

# 6. Coastal hazard adaptation actions

## Badu

### Community overview

Community	English name	Cluster	Type
Badu	Mulgrave	Western	Continental volcanic and granitic rock island

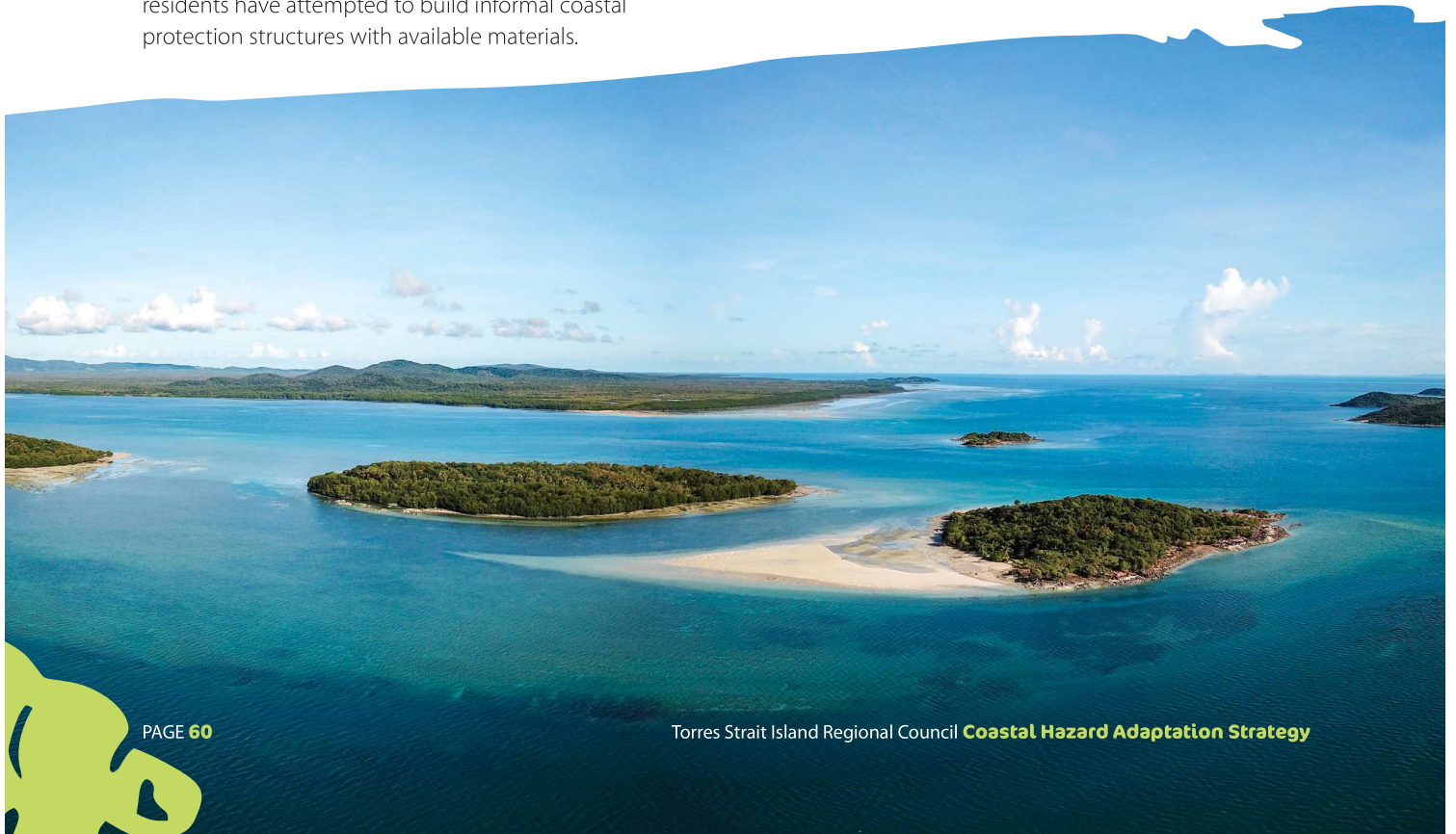
Badu, located in the western island cluster, has one of the largest communities within the Torres Strait region with an estimated population of 704 people (ABS, 2021). The island can be classified as a continental island with geology similar to that found on mainland Australia and is just over 100 km<sup>2</sup> in size.

