QCoast 2100 Knowledge Sharing

The Townsville Coastal Hazard Adaptation Strategy

A lesson in timing

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Principal - Water and Environment
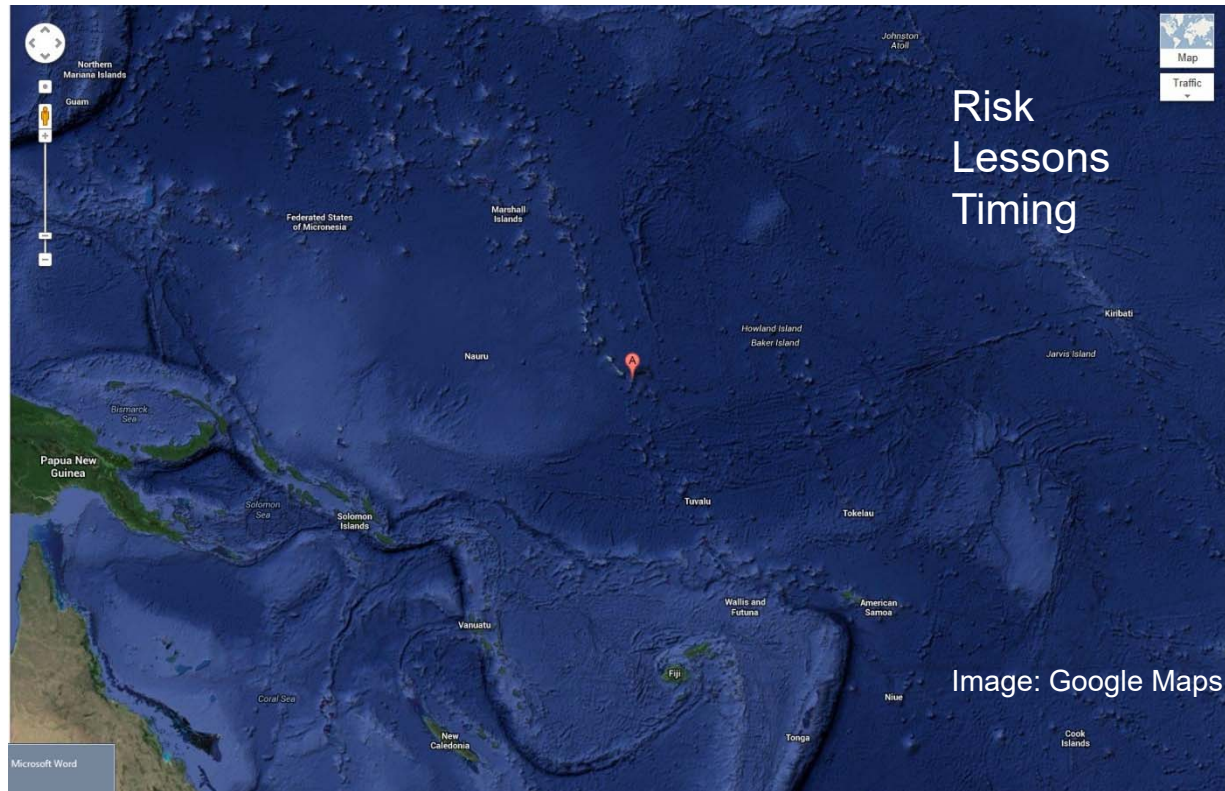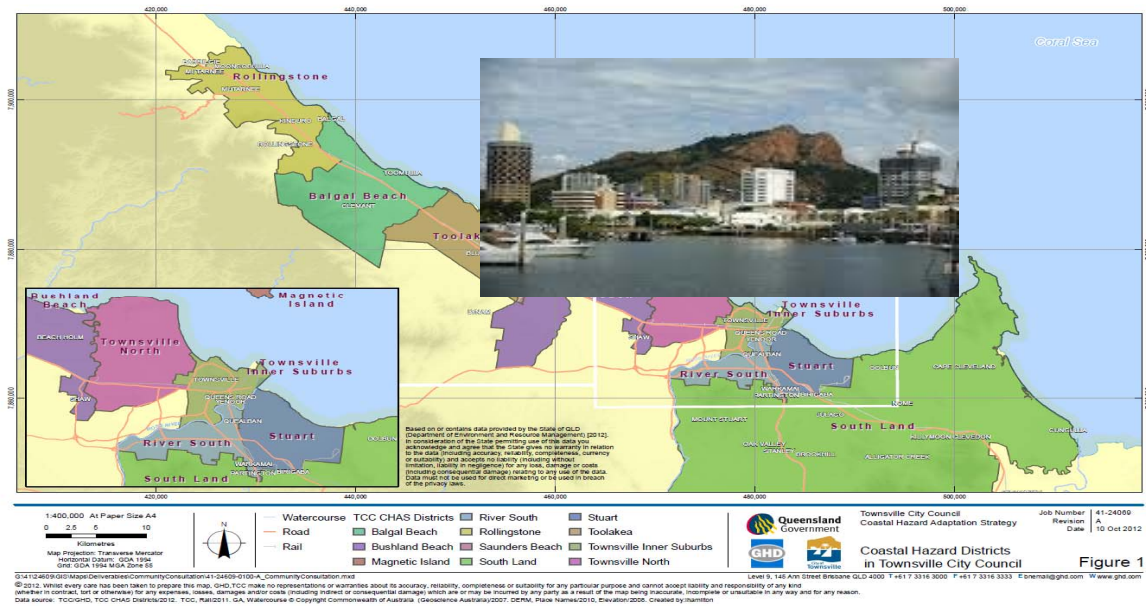

