

Coastal hazard adaptation planning – experiences from QLD and NSW

Climate Council webinar – Thursday 25 November 2021

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Learnings from working alongside QLD and NSW Councils including:



Queensland
Government





Leading practice adaptation

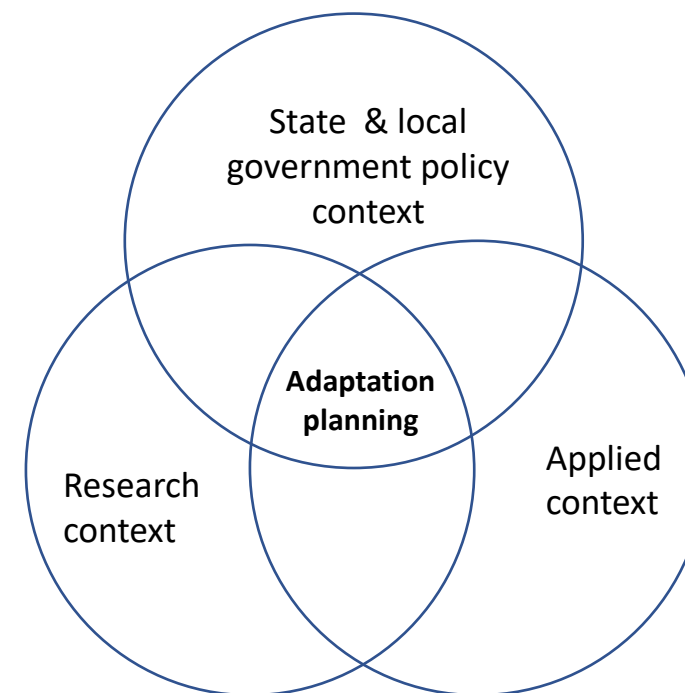
Is framed by:

- State & local government policy context
- Best available science and research