The majority of the community live in the main township (Township 1) on the eastern side of the island, which is bracketed between an elevated headland to the south, and a relatively low lying area to the north. The location of Township 1 on the south-eastern corner of the island provides a level of protection from strong seasonal winds and waves as it is sheltered by Mua Island to the east. The main beach at Badu is approximately 2 km long, split into two compartments by a rocky reef in the vicinity of Church Street. There is a non-engineered seawall spanning the majority of the beach.

There is a small collection of properties on the western side of the island (Township 2) that have previously experienced coastal erosion, with evidence that local residents have attempted to build informal coastal protection structures with available materials.

Some of the key infrastructure in Badu include:

- Airport
- TSIRC office
- Tagai State School (Years Pre prep to 7)
- Health centre with permanent doctor
- Two grocery stores
- Badu Arts Centre
- Sporting Facilities - indoor and outdoor multipurpose courts, Sport Stadium
- Badu Island Foundation - Motel with 6 rooms
- Qld Police Services
- Barge ramp
- Power station
- Pier (small craft and passengers only)
- SES shed
- Water plant reservoirs/ filtration collection wells
- Aragon Child Care Centre



## Risk

The Badu community is currently considered low risk from coastal hazards, with the risk not significantly increasing within the planning horizon of this strategy.




### *Coastal hazards risk profile for Badu from present day to 2100*

Badu Risk Profile	Present Day	2050	2100
Open coast erosion	Low	Low	Low
Tidal inundation	Low	Low	Medium
Storm tide inundation	Low	Low	Medium

## Adaptation response

A strategic adaptation response has been developed for Badu to guide decision making over multiple planning horizons from present day to 2100. Based on the risk assessment and risk profiles for each hazard across the planning horizons, the adaptation response for Badu is to avoid creating new assets in hazard areas and maintain current assets, with the approach being implemented in the present day and into 2050. By 2100, increased risk will trigger the adaptation response to “monitor” through observing changes to individual asset’s capacity to withstand hazards and reviewing risk.

### *Adaptation response profile for Badu*

Present day	2050	2100
<b>Avoid (and maintain)</b> 	<b>Avoid (and maintain)</b> 	<b>Monitor (look and learn)</b> 

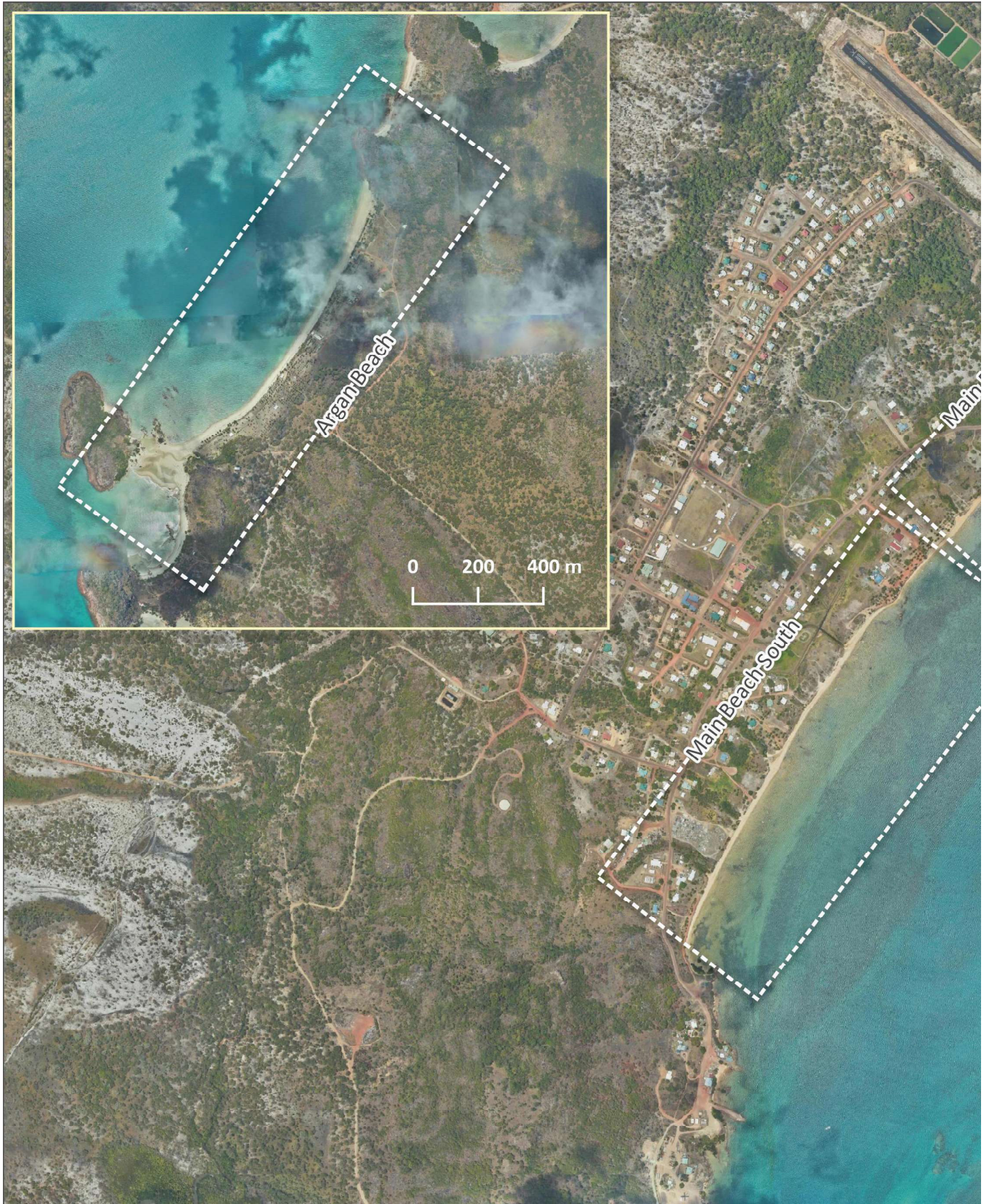
## Adaptation pathways and priority actions