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This presentation

Risk
Lessons
Timing

Image: Google Maps

Image : Google Maps

Townsville's CHAS

Figure 1

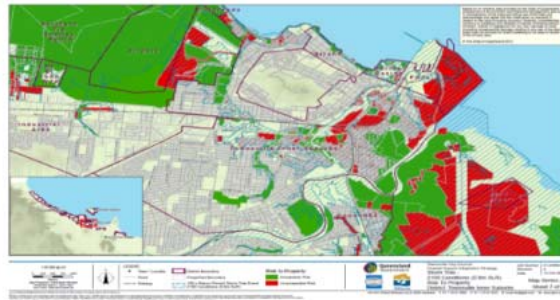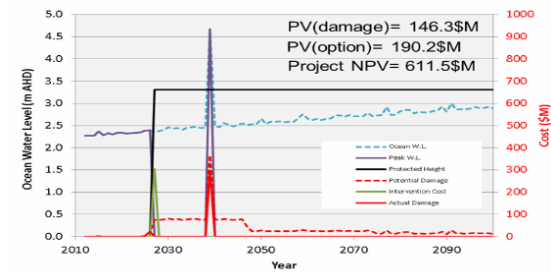Coastal Hazard Districts in Townsville City Council

Townsville's CHAS

- A 2012 **pilot** study for LGAQ
- The first of its kind in Queensland
- Scope:
  - Risks largely based on 1 in 100yr storm tide event
  - 2100 climate (incl Sea Level Rise)
  - Adaptation options
  - MCA / BCA leading to ranking of adaptation options for consideration in Council's planning scheme, & infrastructure / operation / asset management plans