- Lessons from applied contexts around Australia and internationally
- Tailored to local context

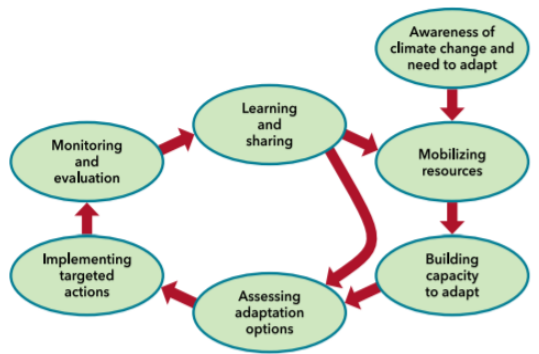
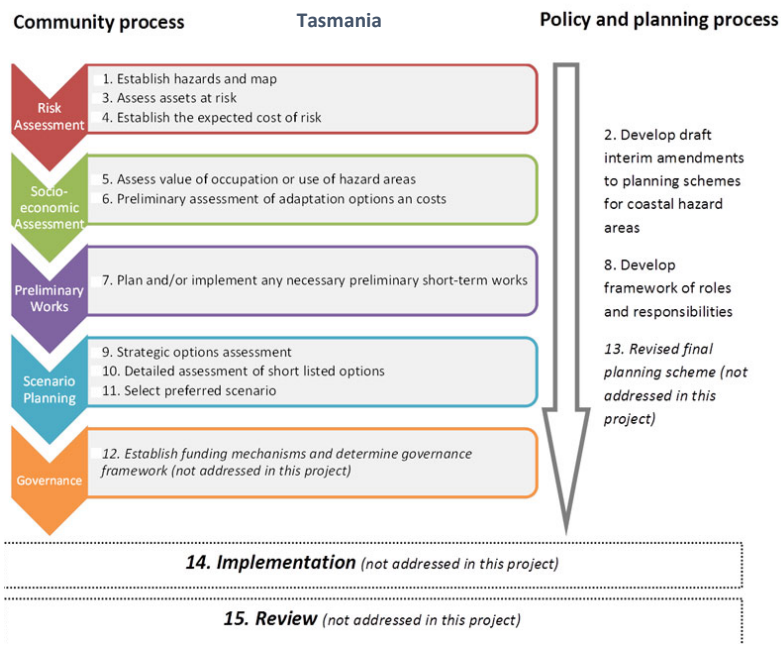
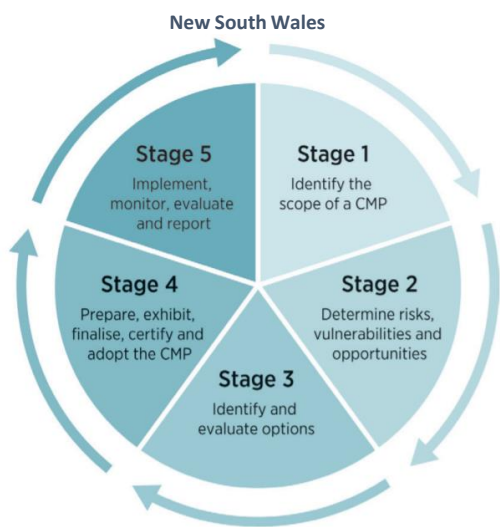
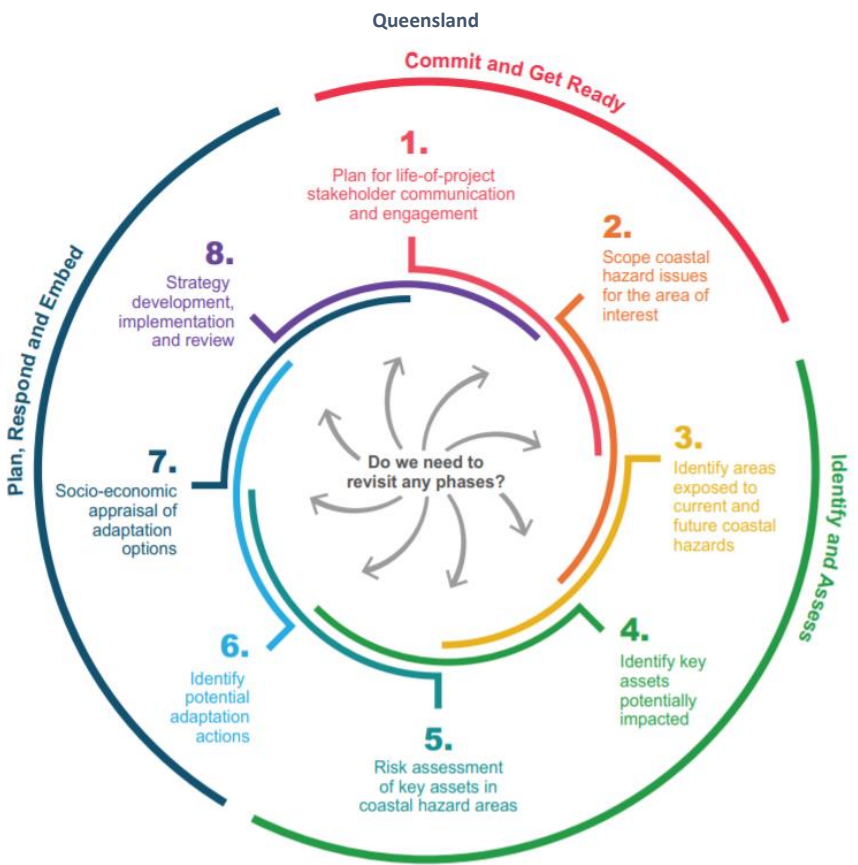
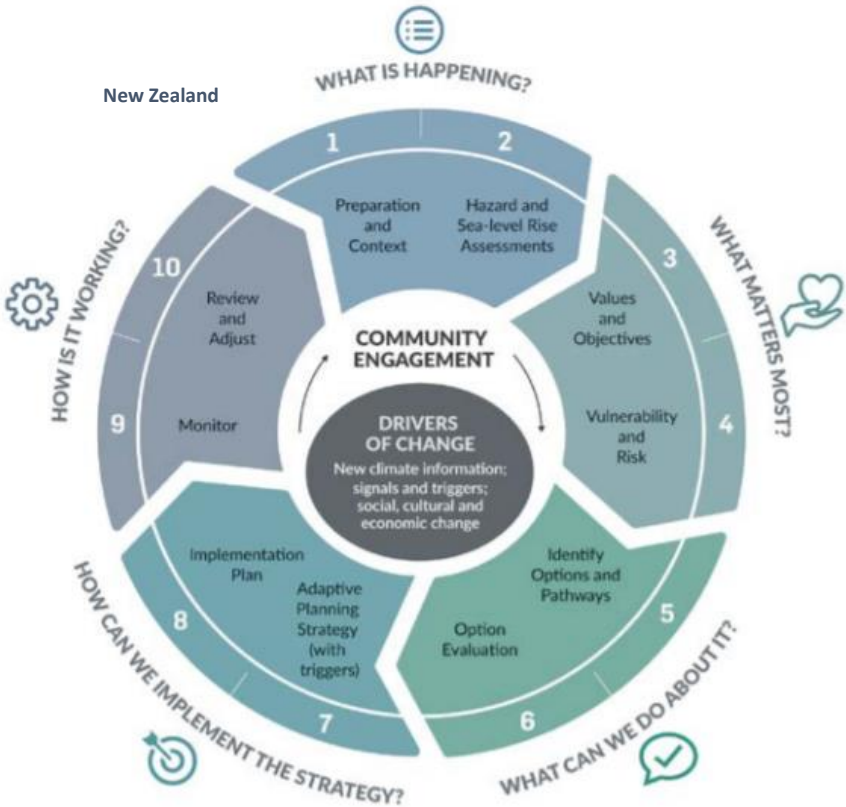
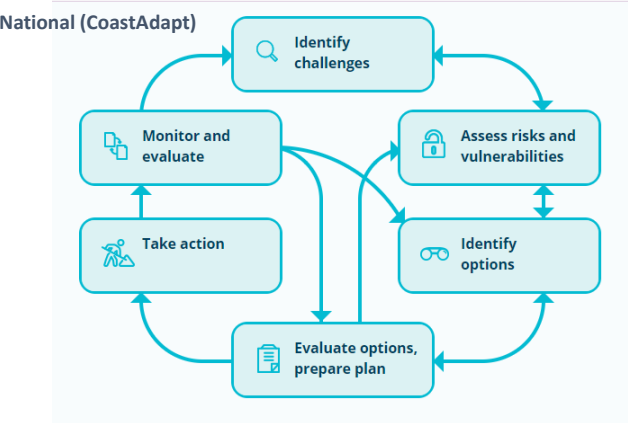
Involves all stakeholders – collaboration & co-design.