Key Management Areas (KMAs) have been defined based on which areas are most at risk, as well as feedback from community leaders and are mapped below. Tailored adaptation pathways for each key management area on Badu are presented in the following pages.

Building on the outcomes of the risk assessment, adaptation response, and input from community leaders, specific priority adaptation actions have been developed to protect and enhance assets and coastal values in the Badu community, as well as enhance community stewardship and improve decision-making. These actions are designed to progress the community along its adaptation pathways.



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### MAIN BEACH NORTH

#### Overview of assets and values at risk

- The northern part of the main beach has several significant assets. The church is located in the centre behind a low rocky headland and there are a number of homes grouped together in the centre of this section of beach.
- At the northern end there is some localised erosion in the vicinity of a natural drainage outlet and around the end of the aerodrome.
- There is concern these assets could be impacted by both coastal erosion and inundation. The area is relatively low-lying, with open vegetation area.
- Attempts at informal erosion control by residents using coconuts in nets or discarded building material has largely been unsuccessful.
- There are several small streams along this section which cause erosion and scour behind the seawalls.



#### Pathway description

At Badu’s Main Beach North, the adaptation pathway starts with dune management. As trigger points are reached, the community may progress to importing sand for beach nourishment or engage in constructing bunds, levees, ground raising with drainage, seawalls or revetments. As time progresses, the community should lead ongoing custodianship and monitoring with the option to revisit the option of relocating or redesigning assets. In the meantime, the community should avoid new development in hazard-prone areas.

Badu – Main Beach North				Present Day	2050	2100
— Prepare	👁️ Ongoing monitoring and review	⏸️ Pause and review adaption actions		Avoid (and maintain)	Avoid (and maintain)	Monitor (look and learn)
➔ Implement	⚙️ Trigger for an additional action	🚫 Abandon existing action and seek alternative pathway		👁️	👁️	👁️
⋮ Transition	▶️ Start implementing					
Key management area adaptation actions and pathway						
Nature based coastal management		Dune management		👁️	👁️	👁️
		Import sand to nourish the beach				⏸️
Coastal engineering		New seawall or revetment				⏸️
		Seawall or revetment upgrade and filling gaps				⏸️
Transition		Relocate assets				⏸️
		Redesign for resilience				⏸️



## MAIN BEACH SOUTH

### Overview of assets and values at risk

- There is a non-engineered sea wall along main beach, south of Church Street. There are several breaks in the seawall, and at some of these breaks, the adjacent beach is beginning to erode towards the township.
- Key community assets identified along this stretch of beach are the old fish factory and the cemetery which is of key concern as it is a culturally significant site.
- At the northern end of this section, a drainage channel empties onto the beach. The channel is considered critical during storm events as it drains the low-lying areas around the township.
- Where the beach has no protection structure, previous erosion is evident, but the vegetation indicates it has not occurred recently.