The CHAS process

PV(damage)= 146.3$M
PV(option)= 190.2$M
Project NPV= 611.5$M

Define Hazard → Determine Risk → Evaluate Adaptation Options → Prepare CHAS → Consider Planning Implementation
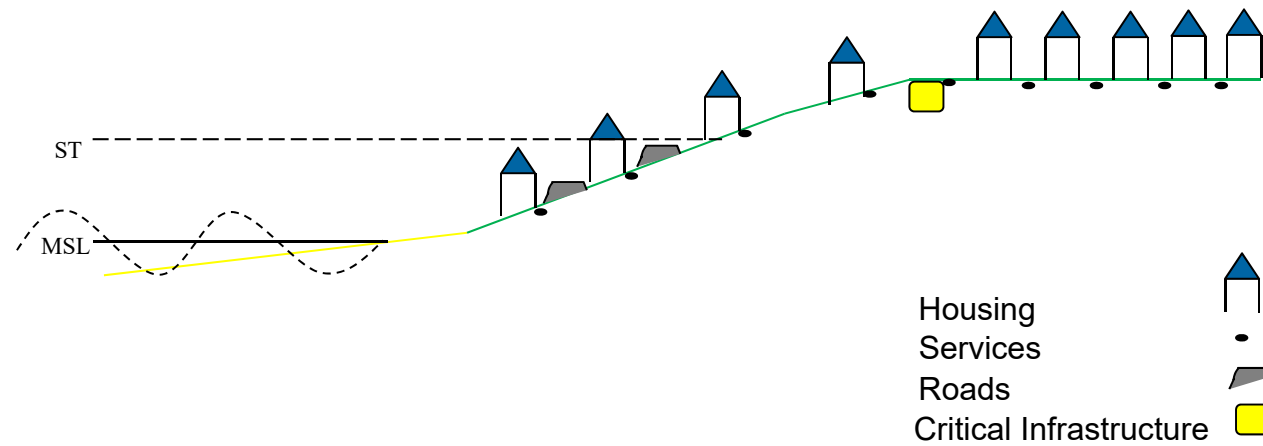
Four Strategies for adapting to coastal hazards

- **Defend**

- **Accommodate**

- **Retreat (Planned Retreat)**

- **Maintain Status Quo (Forced Retreat)**

Maintain Status Quo (Base Case)

Present

ST

MSL

Housing

Services

Roads

Critical Infrastructure

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Maintain Status Quo (Base Case)

2012-2100

ST — — — Increase in maintenance from storm tide — — —

Critical Infrastructure

Erosion due to SLR

MSL

Incremental Loss + Replace

Accommodate

2012-2100

Houses raised above 2100 100 y storm tide level
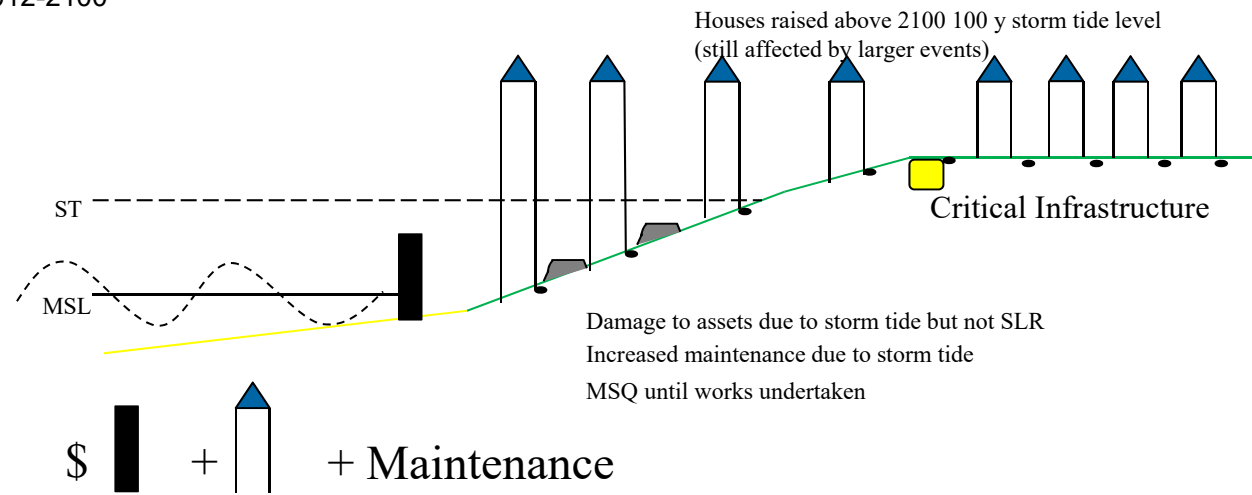(still affected by larger events)

ST

MSL

Critical Infrastructure

Damage to assets due to storm tide but not SLR

Increased maintenance due to storm tide

MSQ until works undertaken

$ + ▲ + Maintenance

Defend

2012-2100

Assets protected from 2100 100 y storm tide level
(still affected by larger events)

