

# 6. Coastal hazard adaptation actions

## Erub

### Community overview

Community	English name	Cluster	Type
Erub	Darnley	Eastern	Continental volcanic and granitic rock island

Erub, located in the eastern cluster of Torres Strait islands, is home to approximately 326 people (ABS, 2021). It is a volcanic island just under 6 km<sup>2</sup> in size, generally surrounded by reef. As the main township is located on the south-western edge of the island, coastal erosion risk is increased by the movement of currents and waves around the island which are predominately caused by the Sager winds (south-east trade winds). The Kuki (north-west winds) can also lead to waves refracting around the island. The wave conditions are reduced in some areas by the extensive fringing reefs extending to the southeast of the island.

Most residential property is located along the southern coastline, with additional infrastructure around the aerodrome to the north-east. The majority of the island is above +5m Australian Height Datum (AHD), including the aerodrome. However, the residential properties and supporting infrastructure is in close proximity to the coastal fringe, which is at increased risk to coastal hazards.

Some of the key infrastructure on Erub includes:

- Airport
- Regional council office
- State school (years pre-prep to 6)
- Health centre with permanent nurse
- One grocery store (IBIS)
- Sporting facilities - very large indoor and outdoor multipurpose courts, rugby league oval
- Demountable accommodation - 15 rooms, adjacent to airport
- Guest house - 5 rooms
- Council workshop/ compound
- Water plant reservoirs/ filtration collection wells
- Power station
- Barge ramp
- Pier (small craft and passengers only)
- Sewer treatment plant



## Risk

The Erub community is presently at low to medium risk from inundation and high risk from erosion, with many of the mapped assets located in the coastal fringe. The inundation risk is expected to increase however the topography of the island may provide more elevated areas to relocate assets which can help to reduce this risk.

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

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

## Adaptation response

A strategic adaptation response has been developed for Erub 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 Erub is to actively manage identified risks, through a range of initiatives including education, nature based and structural engineering solutions. The adaptation approach is to be implemented from present day and also moving forward into 2050 and 2100.

### *Adaptation response profile for Erub*

Present day	2050	2100
<p><b>Actively manage</b></p> 	<p><b>Actively manage</b></p> 	<p><b>Actively manage</b></p> 