### Pathway description

The adaptation pathway for Badu’s Main Beach South begins with dune management. As trigger points are reached, the community may progress to importing sand for beach nourishment or perform seawall and revetment upgrades. If further action is needed, new tide gates can be constructed. As time progresses, the community should lead ongoing custodianship and monitoring with the option to revisit the option of relocating or redesigning assets. In the meantime, the community should avoid new development in hazard-prone areas.

Badu – Main Beach South				Present Day	2050	2100
— Prepare		Ongoing monitoring and review		Pause and review adaption actions		
→ Implement		Trigger for an additional action		Abandon existing action and seek alternative pathway	Avoid (and maintain)	Monitor (look and learn)
⋮ Transition		Start implementing				
Key management area adaptation actions and pathway						
Nature based coastal management		Dune management				
		Import sand to nourish the beach				
Coastal engineering		Seawall or revetment upgrade and filling gaps				
		Tide gate				
Transition		Relocate assets				
		Redesign for resilience				



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## Badu

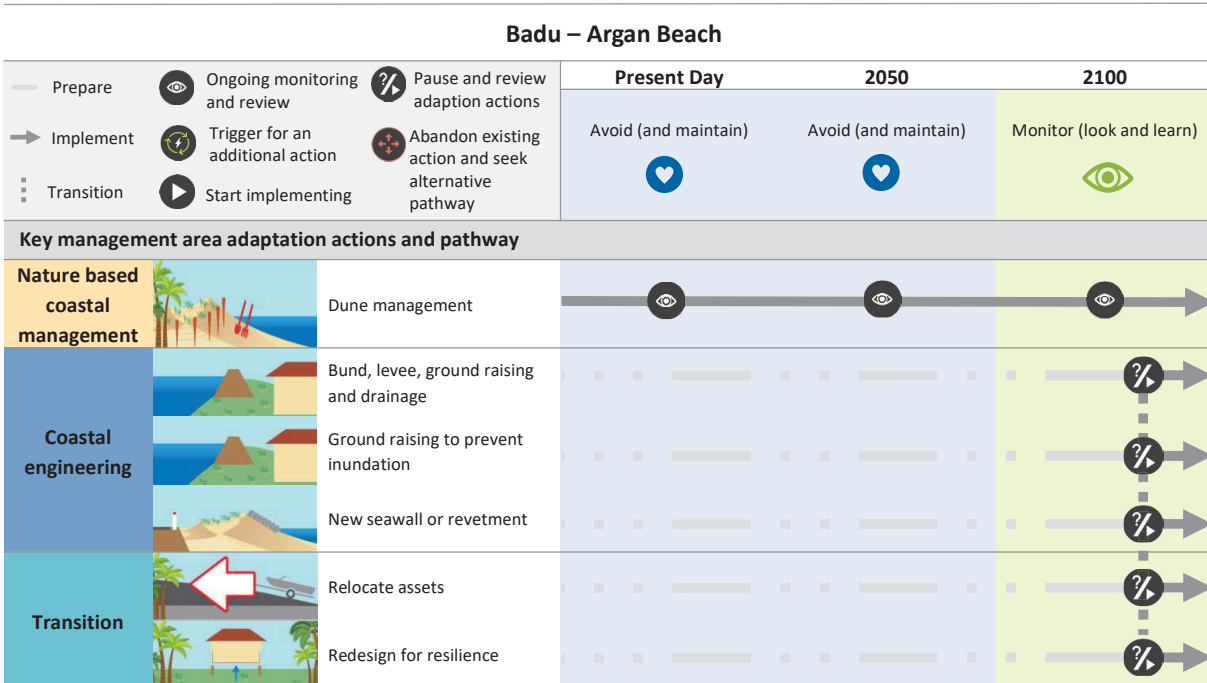
### ARGAN BEACH

#### Overview of assets and values at risk

- There are a few homes on the western side of the island at Argan Beach where the shore is exposed to wind and wave conditions. Some homes have experienced erosion and residents have tried to build informal protection structures using palm fronds and other available materials.

