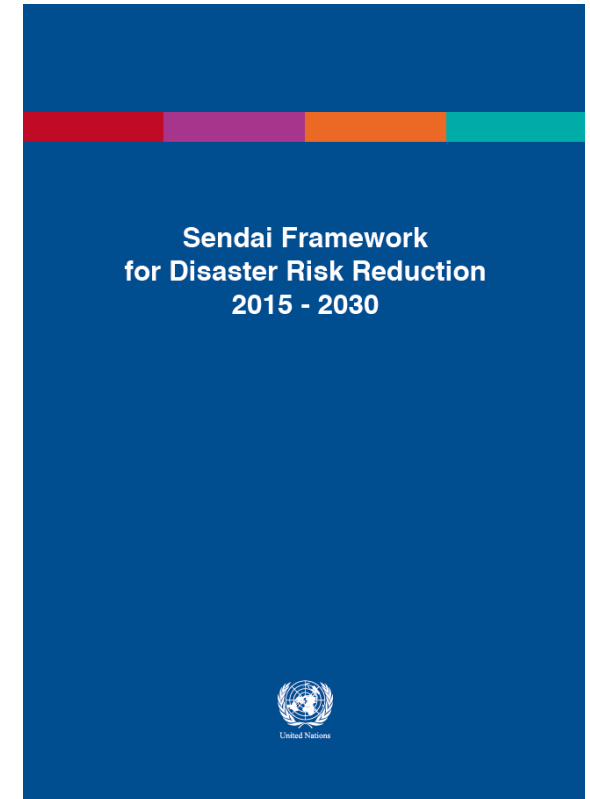
- Targets (by 2030):

1. Substantially reduce global disaster mortality.
2. Substantially reduce the number of affected people globally.
3. Reduce direct disaster economic loss.
4. Substantially reduce disaster damage to critical infrastructure and disruption of basic services.
5. Substantially increase the number of countries with national and local disaster risk reduction strategies.
6. Substantially enhance international cooperation to developing countries to implement the present Framework.
7. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments.



# Sendai Framework for Disaster Risk Reduction

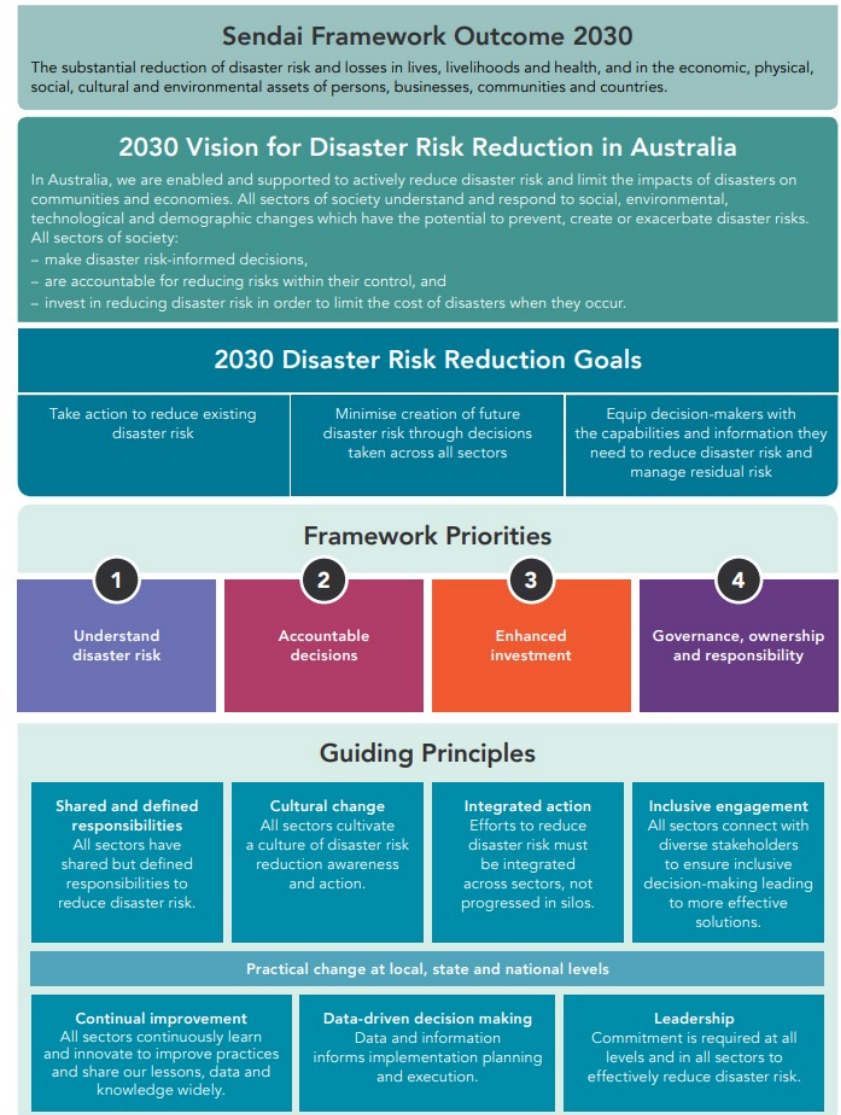
- Priorities for action
  - **Priority 1: Understanding** disaster risk.
  - **Priority 2:** Strengthening disaster risk **governance** to manage disaster risk.
  - **Priority 3: Investing** in disaster risk reduction for resilience.
  - **Priority 4:** Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.