Things to consider when scoping:

- Individual policy contexts
- Opportunities to bring in new research
- What will work in practice – fit for purpose.

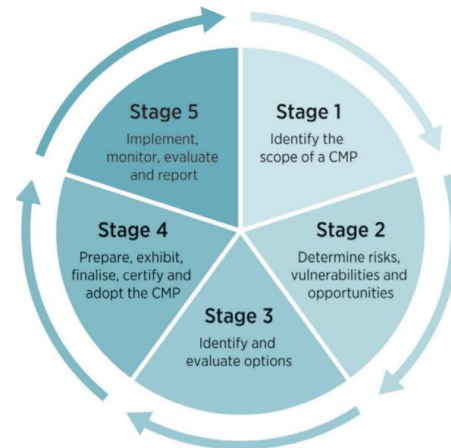


Leading practice adaptation frameworks



Three pillars for leading practice coastal hazard adaptation:

1. Engagement
2. Technical
3. Strategic



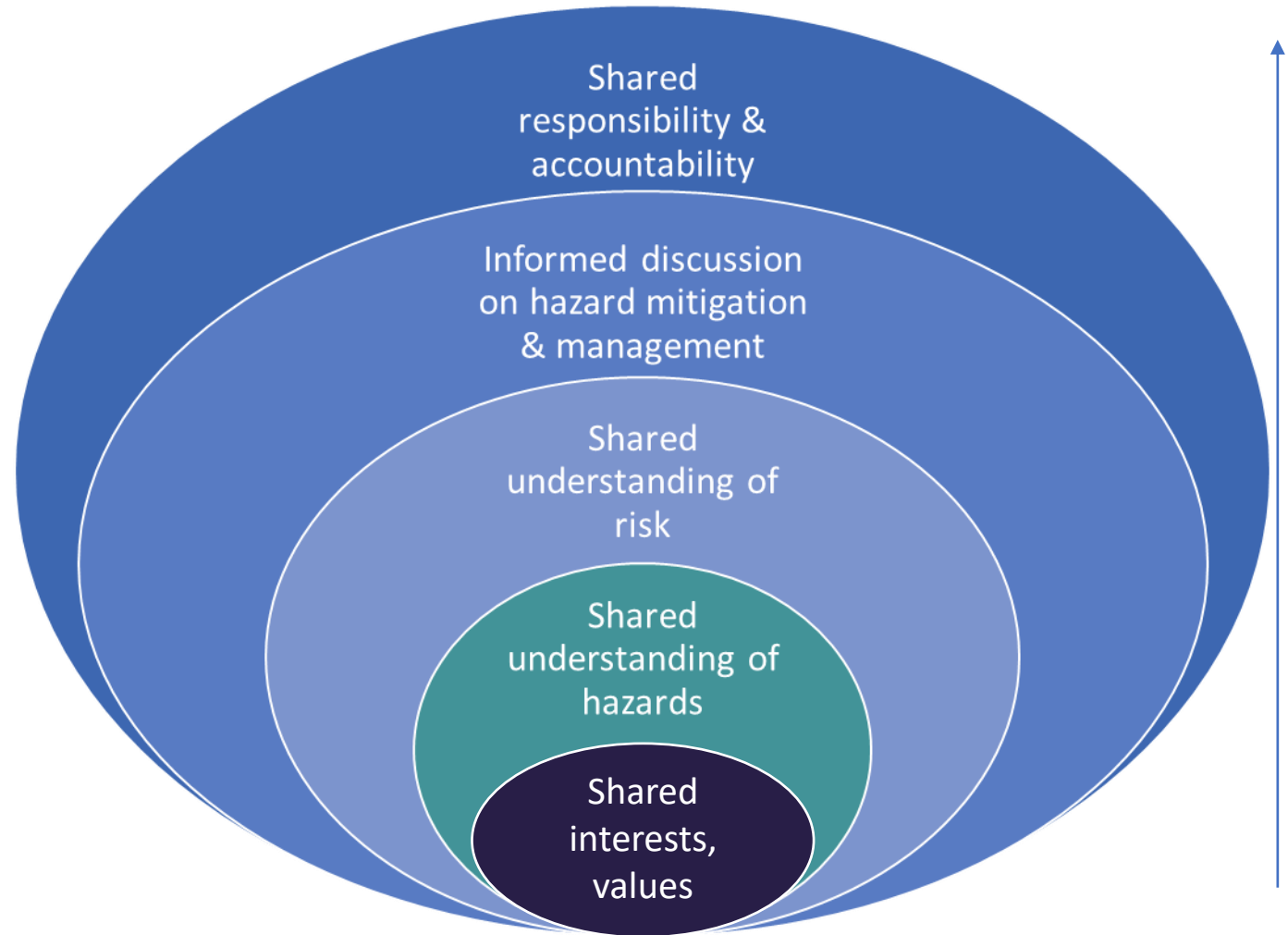
1. Engagement – our communities



Mobilising communities

Major engagement programs

- Councillors
- Council teams
- Local and State agencies
- Traditional Owners
- Agency stakeholders
- Special interest groups
- Community workshops
- Youth
- Development
- Community and stakeholder advisory groups



Things to consider:

- Start early
- Allow time
- Have a strategy and be willing to adjust

Discovering

- Knowledge
- Community stewardship
- Adaptation in action
- Motivation to manage and adapt
- Citizen science
- Passion for integrated catchment-coast and marine management





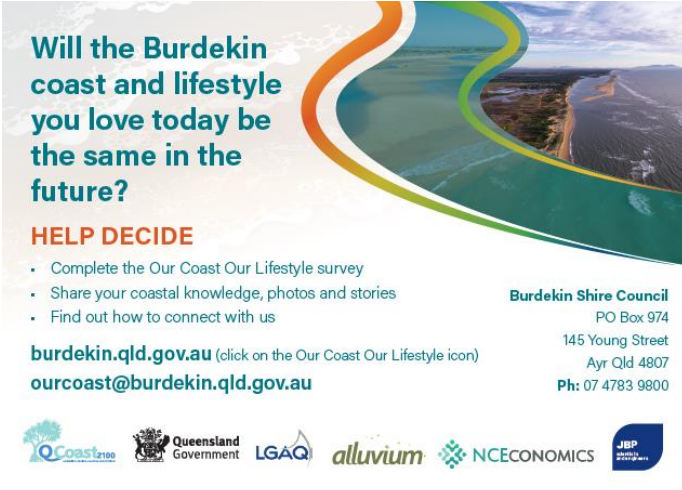
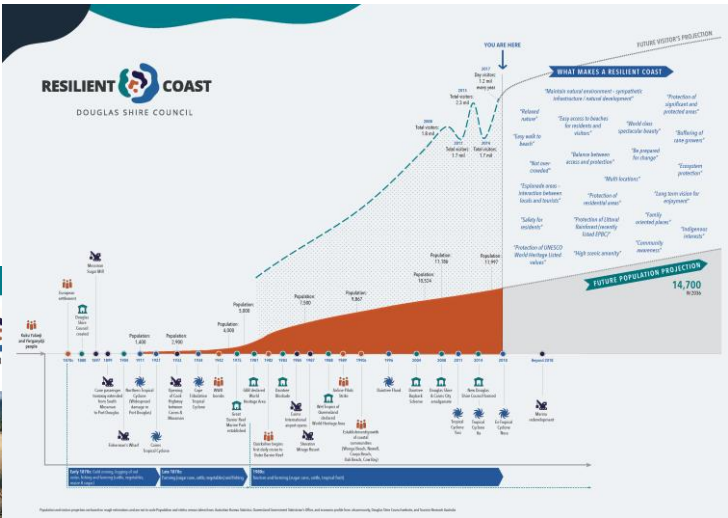
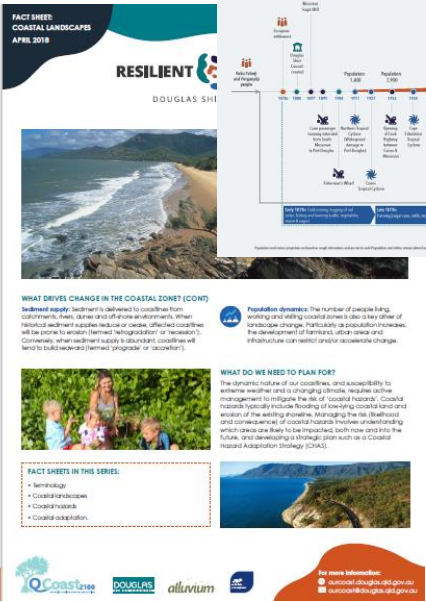
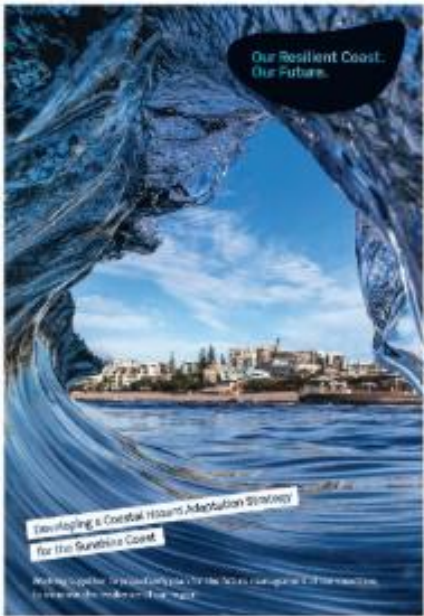
Building energy for the bigger picture – what does a resilient coast look like?

Positive messaging & narratives:

- Past and future change
- Proactive planning
- Opportunities in adaptation.