ST

MSL

Sump

Critical Infrastructure

MSQ until works undertaken
Rainwater detention plus pumping
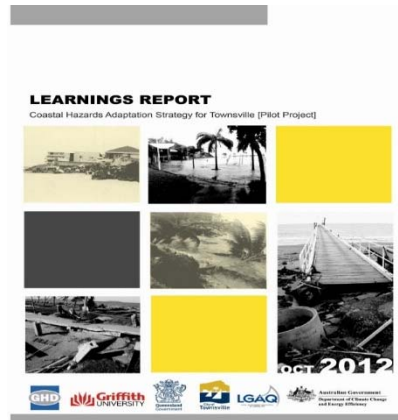
$ + Maintenance of Infrastructure

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LEARNINGS & OBSERVATIONS

- CHAS studies are complex undertakings
- They are not one dimensional
- Key inputs / the things you need to know
    - A quantified hazard
    - Who owns the outcome
    - The acceptability of adaptation options
    - Economic analysis
    - An informed MCA
    - Funding mechanisms and implications
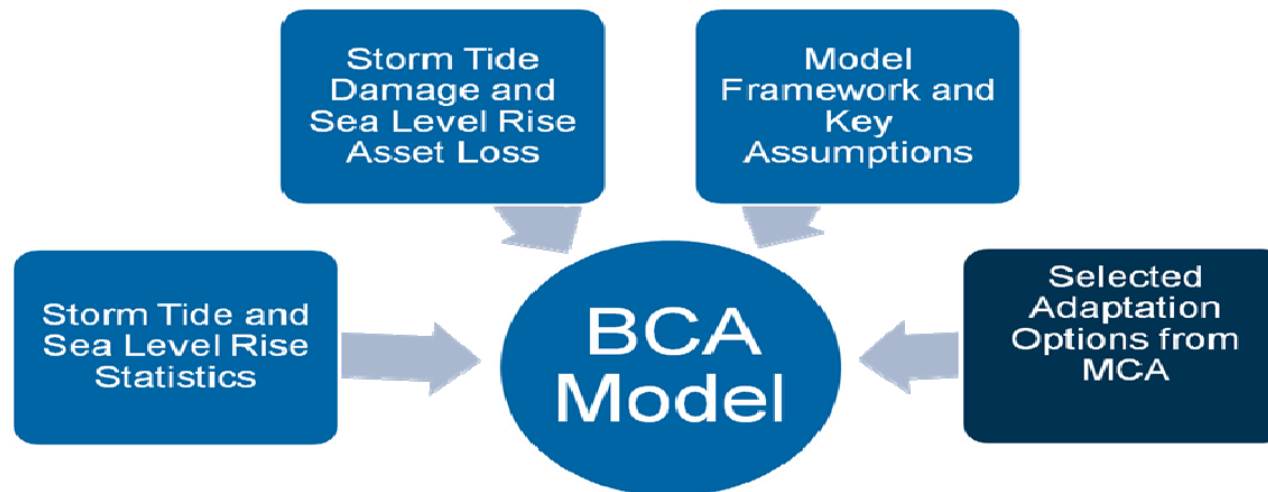   - The importance of timing
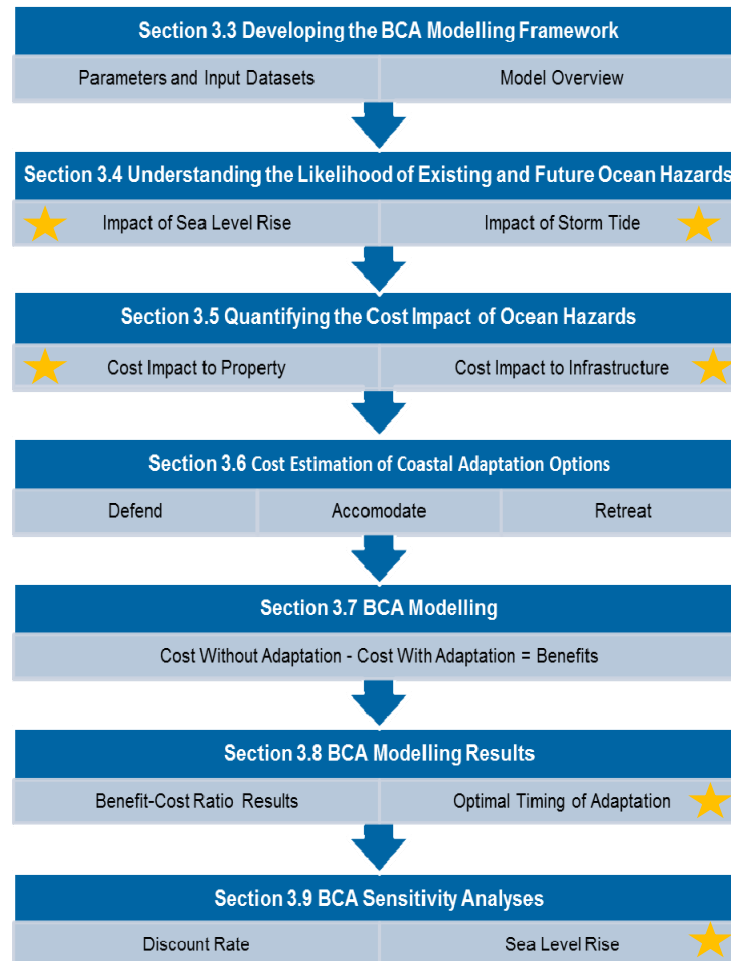
THE IMPORTANCE OF TIME