# Context - Disaster Risk Reduction in Australia

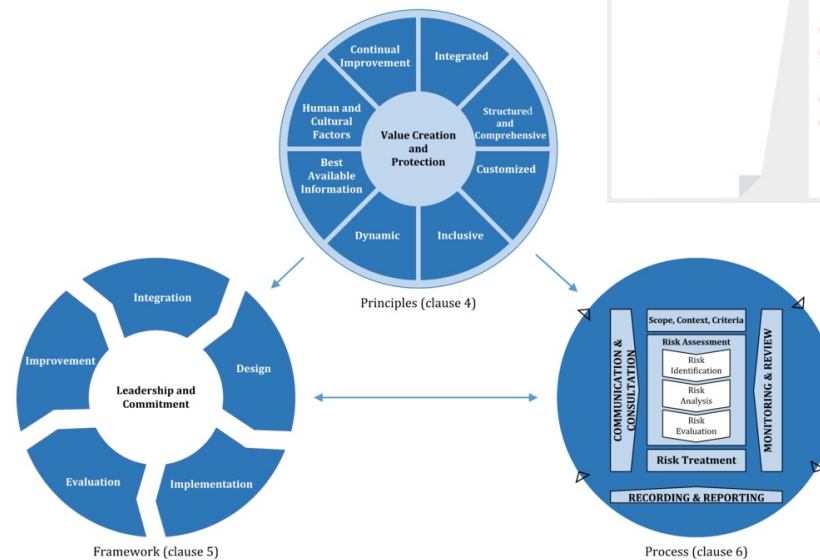
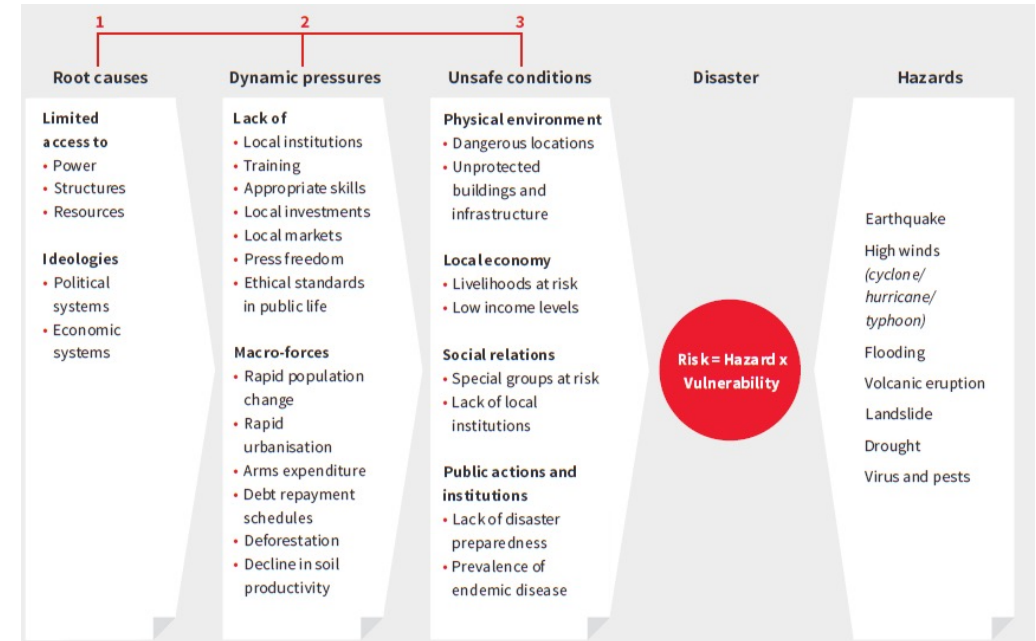
- National Priority 1 *Understand disaster risk*

- To be reduced, all components of disaster risk and impacts must be understood by all sectors: vulnerability, capacity, exposure of persons and assets, hazard characteristics, and the environment.
- Priority strategies for action:
  - A. Improve public awareness of, and engagement on, disaster risks and impacts.
  - B. Identify and address data, information and resource gaps
  - C. Address technical barriers to data and information sharing and availability
  - D. Integrate plausible future scenarios into planning
  - E. Develop cohesive disaster risk information access and communication capabilities to deliver actionable disaster risk data and information
  - F. Support long-term and solution-driven research, innovation and knowledge practices, and disaster risk education
  - G. Improve disclosure of disaster risk to all stakeholders



# Context - Risk Management

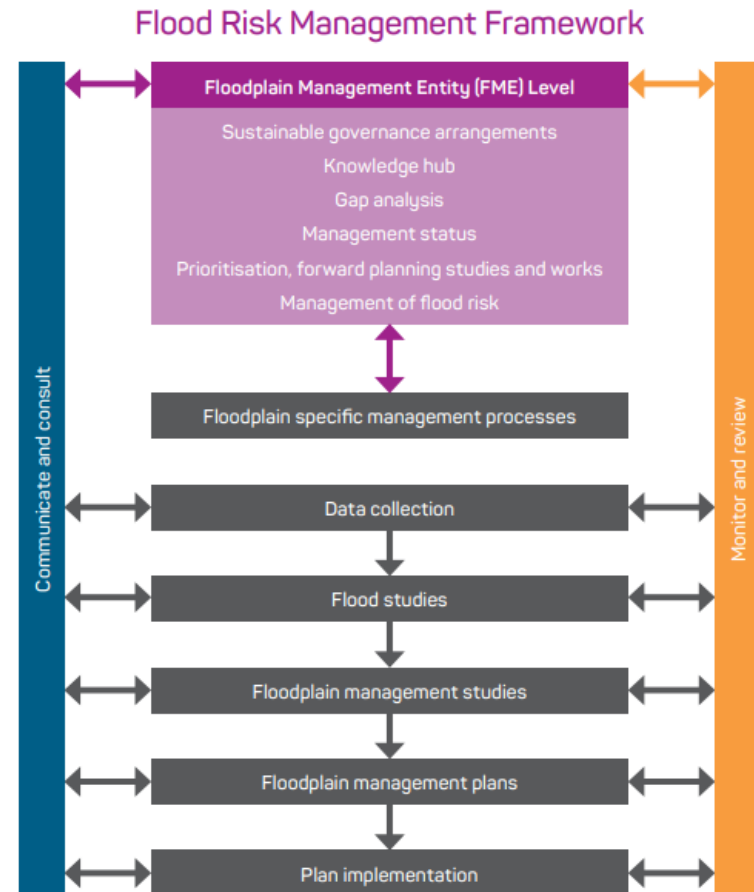
- Hazard specific risk reduction involves understanding:
  - Exposure
  - Likelihood
  - Vulnerability
- Risk-based standards:
  - Framework
  - Principles
  - Process