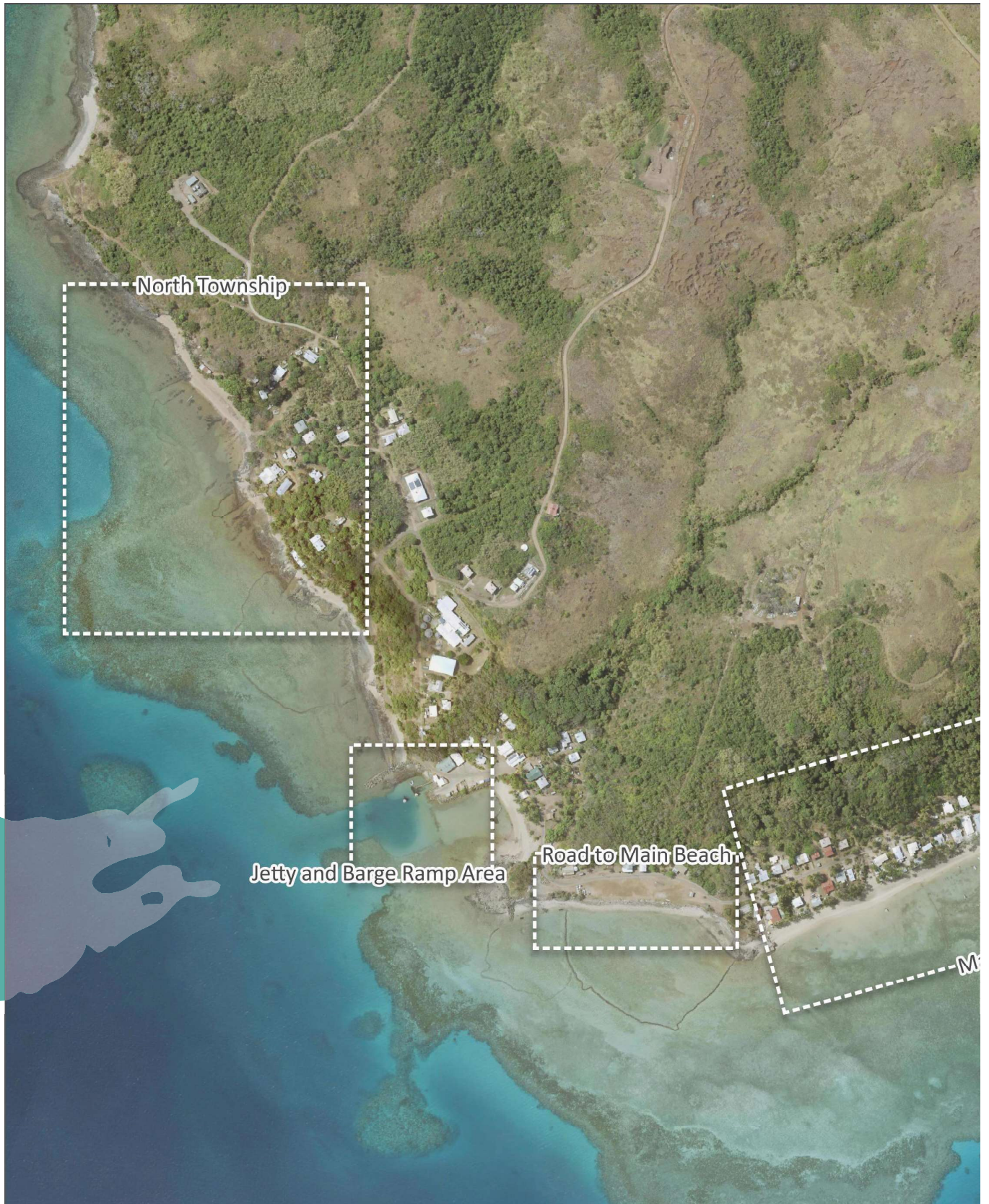
## Adaptation pathways and priority actions

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 Erub 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 Erub 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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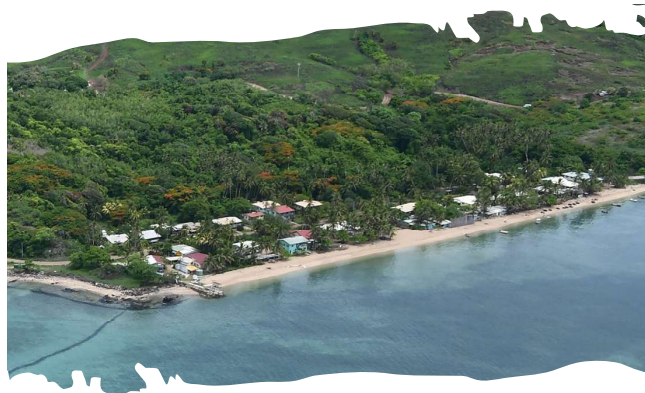
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## Erub

### MAIN BEACH

#### Overview of assets and values at risk

- The Main Beach faces southeast and there is evidence of erosion in the past.
- There have been attempts at erosion control in the past using available materials.
- Evidence of inundation at high tides is apparent and the study found this area may also be impacted under permanent inundation due to sea level rise and storm tide inundation in the future.
- Specific areas the community has expressed concerns about in the past are the main community beaches in front of Egrue, and Isem.
- Residents have expressed concern about an old rubbish dumping site they say is now experiencing erosion east of Isem Village. The community is concerned about the environmental impacts of erosion at the site.