Materials

- Positive messaging
- Thematic communication
- Website
- Monthly project updates
- Coastal story timelines
- Fact sheets
- Surveys
- Media releases



Themed outcomes

Enables:

- Shared visioning
- Reporting back
- Platform to inform risk and adaptation

Environment



Place



Community
(and organisations)



Recreation

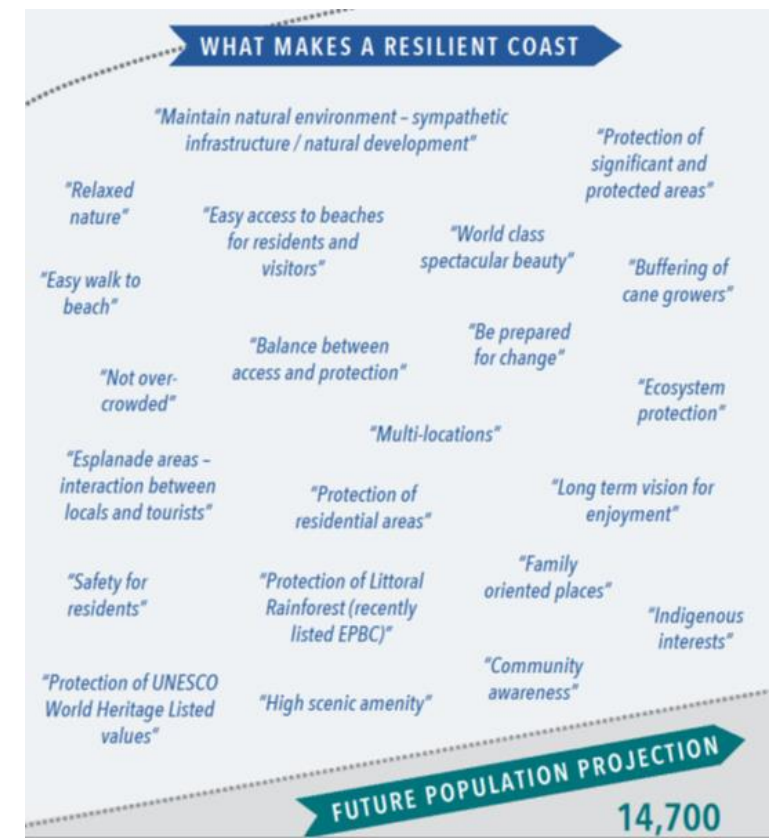


Planning
(and built form)



Engagement: key outcomes

- Shaping the direction of the technical work
- Shared understanding of hazards and risk
- Building partnerships
- Council enabled to pro-actively prepare
- Strong platform for implementation.



2. Technical investigations: Coastal hazards & risk

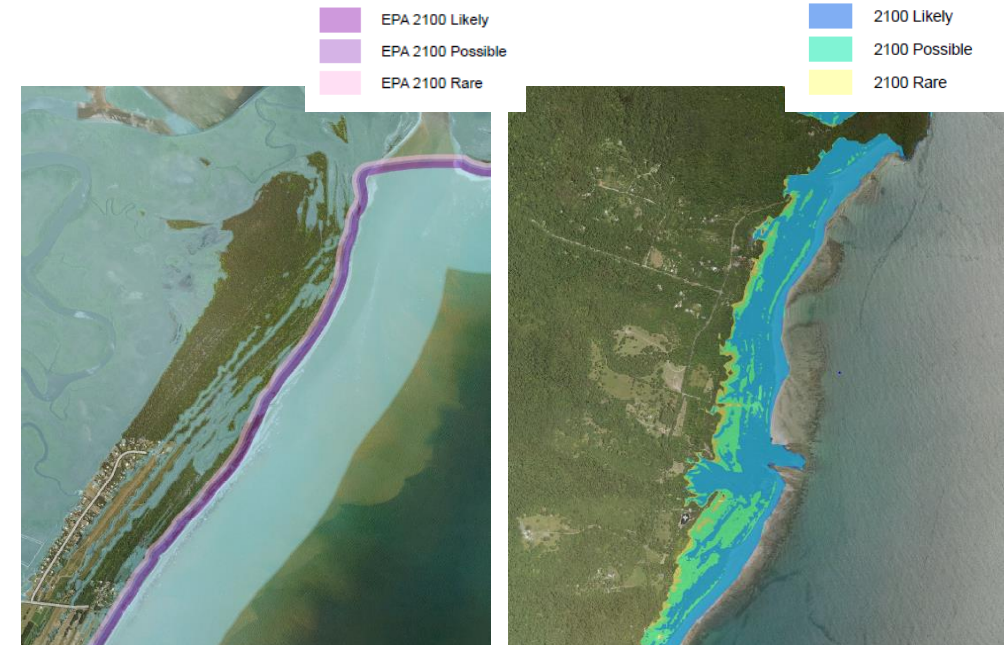
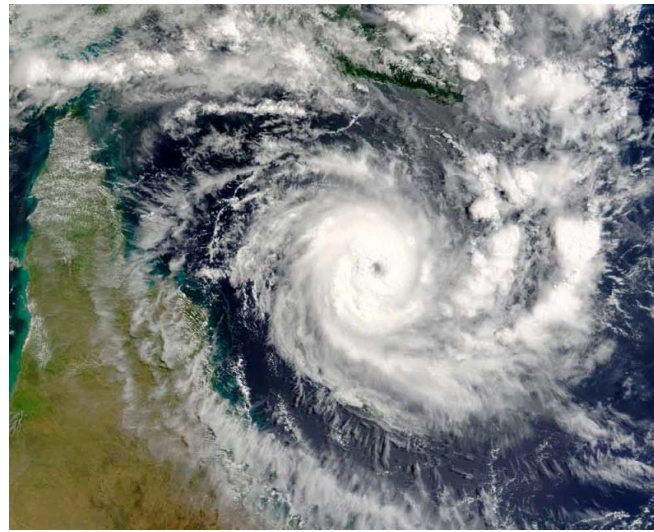


Coastal hazard exposure

- Coastal hazard areas
 - Erosion prone areas
 - Storm tide inundation
 - Tidal inundation due to sea level rise
 - Other.
- Multiple planning horizons (e.g. present day to 2100)
- Multiple event probabilities
- Asset data collation – all types of assets
- Exposure likelihood

Things to consider:

- State guidelines
- Leading practice requirements
- Spatial data set up
- **How technical & strategic come together in later stages**
- Flexibility to tailor technical work to provide best value for Councils



Beach and
foreshore
assets

Buildings and
facilities

Other
infrastructure
and utilities

Transport
infrastructure

Land,
environmental
and cultural
assets

Planning
scheme zones

Risk

Purpose of risk assessment:

- To inform understanding of regional scale distribution of current and emerging risk
- To inform (provide the foundation for) strategic adaptation response
- To be fit for purpose and underpinned by engagement