# Integrated flood risk management

- Best practice flood risk management:
  - Data collection
  - Flood study
  - Flood risk management study
  - Flood risk management plan
  - Plan Implementation





# Integrated flood risk management

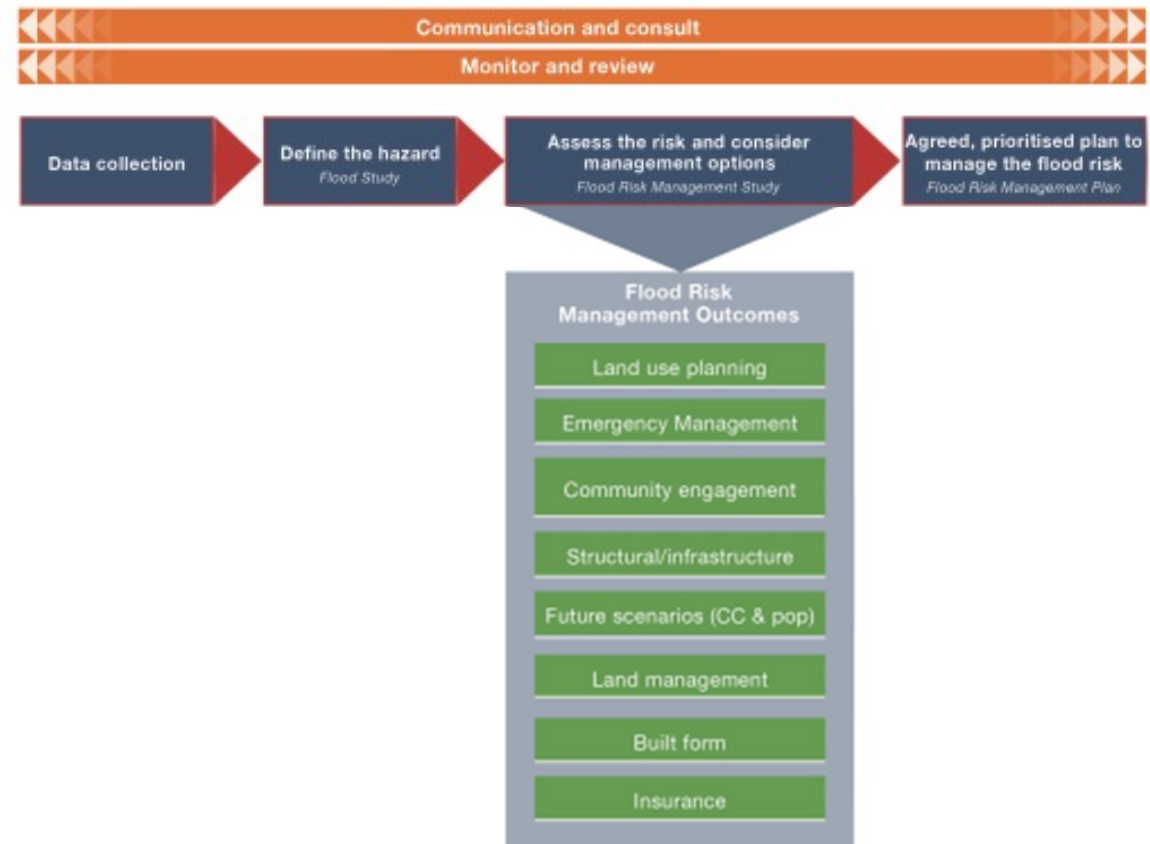
- The Queensland Flood Risk Management Framework
  - Data collection
  - Flood study
  - Flood risk management study
  - Flood risk management plan
  - Plan Implementation



# Integrated flood risk management

- The Queensland Flood Risk Management Framework

- Data collection
- Flood study
- Flood risk management study
- Flood risk management plan
- Plan Implementation



# Integrated flood risk management

- The Queensland Flood Risk Management Framework

- Data collection
- Flood study
- Flood risk management study
- Flood risk management plan
- Plan Implementation





# Application of integrated FRM



## Collect Data:

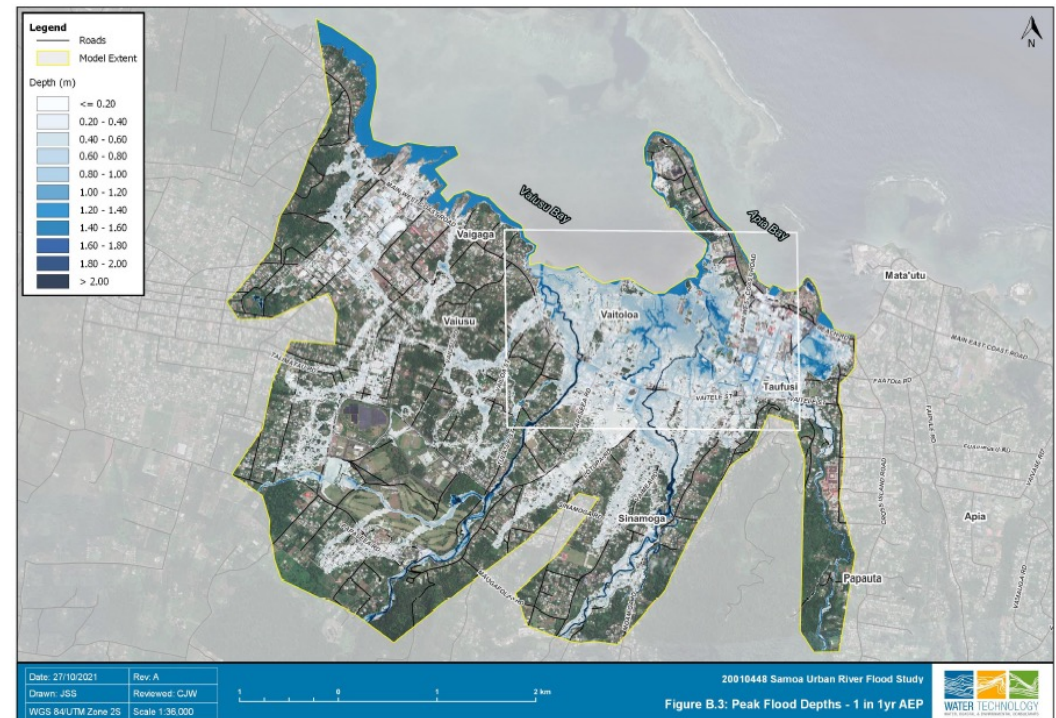
- Ground level information
- Vegetation and land use
- Roads and infrastructure
- Homes/business locations
- Rainfall and river height data