#### Pathway description

At Erub Island's Main Beach, initial active management actions can focus on dune management using vegetation management techniques in three key locations. As trigger points are reached, the community can import sand to nourish the beach to compliment dune management at the three strategic locations. In addition, existing seawalls and revetments can be upgraded and gaps filled, or new sea walls or revetments can be constructed to provide further protection. If needed, tide gates can be installed at two locations for additional protection. 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.

Erub – Main Beach

		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	Actively manage 	Actively manage 	Actively manage 
⋮ Transition	Start implementing Abandon existing action and seek alternative pathway			
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			
	Tide gate			
Transition	Relocate assets			
	Redesign for resilience			



## JETTY AND BARGE RAMP AREA

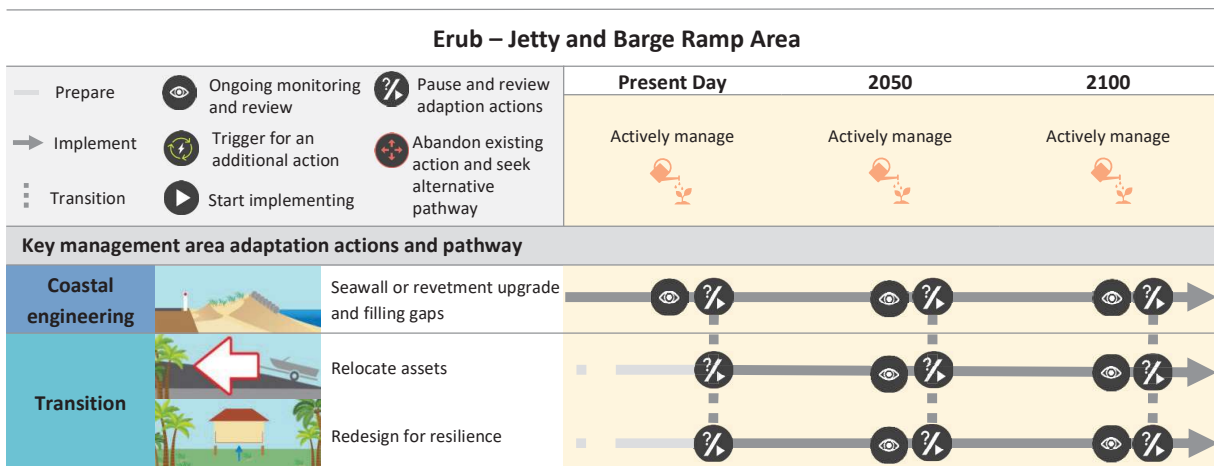
### Overview of assets and values at risk

- Adjacent to the landing is Jetty Beach, which has some small buildings along its length.
- This area experiences inundation and erosion during large tides.
- This area of beach has also had significant historical issues with scour erosion from streams and surface water runoff.
- This type of erosion can move sand out of the beach system and impact sediment balance.
- The study found barge and jetty area may be impacted due to sea level rise inundation and storm tide inundation in the future.



### Pathway description

In the Jetty and Barge Ramp Area on Erub Island, active management can involve upgrading existing seawalls and revetments and filling gaps to provide better coastal protection against hazards. 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.



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## Erub

### ROAD TO MAIN BEACH

#### Overview of assets and values at risk

- There has been a history of erosion of the beach adjacent to the road, threatening transport infrastructure and connectivity along the coastline.



#### Pathway description

In the Road to Main Beach area on Erub Island, initial actions can involve dune management using vegetation management techniques. As trigger points are reached, the community can opt to upgrade existing seawalls or revetments and fill gaps to further secure the area from erosion and inundation. 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.