#### Pathway description

For Badu's Argan Beach, the initial adaptation action is dune management. Upon reaching trigger points, the pathway can include constructing bunds, levees, ground raising with drainage, seawalls or revetments. As time progresses, the community should lead ongoing custodianship and monitoring with the option to revisit the option of relocating or redesigning assets. In the meantime, the community should avoid new development in hazard-prone areas.



Badu Community Action Plan		Indicative cost
<b>1. Council-wide initiatives to enhance custodianship (Priority actions to be implemented within 10 years, and ongoing)</b>		
1.1. Community stewardship		
Badu1.1a	See Council wide actions. Consider how these actions can be effectively used in Badu.	
1.2. Education and knowledge sharing		
Badu1.2a	See Council wide actions. Consider how these actions can be effectively used in Badu.	
1.3. Monitoring		
Badu1.3a	See Council wide actions. Consider how these actions can be effectively used in Badu.	
<b>2. Planning updates (Priority actions to be implemented within 10 years, and ongoing)</b>		
2.1. Land use planning		
Badu2.1a	See Council wide actions. Consider how these actions can be effectively used in Badu.	
Badu2.1b	Consider establishment of a stone quarry to provide materials for coastal protection throughout the Torres Strait.	\$\$
2.2. Disaster planning		
Badu2.2a	See Council wide actions. Consider how these actions can be effectively used in Badu.	
<b>3. Resilient built environment (Priority actions to be implemented within 10 years, and ongoing)</b>		
3.1. Maintaining and improving infrastructure		
Badu3.1a	See Council wide actions. Consider how these actions can be effectively used in Badu.	
Badu3.1b	Consider relocation or redesign for resilience of buildings (in line with the Resilient Housing and Development Guidelines and Designs from action C3.1c) exposed to erosion in the Main Beach North KMA.	\$\$
<b>Badu Community Action Plan</b>		<b>Indicative cost</b>
<b>4. Nature based coastal management (see adaptation pathways for timing)</b>		
4.1 Dune, mangrove and reef protection and enhancement		
Badu4.1a	Identify degraded dunes in all Key Management Areas. Protect and enhance them using local knowledge and Zaget Torateti, including the use of native dune plants, and other stabilising vegetation. Manage access for an appropriate time period to allow vegetation to establish.	\$
4.3 Beach nourishment		
Badu4.3a	Consider small scale beach nourishment or sand scraping to enhance degraded dunes in front of key assets such as houses in Main Beach North KMA and the cemetery in Main Beach South KMA. Supplement with dune restoration and access management, see action Badu4.1.a.	\$\$
<b>5. Coastal engineering (see adaptation pathways for timing)</b>		
5.3 Last line of defence structures		
Badu5.3a	Continue to monitor and maintain existing coastal protection structures in KMA Main Beach South, near the barge ramp, and in front of airstrip, and develop plan to upgrade where needed.	\$\$
Badu5.3b	As part of the adaptation pathway in the Main Beach North KMA and Main Beach South KMA, consider the construction of a coastal protection structure to protect exposed houses and cemetery. This action should not occur before Badu3.1b, Badu4.1a and Badu4.3a are considered.	\$\$\$





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Adaptation theme	Adaptation option	Action ID	2023 Priority strategic actions (completed within 5 – 10 years)	Indicative cost	Timing	Priority
1. Council-wide initiatives to enhance custodianship	1.1. Community stewardship	C1.1a	Establish a coastal resilience officer position within Council who will have responsibility over implementing the Zenadth Kes CHAS. This position will support Council's Climate Change Adaptation and Environment Committee and work closely with communities, across council and with other state and commonwealth agencies, streamlining and facilitating collaboration and effective implementation of adaptation actions.	\$\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.1. Community stewardship	C1.1b	Seek co-funding/resources for further initiatives through grants and stakeholder partnerships.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.1. Community stewardship	C1.1d	Promote coastal custodianship in the youth and future generations with community coast care events. These should weave in cultural knowledge and the idea of Zagat Torateti. They can also include art, communication, and science programs focused on coastal resilience.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.1. Community stewardship	C1.1e	Establish and implement a dune and foreshore protection and maintenance program incorporating Zagat Torateti, access management, and community education. Support local communities in implementing this program.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.1. Community stewardship	C1.1f	Develop a dune and wetland vegetation seed bank for vegetation restoration efforts, involving Traditional Owners, Indigenous Land and Sea Rangers and schools.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.2. Education and knowledge sharing	C1.2a	Develop a Zenadth Kes CHAS - Communication and Engagement Strategy. This will support Council in working with communities to raise awareness of and implement their Community Adaptation Plans. This will use creative and innovative communication channels, leveraging emerging community leaders and content creators. It will outline the appropriate level and protocols of engagement and consultation needed for a range of adaptation actions. Ideally, this communication and engagement strategy should not stand alone but be integrated with Council's existing engagement policies and practices so that its relevance for all current and future development and supporting community resilience is continuously acknowledged.	\$	Ongoing	High