# Application of integrated FRM



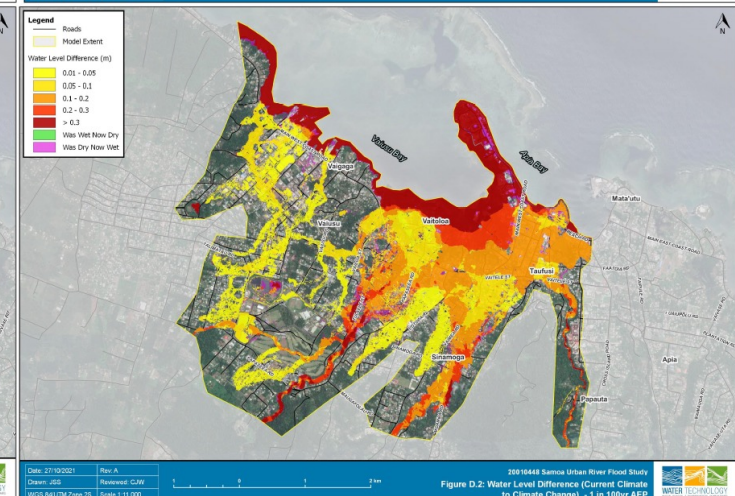
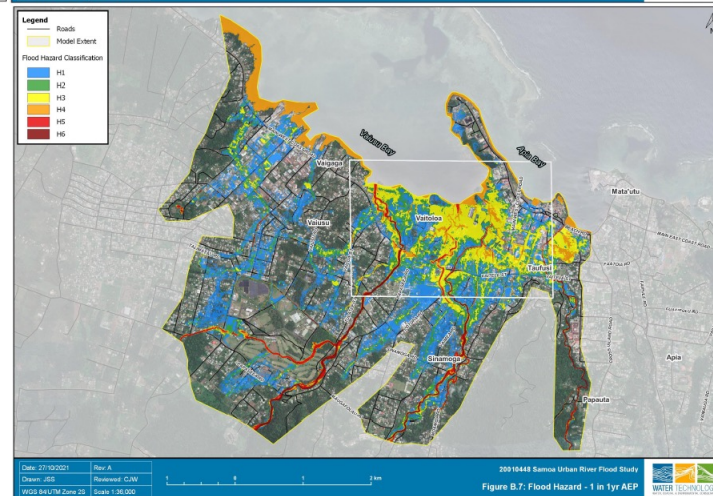
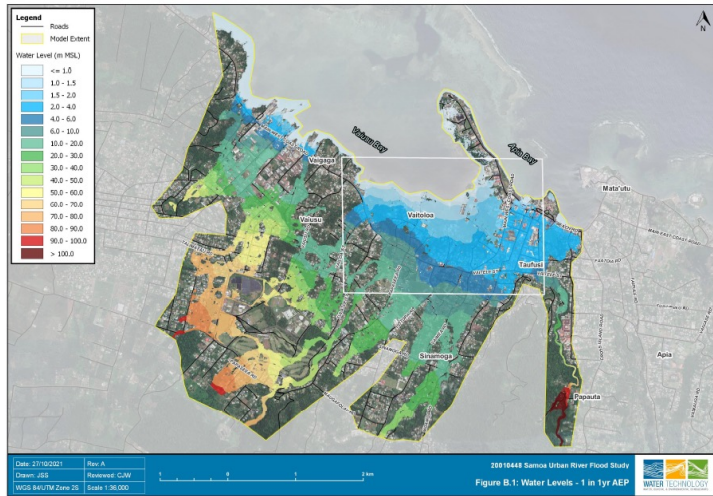
## Define the hazard:

- Flood hazard mapping:
  - Flood level
  - Depth
  - Velocity
  - Hydraulic hazard
  - Time to inundation
  - Duration of inundation