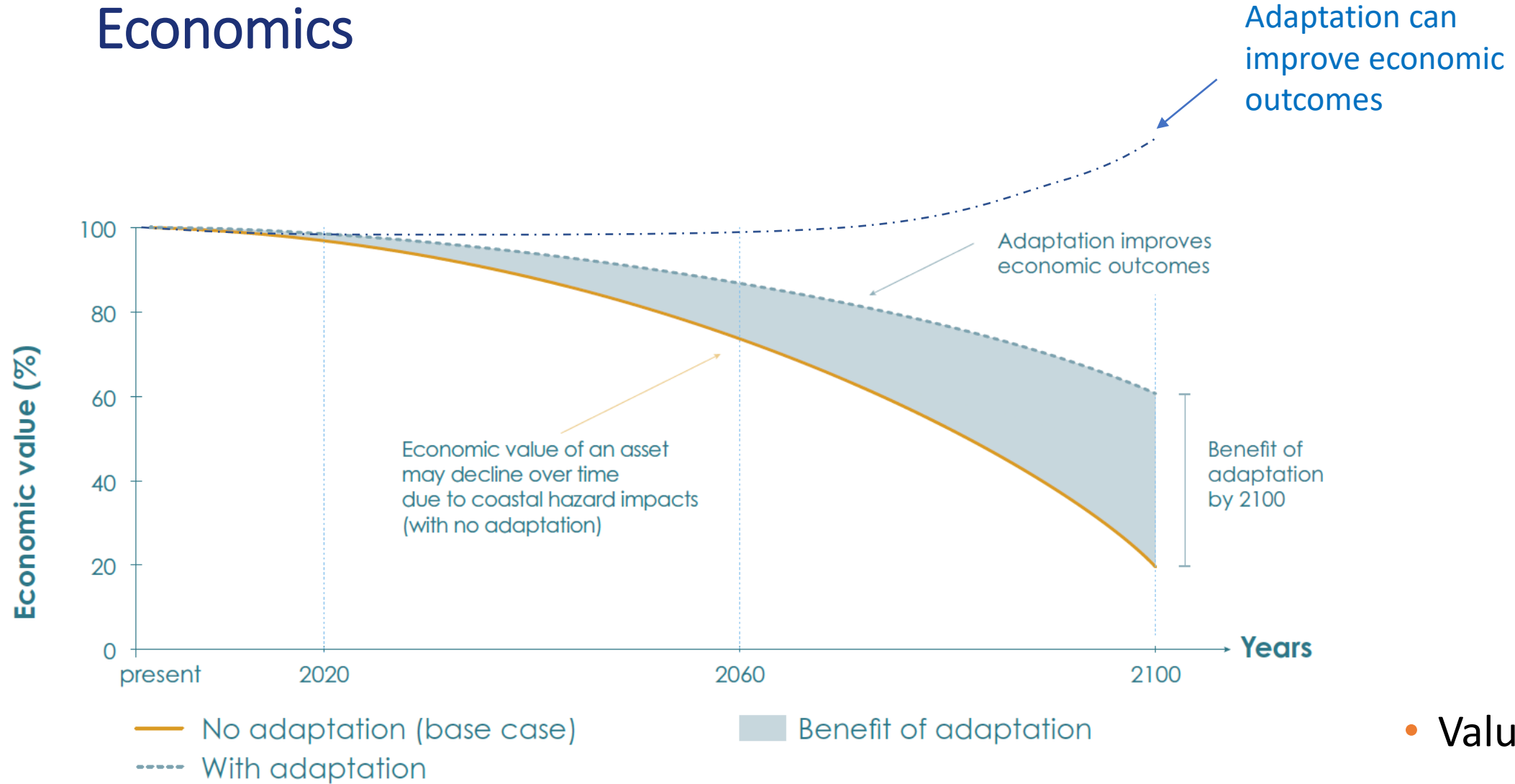
Risk = Likelihood of exposure x consequence

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Likely 10% AEP	Low	Medium	High	Very high	Very high
	Possible 1% AEP	Low	Medium	Medium	High	Very high
	Rare 0.2% AEP	Low	Low	Medium	Medium	High



Consequence	Infrastructure	Economy and growth	Public safety	Environmental values	Traditional Owner values	Community services and lifestyle
Catastrophic	Widespread major damage or loss of property or infrastructure with total value >\$50 million. Partial recovery may take many years.	Regional economic decline, widespread business failure and impacts on state economy.	Loss of lives and/or permanent disabilities.	Severe and widespread permanent regionally significant and natural region. Recovery	Severe and widespread	Widespread semi-permanent impact community structure of the alternatives.
Major	Major damage or loss of property or infrastructure with total value >\$10 million. Full recovery may take several years.	Lasting downturn of local economy with isolated business failures and major impacts on regional economy.	Widespread series injuries/ illnesses.	Severe and semi-permanent or more regional significant and natural region. Partial recovery years.	WHAT MAKES A RESILIENT COAST "Maintain natural environment – sympathetic infrastructure / natural development" "Protection of significant and protected areas" "Relaxed nature" "Easy access to beaches for residents and visitors" "World class spectacular beauty" "Easy walk to beach" "Balance between access and protection" "Be prepared for change" "Buffering of cane growers" "Not over-crowded" "Ecosystem protection" "Esplanade areas – interaction between locals and tourists" "Multi-locations" "Protection of residential areas" "Long term vision for enjoyment" "Safety for residents" "Protection of Littoral Rainforest (recently listed EPBC)" "Family oriented places" "Indigenous interests" "Protection of UNESCO World Heritage Listed values" "High scenic amenity" "Community awareness" FUTURE POPULATION PROJECTION 14,700	Term (~1 month) services, the community available.
Moderate	Moderate - major damage to property or infrastructure with total value >\$1 million. Full recovery may take less than 1 year.	Significant impacts on local economy and minor impacts on regional economy.	Isolated series injuries/ illnesses and/or multiple minor injuries/ illnesses.	Substantial more local ecosystem features Full recovery years.		Term (~1 week) option to es, wellbeing, ity with limited
Minor	Substantial damage to properties or infrastructure with total value >\$200,000.	Individually significant but isolated impacts on local economy.	Minor and isolated injuries and illnesses.	Small, coastal short-term ecosystem features Full recovery 1 year.		Term disruption listed services, ture of the alternatives disruption of es.
Insignificant	Minor damage to properties or infrastructure with total value >\$50,000.	Minor short-term impact on local economy.	Negligible injuries or illnesses.	Little to no impact.		ruption (~1 g, finances, or with numerous

Economics



- Valuation
- Base case
- Cost-benefit

Economics

Implementing the adaptation approach and actions in the Resilient Coast Strategic Plan will contribute to avoiding potential economic costs to the Shire of up to:



\$6 million dollars
per annum



\$42 million dollars
per annum



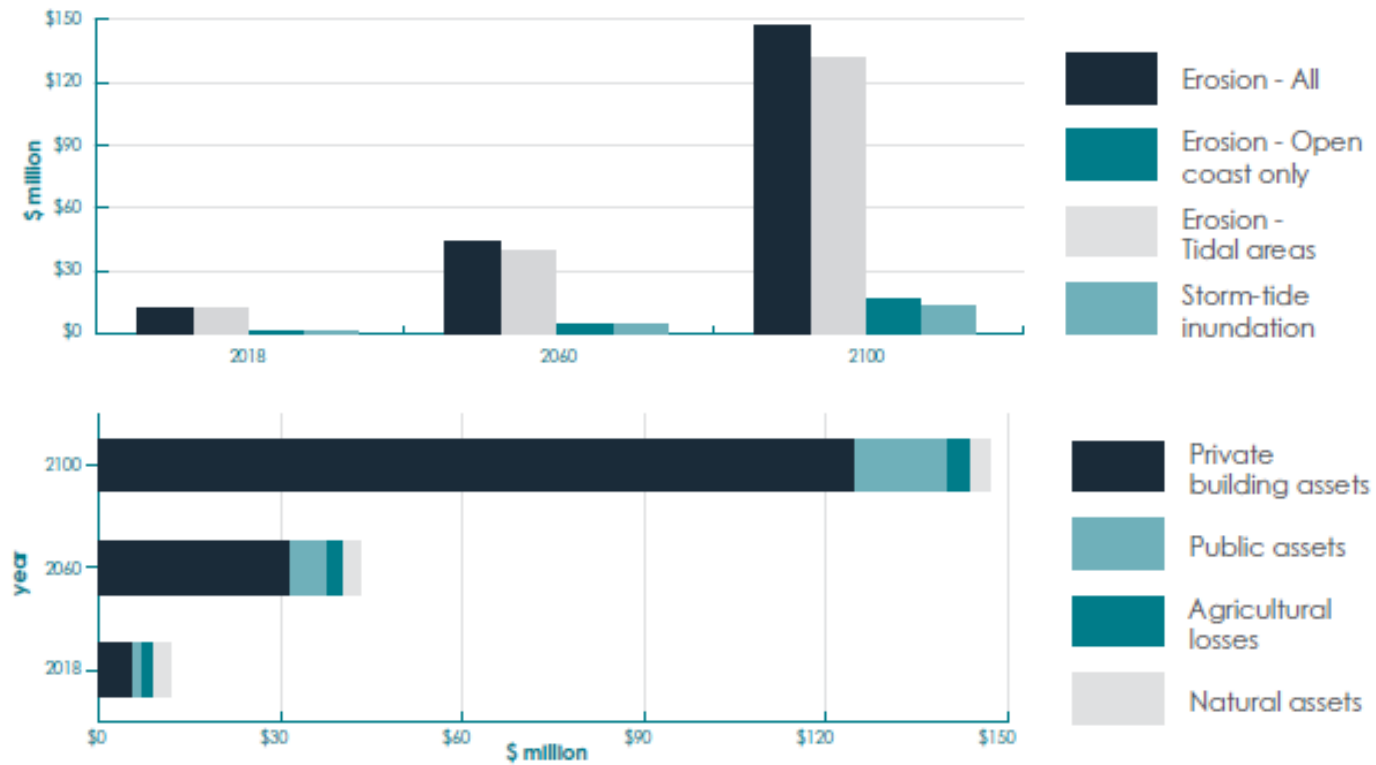
\$140 million dollars
per annum.

Base case: average annual damage costs

1. **Damage to public assets** - Council infrastructure, e.g. culverts, roads and wastewater treatment plants
2. **Damage to private building assets** - Dwellings in the coastal hazard zone
3. **Damage to natural assets** - e.g. Mangroves, wetlands and coastal forests
4. **Loss of production** for agriculture - e.g. lost cane production.



Economics



Average annual damage costs

- AAD apportioned to different hazard and localities
- Split public and private asset damages – provides the foundation for cost sharing discussions

3. Strategic planning

- Adaptation framework & response
- Adaptation actions
- Implementation



Adaptation framework and response

VISION	A RESILIENT COAST FOR DOUGLAS SHIRE		
Adaptation response	Coastal hazard adaptation		
	Monitor	Mitigate	Transition
	Monitor the risk of coastal hazards. Monitor until local trigger levels are reached to initiate mitigation.	Actively mitigate the risk of coastal hazards through a range of adaptation options. Mitigate until local trigger levels are reached to initiate transition.	A strategic decision to transition to an alternative landuse in some areas. Mitigation may be part of the transition process.
	Adaptation options		

Things to consider:

- Tailoring our language – how we talk about adaptation
- Roles and responsibilities
- Decision making triggers
- Defined responses, range of actions

	Adaptation response		
	2018	2060	2100
Degarra	Monitor	Mitigate	Mitigate
Cowle Point	Monitor	Monitor	Monitor
Cape Tribulation	Monitor	Mitigate	Mitigate
Thornton Beach	Mitigate	Mitigate	Mitigate
Cow Bay and Cape Kimberley	Monitor	Monitor	Monitor
Wonga Beach	Mitigate	Mitigate	Mitigate*
Rocky Point	Mitigate	Mitigate	Mitigate
Newell	Mitigate	Mitigate	Mitigate*
Cooya Beach	Mitigate	Mitigate	Mitigate*
Port Douglas and Craiglie	Mitigate	Mitigate	Mitigate*
Pebbly Beach	Mitigate	Mitigate	Mitigate
Oak Beach	Mitigate	Mitigate	Mitigate
Wangetti	Monitor	Mitigate	Mitigate
South of Wangetti	Monitor	Mitigate	Mitigate

* A transition response may be appropriate for limited areas within each locality

Adaptation actions

1. Shire-wide initiatives

- Community stewardship program
- Growing adaptive capacity
- Monitoring program

2. Planning updates

- Land use planning
- Disaster management

3. Modifying infrastructure

- Build resilience
- Relocate infrastructure

4. Coastal management and engineering

- Dune protection
- Beach nourishment
- Structures to assist with sand retention
- Last line of defence structures
- Structures to minimise flooding

FACT SHEET:
COASTAL ADAPTATION

RESILIENT COAST

DOUGLAS SHIRE COUNCIL

BUILDING A RESILIENT COAST

At the interface of the catchment and ocean, the coastal zone will continue to be prone to periodic impacts from coastal hazards such as storm tide inundation and short and long-term erosion processes. As changes to our climate occur, these impacts are expected to become more severe. Councils and communities can work together to build the resilience of the coastline and adapt to change.

A resilient coast has social, economic and environmental systems in place to avoid, manage and mitigate the impact of hazardous events or disturbances. Resilience also means the ability to respond or reorganise in ways that maintain the essential function, identity and values of a region.

HOW CAN WE ADAPT?