Adaptation theme	Adaptation option	Action ID	2023 Priority strategic actions (completed within 5 – 10 years)	Indicative cost	Timing	Priority
1. Council-wide initiatives to enhance custodianship	1.2. Education and knowledge sharing	C1.2b	Develop locally and culturally appropriate educational materials about coastal processes, climate change, monitoring and adaptation with a focus on nature based management and innovative and island-appropriate design and development. Integrate these materials into the implementation of the Zenadth Kes CHAS - Communication and Engagement Strategy (action C1.2a).	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.2. Education and knowledge sharing	C1.2c	Work with organisations like the TSRA, CSIRO, Universities, Non-Profits, and the Torres Strait Climate Centre of Excellence to support further research and innovation into coastal hazard and climate change adaptation.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.2. Education and knowledge sharing	C1.2d	Continue to advance partnerships and collaboration with Traditional Owners to further consider needs and aspirations for Aboriginal and Torres Strait Islander People in coastal hazard adaptation.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.2. Education and knowledge sharing	C1.2e	Promote cross-sector partnerships and initiatives to enhance resilience and strategic adaptation for transport infrastructure, including boating infrastructure.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3a	Develop a tailored integrated monitoring and reporting program to inform future adaptation. Incorporates actions C1.3b-h.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3b	Undertake drone survey (elevation and aerial imagery) monitoring of beaches.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3c	Undertake underwater coral reef surveys to map the extent and condition. Explore the use of photogrammetry to create detailed 3D models of reefs.	\$\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3d	Establish a network of water level gauges throughout the TSIRC regions. Train community members to operate and maintain them.	\$\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3e	Undertake regular coastal protection structure condition assessments.	\$	Ongoing	High

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1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3f	Establish a monitoring program for sites of cultural significance that measures indicators such as spiritual/social value, archaeological value, physical condition, and protection of sites.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3g	Establish a system of Citizen Science photo monitoring points (CoastSnap, Fluker Post or similar) at beaches in the area.	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3h	Create a platform/process with Council for monitoring data storage and management	\$	Ongoing	High
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3i	Undertake detailed sediment supply and transport studies for coral cay islands and lagoons.	\$\$	Within 5 years	Medium
1. Council-wide initiatives to enhance custodianship	1.3. Monitoring	C1.3j	Review and further examine the sediment dynamics around TSIRC communities and the shoreline including: <ul style="list-style-type: none"> <li>· Geomorphic assessment</li> <li>· Hydrodynamic modelling</li> <li>· Shoreline Erosion Management Plan.</li> </ul> Linked to C1.3i	\$	Ongoing	High
2. Planning updates	2.1. Land use planning	C2.1a	Submit updated Erosion Prone Area layers to State Government for formal update to the existing State-wide mapping.	\$	Immediate	High
2. Planning updates	2.1. Land use planning	C2.1b	Use the updated Erosion Prone Area and storm tide mapping and outcomes of the Zenadth Kes CHAS in current and future Planning Scheme and Master Plan updates to inform decisions on development areas and strategic land use planning.	\$	Ongoing	High
2. Planning updates	2.1. Land use planning	C2.1c	Consider implications (within Council) of the Strategy for future development approvals and conditions, including: <ul style="list-style-type: none"> <li>· Approval conditions for lots of undeveloped land, and</li> <li>· Implications for future development approvals and conditions.</li> </ul>	\$	Ongoing	High
2. Planning updates	2.2. Disaster management	C2.2a	Use the updated Erosion Prone Area and storm tide mapping, risk assessment and economic implications to update the TSIRC Local Disaster Management Plan. Ensure local community input is used to inform the updated plan.	\$	Within 5 years	Medium
2. Planning updates	2.2. Disaster management	C2.2b	Review the long-term adequacy of evacuation and shelter facilities and evacuation routes, including evacuation by land and sea.	\$	Ongoing	High