# Application of integrated FRM





# Application of integrated FRM

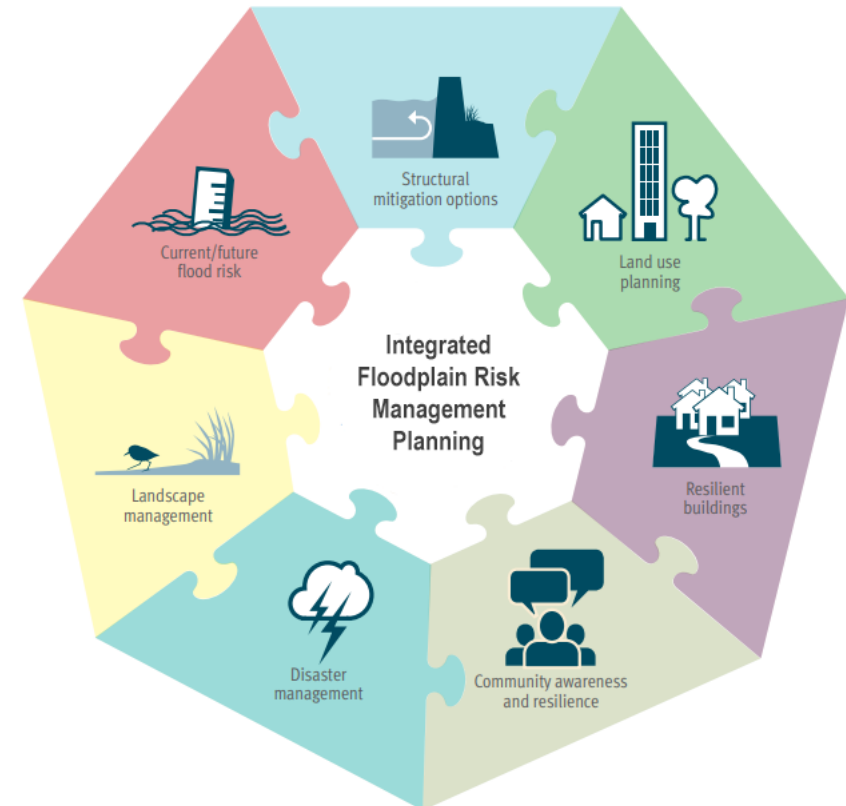


## Assess the risk:

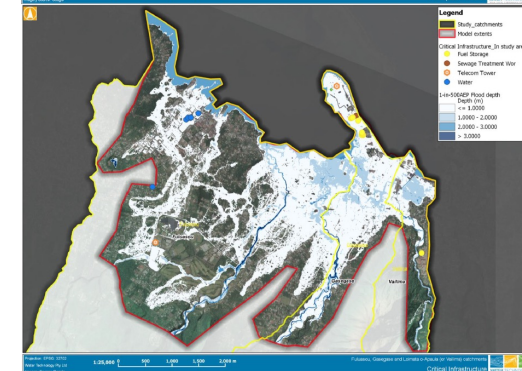
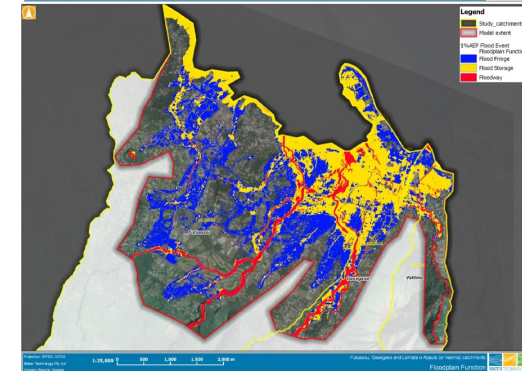
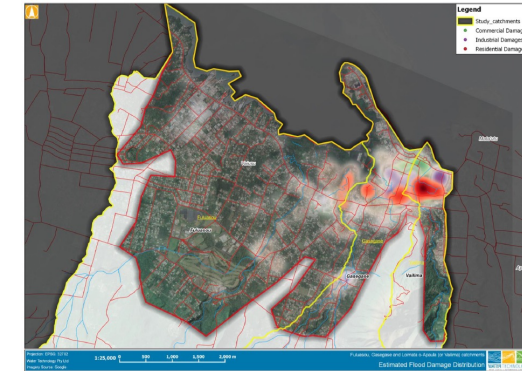
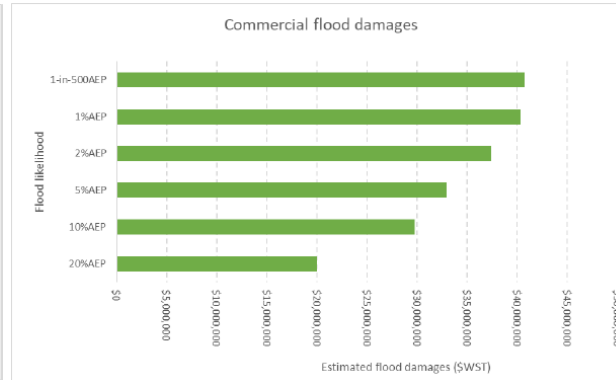
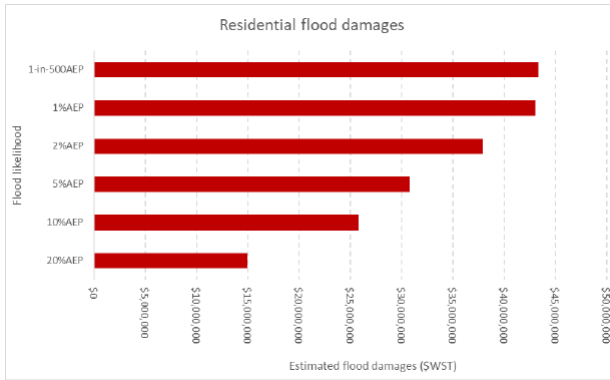
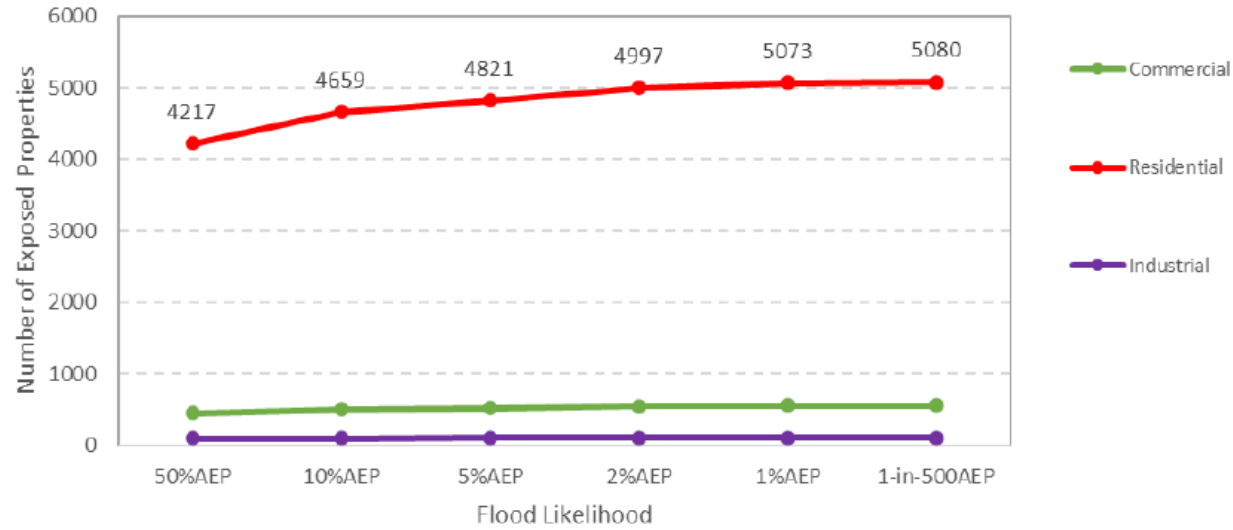
- Risk to people
- Risk to property
- Risk to infrastructure
- Risk to the environment