- Current risk
- SLR
- Hazard
- Damages
- Benefits
- Utilising the combined strengths of Multi-Criteria Assessment and Benefit-Cost Analysis
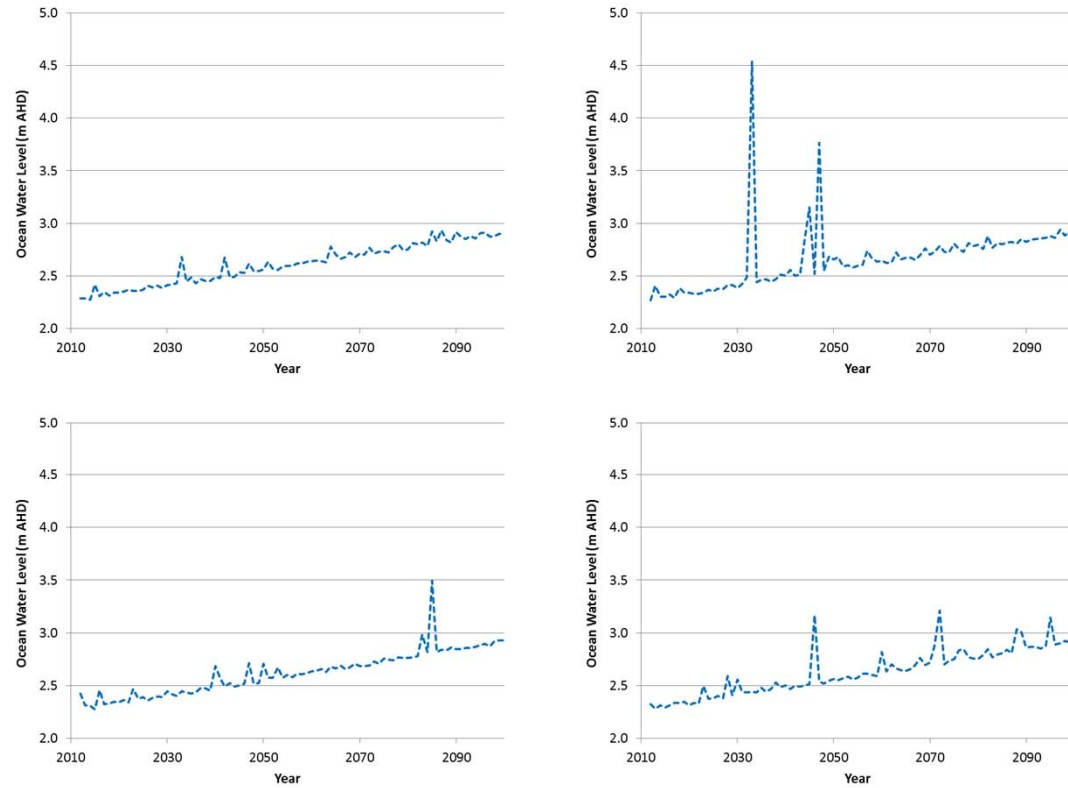
Photo: Sugar Loaf Wharf, Coromandel. Jan 4 2014, Stuart Crawley, WRC