Adaptation theme	Adaptation option	Action ID	2023 Priority strategic actions (completed within 5 – 10 years)	Indicative cost	Timing	Priority
3. Resilient built infrastructure	3.1. Increasing infrastructure resilience	C3.1a	Review at-risk infrastructure (from CHAS data outputs) and embed risks into current asset management plans/Master Plan (this could include 'betterment' at critical asset refurbishment/renewals points).	\$	Ongoing	High
3. Resilient built infrastructure	3.1. Increasing infrastructure resilience	C3.1b	Review access road renewals and upgrades (prioritisation), and upgrade design requirements and timing of upgrades.	\$	Ongoing	High
3. Resilient built infrastructure	3.1. Increasing infrastructure resilience	C3.1c	Produce "Resilient Housing and Development Guidelines and Designs" tailored to the Torres Strait Islands. This should cater to all island types. Community knowledge holders, elders and leaders should be heavily consulted for this process.	\$\$	Ongoing	High
3. Resilient built infrastructure	3.1. Increasing infrastructure resilience	C3.1d	Consult with utility providers on future services and upgrades, and implications of coastal hazard areas.	\$	Ongoing	High
3. Resilient built infrastructure	3.1. Increasing infrastructure resilience	C3.1e	Audit stormwater assets in areas subject to erosion and inundation, and develop plan to upgrade in line with refurbishment/renewals points.	\$\$	Ongoing	High
3. Resilient built infrastructure	3.2. Relocate infrastructure	C3.2a	Develop "Priority Asset Relocation and Redesign Guidelines" to assist communities in developing island specific relocation strategies. Community knowledge holders, Elders, other leaders and young people should be heavily consulted for this process. Factors to consider include:  Approvals Native Title Hazards Master Plan Town Planning	\$	Immediate	High

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4. Nature-based coastal management	4.1. Dune, mangrove and reef protection and enhancement	C4.1a	Support local communities in re-establishing, rehabilitating, or protecting coastal dunes	\$	Ongoing	High
4. Nature-based coastal management	4.1. Dune, mangrove and reef protection and enhancement	C4.1b	Support local communities in re-establishing, rehabilitating, or protecting mangroves	\$	Ongoing	High
4. Nature-based coastal management	4.1. Dune, mangrove and reef protection and enhancement	C4.1c	Support local communities in re-establishing, rehabilitating, or protecting coral reefs	\$	Ongoing	High
4. Nature-based coastal management	4.1. Dune, mangrove and reef protection and enhancement	C4.1d	Scope the feasibility and priority locations for natural reef enhancement activities, requiring comprehensive knowledge of the latest scientific findings and methodologies to ensure effective implementation and multiple benefit outcomes.	\$\$	Within 5 years	Medium
4. Nature-based coastal management	4.2. Living shorelines	C4.2a	Develop a detailed "Living Shorelines Design and Implementation Plan" to prioritise and support the communities where a living shoreline has been determined as a feasible option.	\$\$	Within 5 years	Medium
4. Nature-based coastal management	4.2. Living shorelines	C4.2b	Develop a detailed "Artificial Reef Design and Implementation Plan" to prioritise and support the communities where an artificial reef has been determined as a feasible option.	\$\$	Within 5 years	Medium
4. Nature-based coastal management	4.3. Beach nourishment	C4.3a	Develop a detailed "Beach Nourishment Design and Implementation Plan" to prioritise and support the communities where beach nourishment or sand management has been determined as a feasible option.	\$\$	Within 5 years	Medium

Adaptation theme	Adaptation option	Action ID	2023 Priority strategic actions (completed within 5 – 10 years)	Indicative cost	Timing	Priority
5. Coastal engineering	5.1. Structures to reduce coastal hazards	C5.1a	Continue to implement the Seawall Project.	\$\$\$	Ongoing	High
5. Coastal engineering	5.1. Structures to reduce coastal hazards	C5.1b	Continue to monitor and maintain existing coastal and flood protection structures.	\$\$\$	Ongoing	High
5. Coastal engineering	5.1. Structures to reduce coastal hazards	C5.1c	Audit coastal and flood protection assets, and develop plan to upgrade where needed.	\$	Ongoing	High