## Identify the options:

- Long list
- Short list

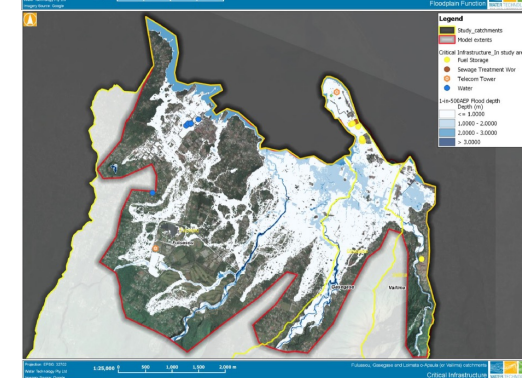
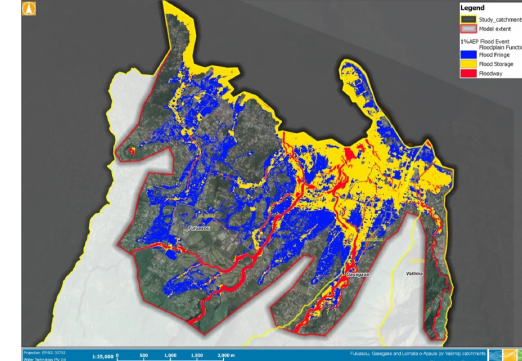
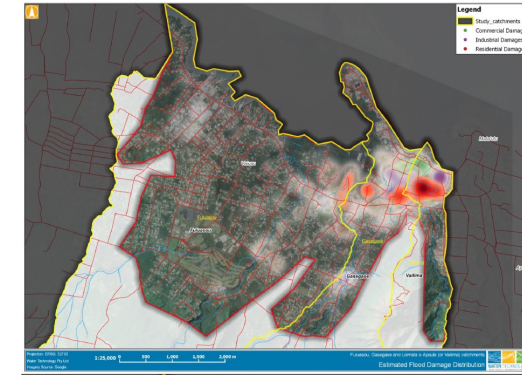
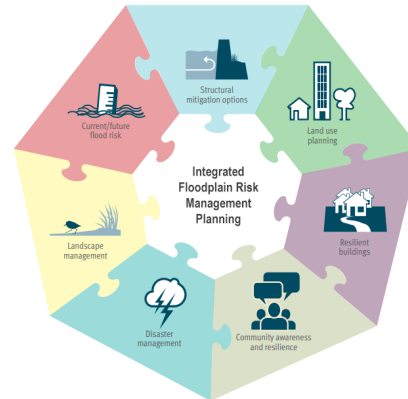
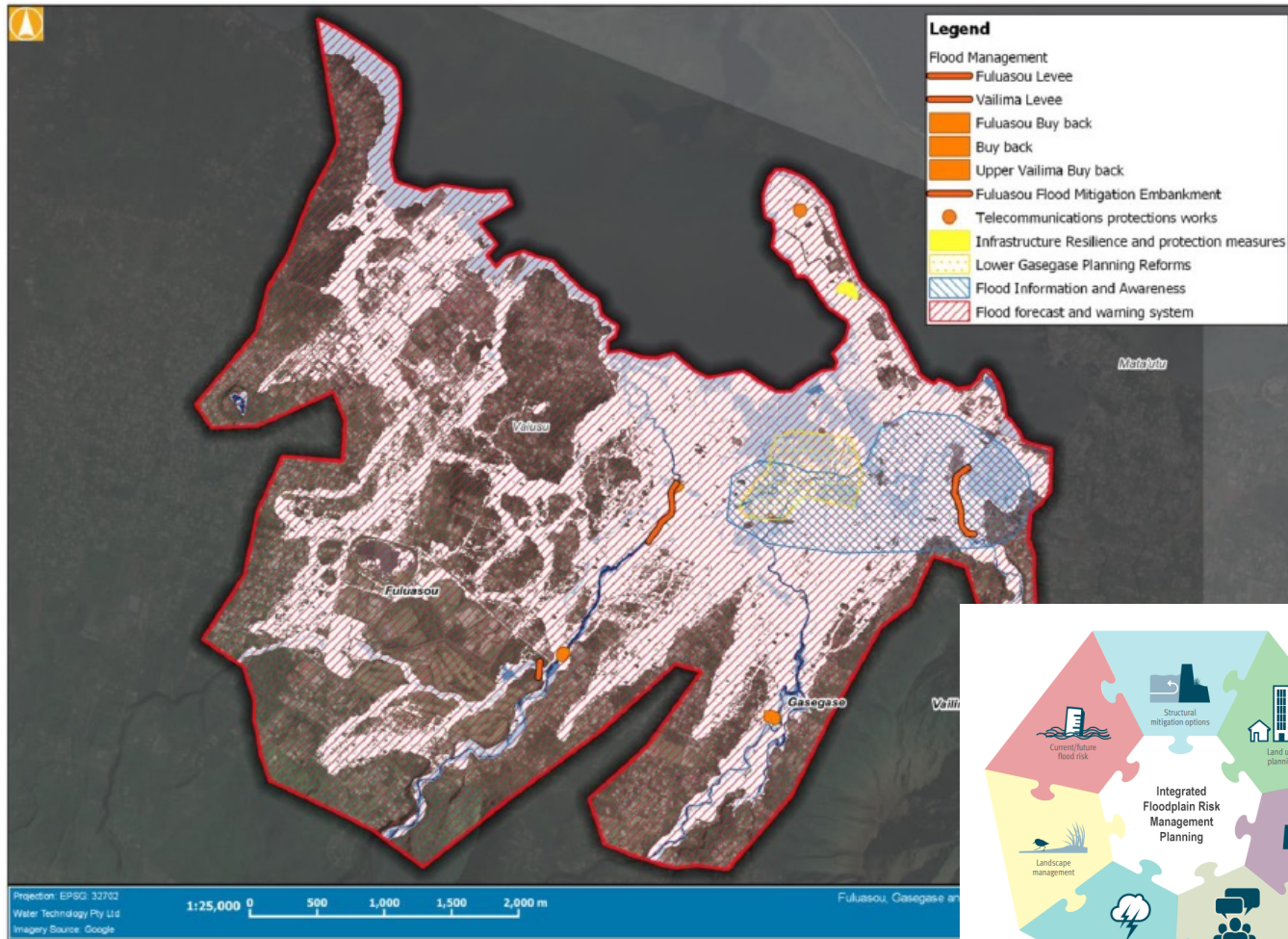