Benefit-Cost Analysis

Section 3.3 Developing the BCA Modelling Framework

| Parameters and Input Datasets | Model Overview |

Section 3.4 Understanding the Likelihood of Existing and Future Ocean Hazards

| ⭐ Impact of Sea Level Rise | Impact of Storm Tide ⭐ |

Section 3.5 Quantifying the Cost Impact of Ocean Hazards

| ⭐ Cost Impact to Property | Cost Impact to Infrastructure ⭐ |

Section 3.6 Cost Estimation of Coastal Adaptation Options

| Defend | Accomodate | Retreat |

Section 3.7 BCA Modelling

| Cost Without Adaptation - Cost With Adaptation = Benefits |

Section 3.8 BCA Modelling Results

| Benefit-Cost Ratio Results | Optimal Timing of Adaptation ⭐ |

Section 3.9 BCA Sensitivity Analyses
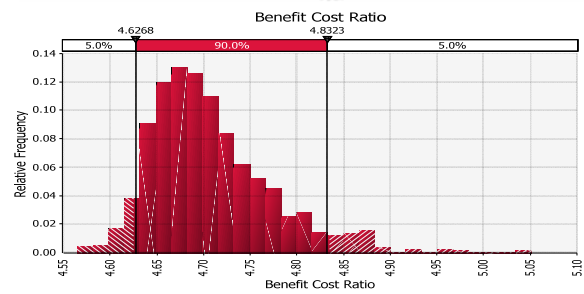
| Discount Rate | Sea Level Rise ⭐ |

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Figure 1   Example of four separate future 88 y water level realisations.

Benefit-Cost Analysis

88 y water level time history

Storm Tide Damage

Benefit Cost Ratio

Sea Level Rise Losses
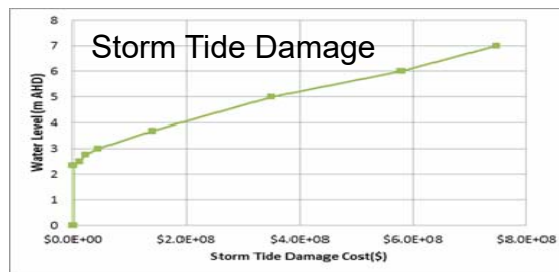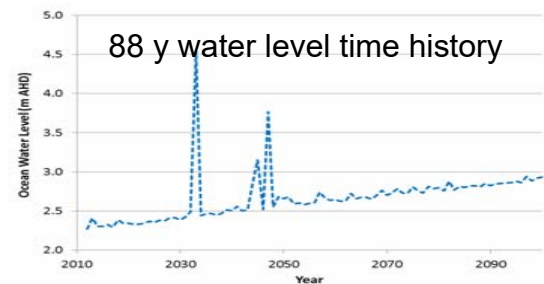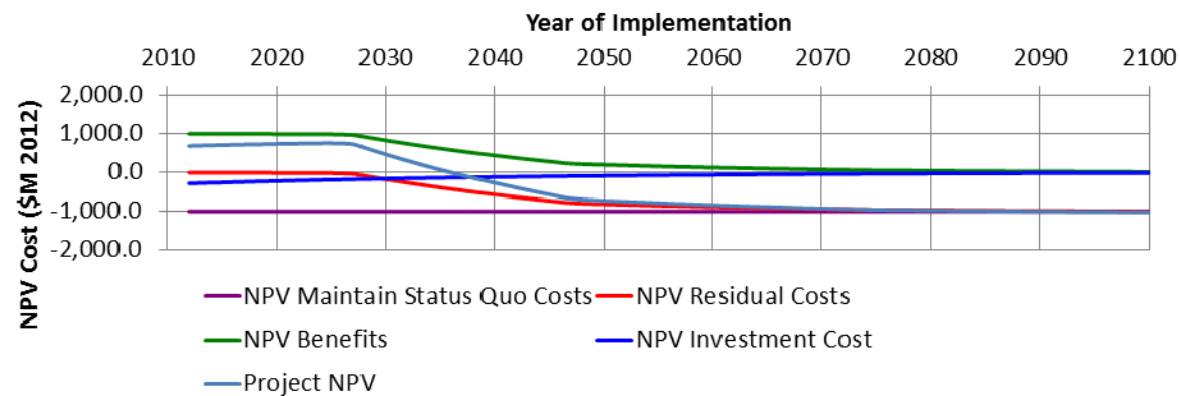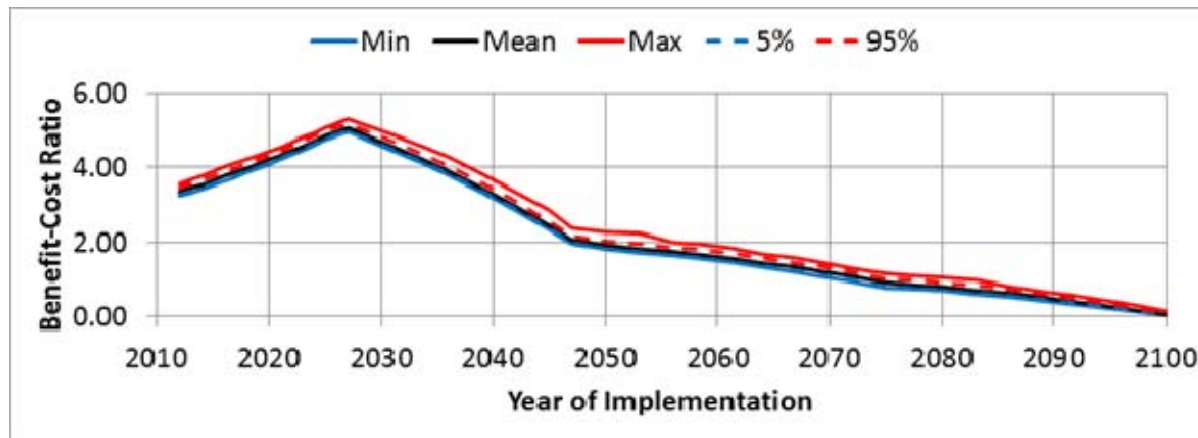
RESULTS