There are a range of ways we can adapt to change in the coastal zone. Across each region, broad adaptation responses include:

- Avoid the hazards (or retreat)
- Accommodate change (moderate intervention)
- Hold the line / defend (major intervention)

For each of these broad responses there are a range of adaptation actions that can be used to avoid, manage and mitigate the risk of coastal hazards. There are:

FACT SHEET:
COASTAL ADAPTATION

RESILIENT COAST

DOUGLAS SHIRE COUNCIL

EXAMPLE ADAPTATION OPTIONS

1. **Updates to landuse planning**

Updates to landuse planning may include:

- Identifying appropriate areas for new development (residential, commercial), and new critical infrastructure (e.g. roads, hospitals)
- Tailoring specific uses for flood and erosion prone areas (e.g. sporting fields, open space and parklands, conservation zones)
- Planning for agriculture, industry, and ecosystem changes
- Updating emergency response planning.

EXAMPLE ADAPTATION OPTIONS (CONTINUED)

3. **Coastal engineering**

The range of coastal engineering adaptation options include:

Dune protection and maintenance

Dune protection and maintenance involves limiting disturbance to dunes and protecting/enhancing dune vegetation to increase the stability of the dunes.

The dune system is the beach's natural defence to coastal hazards. The foredunes dissipate wave energy and protect the land behind from impacts of erosion and storm tide. Vegetation across the dunes traps windblown sand and enhances the ability of dunes to rebuild after storm activity. Vegetation plants can be tailored to each site, and with consideration of other needs (e.g. views, access).

Beach nourishment

Beach nourishment involves importing additional sand to increase the volume of sand on the beach. Sand can be sourced from off-shore, quarries or other sources. Beach nourishment is typically combined with dune maintenance, to enhance the level of protection against erosion and storm tide levels.

Beach nourishment has the benefit of providing increased protection from coastal hazards while maintaining the natural values of the beach and coastline.

Structures to assist with sand retention

Structures can be installed to assist with retaining sand in a specific area of the shoreline. Usually combined with beach nourishment and dune maintenance, these structures typically take the form of one or many groynes that extend perpendicular to the long-shore sand transport.

Groynes will accumulate sand to the side where sand moves towards the groyne. Groynes are typically made of rock, wood, or geo-fabric bags.

Structures to assist with off-shore energy dissipation

Structures can be installed off-shore to create a zone where wave energy will break and dissipate prior to reaching the beach. These structures include breakwaters and artificial reefs. Natural off-shore reefs such as those present along the Douglas Shire Coastline already provide this benefit for many beaches.

Last line of defence structures

Structures such as seawalls can be used to protect critical assets where other coastal engineering options are not considered to be feasible. Seawalls provide an artificial barrier between the ocean and adjacent coastal land, and protect the coastal assets behind the wall from erosion. Seawalls are typically made of rock, concrete or geo-fabric bags, and can be designed as buried revetments or exposed walls.

A seawall is a hard barrier to wave energy. Unlike a dune system, a seawall has limited capacity to dissipate (spread out and absorb) energy when it hits the wall. As a result, waves reflect off the seawall and scour sand away from the base (or toe). The presence of a seawall can often result in a complete loss of the high tide sandy beach. The appropriateness of seawalls is considered on a site by site basis.

Structures to minimise coastal flooding

Structures such as dikes and levees can be used to keep floodwaters from entering specific areas. Dikes and levees are artificially elevated mounds or walls that can be made of earth, rock, concrete, geo-fabric bags or other materials. The presence of dikes and levees can be either part of an emergency planning approach, or more permanent features as part of a drainage network.

ADAPTATION OBJECTIVES INCLUDE TO:

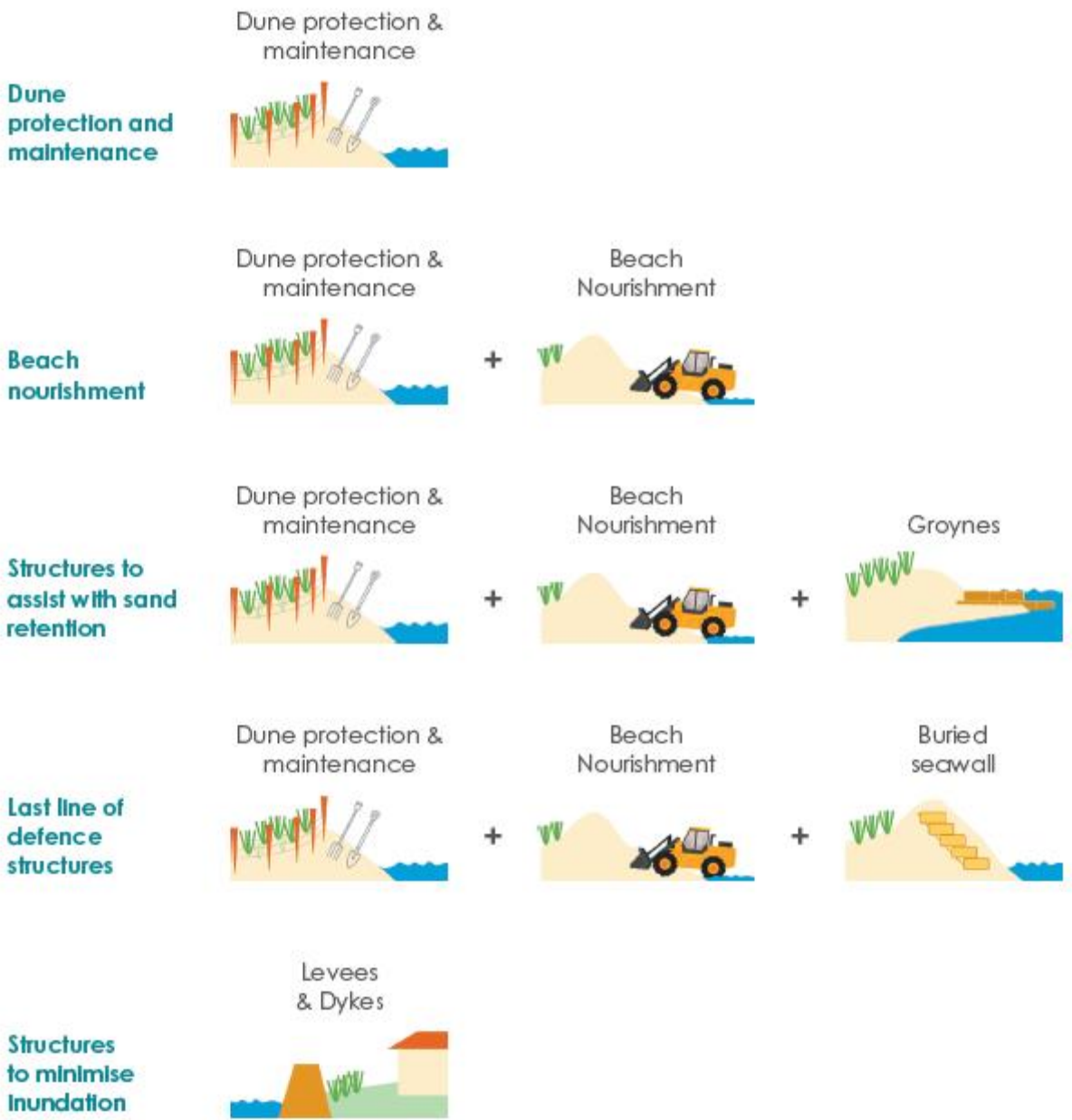
- Retain the natural beauty of the coast
- Limit adverse impacts on scenic amenity
- Protect important ecosystems
- Protect important rainforests, vegetation and tree canopies (especially north of the Daintree River)
- Maintain access to the region
- Minimise potential impacts on tourism
- Protect significant, protected and sensitive areas (environment and biodiversity)
- Retain sandy beaches
- Maintain access to beach and assets
- Limit impact on assets and infrastructure (including new developments) within hazard zone (particularly south of the Daintree River)
- Retain arable land (cane farming).

