

# COST BENEFIT ANALYSIS OF FLOOD MITIGATION IN SAMOA



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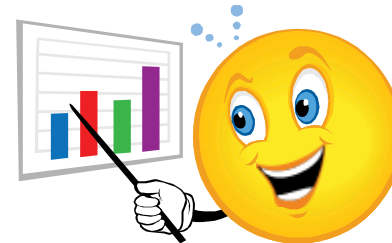
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# This presentation

- Background
- Key steps in analysis
- Results
- Impacts





# Background

- Samoa and flooding
- Apia and river system
- Samoa Flood Management and Action Plan  
⇒ lower Vaisigano catchment area



# Proposed Action Plan activities

- Structural flood management options:
  - Construction of floodwalls
  - Construction of a by-pass channel
  - Construction of a reservoir
  - Increasing channel conveyance
  - Pumping
  - River maintenance
- Non-structural flood management options
  - Development controls (requiring buildings to have minimum (raised) floor heights)
  - Improved flood forecasting system

WHAT TO FOCUS ON?



# Defining impacts: without mitigation

- What difference would flood mitigation have?
- Common impacts of flooding without the mitigation measures



Market costs (damage and losses)	Non market costs
<ul style="list-style-type: none"> <li>• Damage to replaceable household belongings</li> <li>• Damage to replaceable business assets</li> <li>• Loss of earnings (as businesses could not operate during/after floods)</li> <li>• Clean up (expense)</li> </ul>	<ul style="list-style-type: none"> <li>• Clean up (time)</li> <li>• Injuries and health impacts (diarrhoea, stress etc.).</li> <li>• Loss of irreplaceable items (eg., family heirlooms, wedding tapa etc.)</li> </ul>







# With and without analysis

Without? With?



TUVALU  
Funafuti  
Wallis  
and  
Futuna

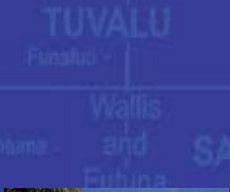
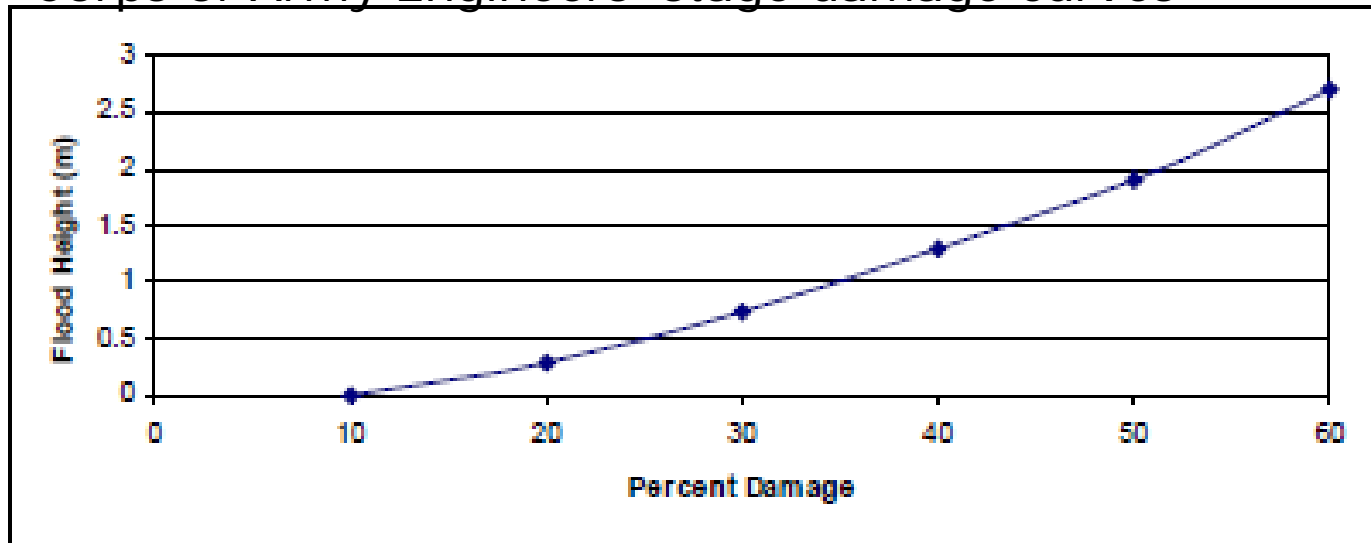