Erub – Road to Main Beach				
		Present Day	2050	2100
— Prepare	👁️ Ongoing monitoring and review			
➔ Implement	⚡ Trigger for an additional action	Actively manage	Actively manage	Actively manage
⋮ Transition	▶ Start implementing			
	⏸️ Pause and review adaption actions			
	🚫 Abandon existing action and seek alternative pathway			
Key management area adaptation actions and pathway				
Nature based coastal management	Dune management	👁️	👁️	👁️
Coastal engineering	Seawall or revetment upgrade and filling gaps	👁️ ⏸️	👁️ ⏸️	👁️ ⏸️
Transition	Relocate assets	⏸️	👁️ ⏸️	👁️ ⏸️
	Redesign for resilience	⏸️	👁️ ⏸️	👁️ ⏸️

## NORTH TOWNSHIP

### Overview of assets and values at risk

- The sewer infrastructure, although inland, could be vulnerable to sea level rise inundation and storm tide inundation in the future.
- Residents have expressed concern about an old rubbish dumping site they say is now experiencing erosion east of Isem Village. The community is concerned about the environmental impacts of erosion at the site.



### Pathway description

In the North Township on Erub Island, initial efforts can centre on dune management through vegetation management at two locations. As trigger points are reached, the community can opt to upgrade existing seawalls or revetments and fill gaps to further secure the area from erosion and inundation. 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.

Erub – North Township				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		Actively manage 	Actively manage 	Actively manage 
⋮ Transition	Start implementing					
Key management area adaptation actions and pathway						
<b>Nature based coastal management</b>		Dune management				
<b>Coastal engineering</b>		Seawall or revetment upgrade and filling gaps				
<b>Transition</b>		Relocate assets				
		Redesign for resilience				





## 6. Coastal hazard adaptation actions

Erub 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		
Erub1.1a	See Council wide actions. Consider how these actions can be effectively used in Erub.	
1.2. Education and knowledge sharing		
Erub1.2a	See Council wide actions. Consider how these actions can be effectively used in Erub.	
1.3. Monitoring		
Erub1.3a	See Council wide actions. Consider how these actions can be effectively used in Erub.	
<b>2. Planning updates (Priority actions to be implemented within 10 years, and ongoing)</b>		
2.1. Land use planning		
Erub2.1a	See Council wide actions. Consider how these actions can be effectively used in Erub.	
Boigu2.1b	Consider re-establishment of a stone quarry to provide materials for coastal protection throughout the Torres Strait	\$\$
2.2. Disaster planning		
Erub2.2a	See Council wide actions. Consider how these actions can be effectively used in Erub.	
<b>3. Resilient built environment (Priority actions to be implemented within 10 years, and ongoing)</b>		
3.1. Maintaining and improving infrastructure		
Erub3.1a	See Council wide actions. Consider how these actions can be effectively used in Erub.	
Erub3.1b	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 and North Township KMAs.	\$\$



Erub Community Action Plan		Indicative cost
<b>4. Nature based coastal management (see adaptation pathways for timing)</b>		
4.1 Dune, mangrove and reef protection and enhancement		
Erub4.1a	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.	\$
4.2 Living shorelines		
Erub4.2a	Explore feasibility of an artificial reef to enhance fringing reef resilience, bolstering natural sediment supply and dissipating wave energy.	\$\$
4.3 Beach nourishment		
Erub4.3a	Monitor beach profiles in the Main Beach, Road to Main Beach, and Jetty and Barge Area KMAs and consider beach nourishment or sand scraping to enhance degraded dunes in front of key assets. Supplement with dune restoration and access management, see action Erub4.1.a	\$\$
<b>5. Coastal engineering (see adaptation pathways for timing)</b>		
5.3 Last line of defence structures		
Erub5.3a	As part of the adaptation pathway in the Main Beach, Road to Main Beach, and Jetty and Barge Area KMAs, consider the construction of a coastal protection structure to protect exposed houses. This action should not occur before Erub3.1b, Erub4.1a and Erub4.3a 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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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	1.3. 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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Adaptation theme	Adaptation option	Action ID	2023 Priority strategic actions (completed within 5 – 10 years)	Indicative cost	Timing	Priority
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