District	Locality	Adaptation Option	NPV Project (M)	NPV Project - NPV Maintain Status Quo (M)	Optimal Year of Adaptation Implementation	PV Cost of Adaptation Investment (M)
1	A	Defend Option 1	$724	$1,732	2027	$190
2	B	Defend	$168	$386	2027	$13
3	C	Defend	$127	$277	2027	$10
4	D	Defend	$117	$255	2028	$1
2	E	Defend	$8	$21	2027	$3
5	F	Retreat	-$18	$60	2029	$75
6	G	Retreat	-$50	$12	2080	$24
7	H	Retreat	-$9	$11	2064	$8
4	I	Retreat	-$10	$9	2042	$8
2	J	Accommodate	-$19	$8	2080	$16
8	K	Retreat	-$3	$7	2034	$6
4	L	Retreat	-$13	$7	2036	$16
9	M	Retreat	-$4	$5	2039	$3
10	N	Retreat	-$2	$4	2036	$3
7	O	Retreat	-$16	$3	2080	$11
8	P	Retreat	-$12	$3	2080	$8
4	Q	Retreat	-$0.2	$1	2027	$1
9	R	Retreat	-$1	$0.2	2053	$1
4	S	Defend	-$7	$0.1	2089	$3
4	T	Defend	-$0.1	$0.0	2089	$0.1
4	U	Retreat	-$7	-$0.7	2089	$5
4	V	Defend	-$7	-$2	2089	$4
11	W	Retreat	-$27	-$9	2047	$26

Economically Viable

Better than Maintain Status Quo

Not Economically Viable

CONCLUSION

- Risks
    - Existing
    - Future
- Lessons
    - All disciplines are relevant
    - Planning v response
    - Private v public
    - Informed decision making
- Timing
    - SLR
    - Hazard
    - Damages
    - Costs….

COASTAL HAZARD ADAPTATION STRATEGY FOR TOWNSVILLE CITY COUNCIL
Pilot Project

OCT 2012

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