'With' scenario	'Without' scenario
<ul style="list-style-type: none"><li>• Reduced damage to household belongings</li><li>• Reduced damage to business assets</li><li>• Reduction in the loss of earnings sustained</li><li>• Reduced clean up (time, expense)</li><li>• Reduced scale of injuries and lower health impacts (diarrhoea, stress etc.)</li><li>• Cost of implementing project/mitigation works</li></ul>	<ul style="list-style-type: none"><li>• Damage to household belongings continue</li><li>• Damage to business assets continue</li><li>• Loss of earnings continue (cannot operate during/after floods)</li><li>• Clean up continues (time, expense)</li><li>• Injuries and health impacts continue (diarrhoea, stress etc.).</li></ul>



# Values 'without'

- Basic information: where gets flooded, number of houses, businesses, structure of building (wood? Concrete blocks?), size etc.
- Use of GIS/ flood maps to predict flood damage without flood mitigation
- Flood maps for Vaisigano predict extent to which buildings would be below water for floods of different severity
- Corps of Army Engineers 'stage damage curves'





# Values 'without'

- **Published flood records:**

⇒ Government records = av cost to schools of WST\$5,000 (damage to books and walls)

⇒ Adjust for inflation

⇒ Likely education costs without flood mitigation

- **Dedicated business surveys:**

⇒ Businesses take av 3.5 days to clean up premises

⇒ 3.5 x minimum daily wage x number business flooded

⇒ likely clean up costs without flood mitigation



*A raised threshold prevents damage from minor flooding.*







# Valuing benefits

- Benefits of flood mitigation – *flood costs avoided*
- How do we know how much different measures reduce damage?
  - evidence from various flood studies and consultations with experts (floodwalls/embankments/ bypass/diversion channel)
  - lead time damage functions (mathematical models based on previous experience to predict damage prevented, given warning times – this was used to estimate the benefits of improved flood warning/advisory system)
  - flood maps/US Core of Army Engineers stage damage curves (to assess the introduction of elevated flood heights)





# Valuing costs

- Consultations with relevant stakeholder groups
- Construction companies (floods walls)
- Technical agencies (e.g. flood monitoring)





# Results

Floods in Apia without mitigation measures = average:

- WST\$1.2 million for 1 in 5-year flood to WST\$5.4 million for 1 in 100-year flood
- Average damage from flooding in lower Vaisigano catchment area was estimated to be around WST\$619 000 per year
- Pays off of different mitigation options





# Pay offs



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and Futuna  
SAMI



Mitigation option	Benefit: cost ratio	Key factors affecting pay off
Improved forecasting system	1.7:1 to 1.9:1	Discount rate, % ppl receiving warning
Constructing wooden homes with raised floors	4:1 to 44:1	Discount rate
Constructing cement block homes with raised floors	2:1 to 28:1	Discount rate
Floodwalls	0.1:1 to 0.64:1	Choice of floodwall design and discount rate
Diversion channels estimated	0.01:1 to 0.09:1	Discount rate





# Things to note

- Items not valued due to difficulty:
  - avoided health costs
  - trauma suffered by residents during flooding
  - negotiations needed to convince landowners to permit structural changes
  - reduced flood damage to households and businesses in nearby districts
  
- Poor pays off for structural options (high up front costs)



# Impacts?

- Advice to government on what to support
  - nothing materialized?
- Interest from donors in supporting some interventions assessed as economically feasible (EU re flood modelling work)
  - nothing materialized?
- Requests from government of Samoa for more CBAs to inform water management



# Fa'afetai tele lava, vinaka vaka levu Malo, tanku tumas



Questions?