# Application of integrated FRM



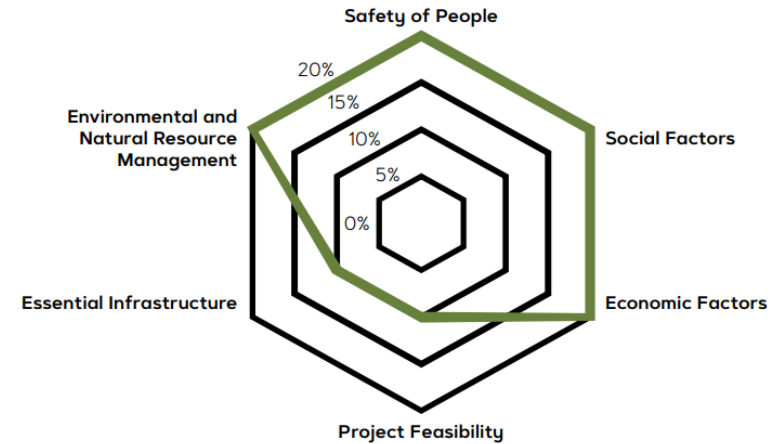
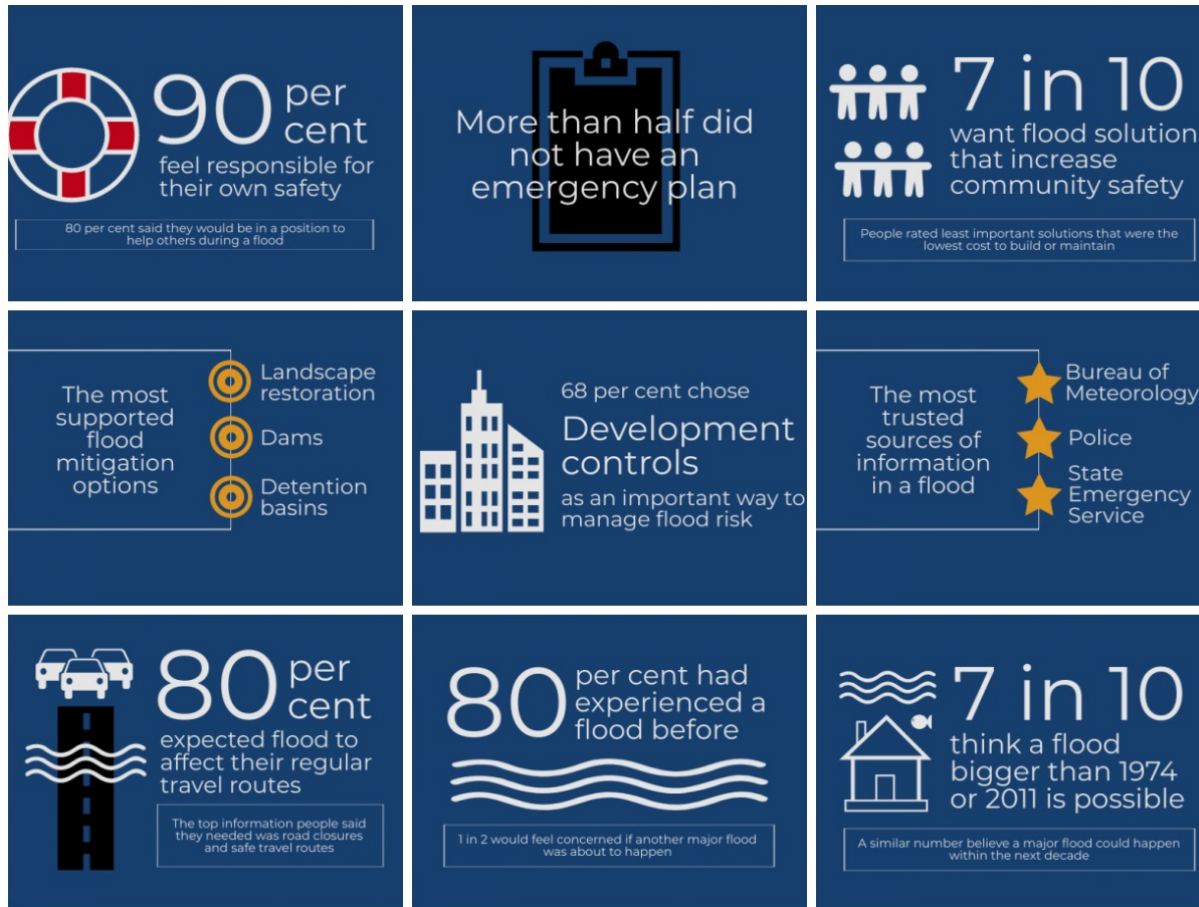