These objectives provide a reference for considering the suitability of different coastal hazard adaptation options across the Douglas Shire.

Actions and sequencing informed by technical, engagement, and economic inputs

	Dune protection and maintenance			Open Coast Erosion		
	Dune Protection & Maintenance			Last line of defence structures		
	Present day	2060	2100	Beach nourish	Buried seawall	
Degarra	●	●	●	○	○	○
Cowle Point	●	●	●	○	○	○
Cape Tribulation	●	●	●	○	○	○
Thornton Beach	●	●	●	○	○	○
Cow Bay and Cape Kimberley	●	●	●	○	○	○
Wonga Beach	●	●	●	●	●	●
Rocky Point	●	●	●	●	●	●
Newell	●	●	●	●	●	●
Cooya Beach	●	●	●	●	●	●
Port Douglas and Craiglie	●	●	●	●	●	●
Pebbly Beach	●	●	●	○	○	○
Oak Beach	●	●	●	●	●	●
Wangetti	●	●	●	○	○	○
South of Wangetti	●	●	●	○	○	○

Douglas Shire example



Format of the strategy



4 RESILIENT COAST STRATEGIC PLAN

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Adaptation actions

Council/region-wide initiatives



Putting the green back into the Daintree

Glenis Ghidella

VOLUNTEERS dug deep to revegetate one of the world's oldest rainforests. Conservation organisation Daintree Life hosted their first community tree planting day in Cow Bay.

Daintree Life co-founder Corinne Kerr said they were grateful for the turnout. "It was absolutely heart-warming and amazing," she said. "It was hard work but it's worth the effort because we see so much wildlife come through the land we want to plant on."

"Planting on these disused service roads will expand the national park, add habitat for the wildlife and beautify the area. It's magical to drive through a tunnel of trees."

A total of 1058 trees were planted on the day.

Daintree Life said the revegetation project will also eliminate weeds.

The group work closely with Douglas Shire Council and source native trees locally. The next planting day is at Cow Bay on Sunday, January 13, 2019. For more details visit www.daintreelife.com.au.



Volunteers, including Douglas Shire mayor Julia Leu and councillor David Carey, who helped plant trees on an old disused service road in Cow Bay. Picture: SUPPLIED

Theme	Strategic action no.	Description	2020 Priority strategic actions (completed within 5 – 10 years)
1. Shire-wide Initiatives	1.1 Community stewardship program	Develop programs and partnerships to enhance stewardship of the coastline.	1.1.1 Establish program / officer role 1.1.2 Establish and implement dune protection and maintenance program utilising a mix of Council and volunteers' time 1.1.3 Seek co-funding / resources for further initiatives.
	1.2 Knowledge sharing	Facilitate knowledge sharing and education on hazards and adaptation.	1.2.1 Identify networks / forums for knowledge sharing (internal and external) 1.2.2 Generate communication materials (on Strategic Plan implementation) 1.2.3 Facilitate training / education workshops / events 1.2.4 Co-ordinate cross-agency information sharing. 1.2.5 Promote collaborative partnerships to pursue initiatives for integrated catchment and coastal management (rivers, estuaries, coastline) 1.2.6 Promote collaborative partnerships to pursue initiatives for integrated coast and marine management (coastline, marine environment and ecosystems, fisheries) 1.2.7 Promote cross-sector partnerships and initiatives to enhance resilience and strategic adaptation for agriculture 1.2.8 Promote cross-sector collaboration to improve understanding of future coastal hazard implications for local native species and ecosystems, including terrestrial, freshwater and marine environments.
	1.3 Monitoring	Monitor changes in coastal hazard risk and effectiveness of adaptation.	1.3.1 Establish photo point monitoring system (coast snap or similar) at key areas 1.3.2 Create a platform / process for data management 1.3.3 Develop monitoring / evaluation metrics for implementation of actions, and effectiveness of actions (also a potential post-graduate student project) 1.3.4 Establish drone survey (elevation and aerial imagery) monitoring (every 5 – 10 years), or other tailored monitoring and reporting needed to inform adaptive management and the 10-year planning scheme review.

Adaptation actions – by location



Figure 12. Locality map – Wonga Beach.

Wonga Beach	Present day	2060	2100
Adaptation response	Mitigate	Mitigate	Mitigate*
Adaptation actions			
1. Shire-wide initiatives	As per Shire-wide actions		
2. Planning updates	As per Shire-wide actions Focus action 2.1.2: Review zoning and development approval conditions for un-developed land with existing approvals Focus action 2.1.3: Clarify implications for future development approvals and conditions Focus action 2.1.4: Develop approach/triggers for a transition response for targeted areas		
3. Modifying infrastructure	As per Shire-wide actions Focus action 3.1.2: Promote Resilient homes		
4. Coastal management and engineering	As per Shire-wide actions		
4.1 Dune protection and maintenance	Implement as part of Shire-wide program		
4.2 Additional open coast erosion mitigation works (if required)	N/A	Develop a SEMP and implement erosion mitigation works.	
4.3 Additional protection from tidal and storm tide inundation (if required)	N/A	Undertake concept design and implement inundation protection works	
Potential average annual damages from coastal hazards (to be mitigated)	\$0.5M	\$4M	\$22M

* A transition response may be appropriate for limited areas

Strategy implementation

- Implementation context & adaptive management
- Change management
- Monitoring and evaluation



Key learnings

Reflections on what works well

1. Communication and engagement:
 - Engage early, make an ongoing process
 - Set up partnerships
 - Seek values / synergies.
2. Technical investigations:
 - Aim for leading practice
 - Create a tailored approach that is fit for purpose and best value for Council
 - Understand how the technical work can/will be informed by engagement
 - Understand how the technical work can/will underpin strategic decisions.
3. Strategic planning
 - Tailor the adaptation language (strategic response, actions)
 - Include Council-wide as well as location specific actions
 - Do the economics
 - Seek partnerships to implement.



And at the end –
celebrate!