# Application of integrated FRM





# Prioritisation of integrated FRM

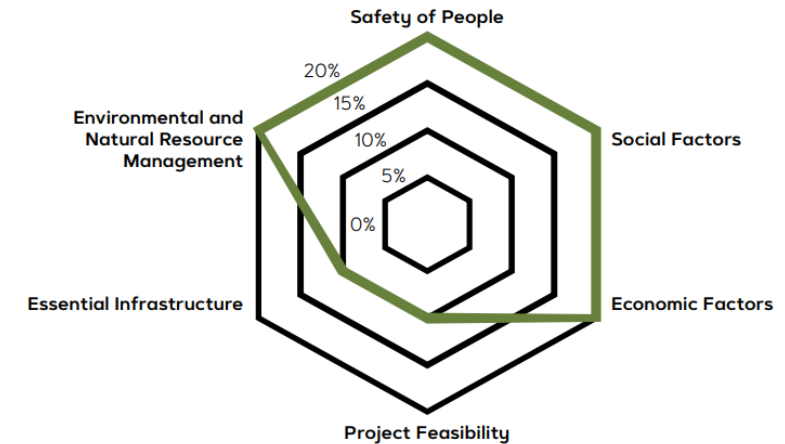


Likelihood of consequence	AEP range (%)	Level of consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likely	>10	Environment	People Public admin Social setting Economy			
Unlikely	1 to 10	Environment	People Public admin Social setting Economy	People Public admin Social setting Economy		
Rare to very rare	0.01 to 1	Environment	Public admin	People Public admin Social setting Economy		
Extremely rare	<0.01	Environment	Public admin	People Public admin Social setting Economy		

Risk: Very low (Blue), Low (Green), Medium (Yellow), High (Orange), Extreme (Red)  
AEP = annual exceedance probability

# Prioritisation of integrated FRM

ID	Risk Description	Identified Measure	Benefits Score	Rank
11	Fulusou, Gasegase and Vailima flood forecasting system	Flood forecasting system and warning system	78	1
7	Fulusou Levee at Lepea	Structural mitigation (levee)	68	2
3	Vailima Levee at Togafuafua	Structural mitigation (levee)	68	2
6	Lower Vailima and Gasegase Flood Information and Awareness	Community resilience program	64	4
4	Gasegase - Planning Reforms at Fugalei	Restrict future development in the delta at Fugalei	60	5
1	Vailima -Telecommunications Tower Protection at Mulinu'u Peninsula	Asset flood resilience/protection	58	6
2	Vailima -Fuel Storage Protection at Mulinu'u Peninsula	Asset flood resilience/protection	58	6
10	Fulusou – Flood mitigation embankment at Tuanaimato	Flood detention basin D/S of Tuanaimato Golf Club	54	8
8	Fulusou – Buy back at Lepea	Property buy back for high risk properties	48	9
9	Fulusou – Buy back at Tuanaimato	Property buy back for high risk properties	48	9
5	Gasegase – Buy back at Sinamoga	Property buy back for high risk properties	48	9

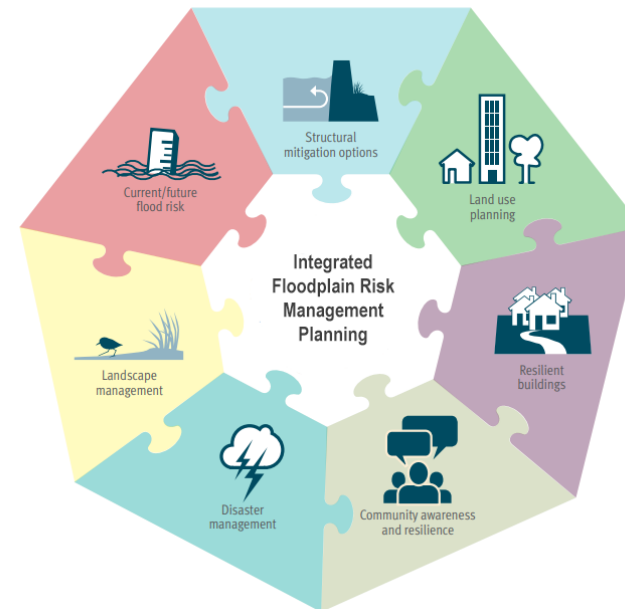


Likelihood of consequence	AEP range (%)	Level of consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likely	>10	Environment	People Public admin Social setting Economy			
Unlikely	1 to 10	Environment	People Public admin Social setting Economy	People Public admin		
Rare to very rare	0.01 to 1		Environment Public admin	People Social setting Economy	People Public admin	
Extremely rare	<0.01		Environment	People Public admin Social setting Economy	People Public admin	

Risk: Very low (Blue), Low (Green), Medium (Yellow), High (Orange), Extreme (Red)  
AEP = annual exceedance probability

# Integrated Flood Risk Management

- The Queensland Flood Risk Management Framework
  - Evidence based
  - Full range of possible flood events
  - Current and future climate
  - Integrated solutions
  - Economic assessment framework
- The Queensland Flood Risk Management Framework







# Questions?

**William Prentice, Water Technology**  
Principal Engineer – Planning, Resilience and Expert Services  
National Practice Lead – Resilience and Adaptation  
[william.prentice@watertech.com.au](mailto:william.prentice@watertech.com.au)