

6. Coastal hazard adaptation actions

lama

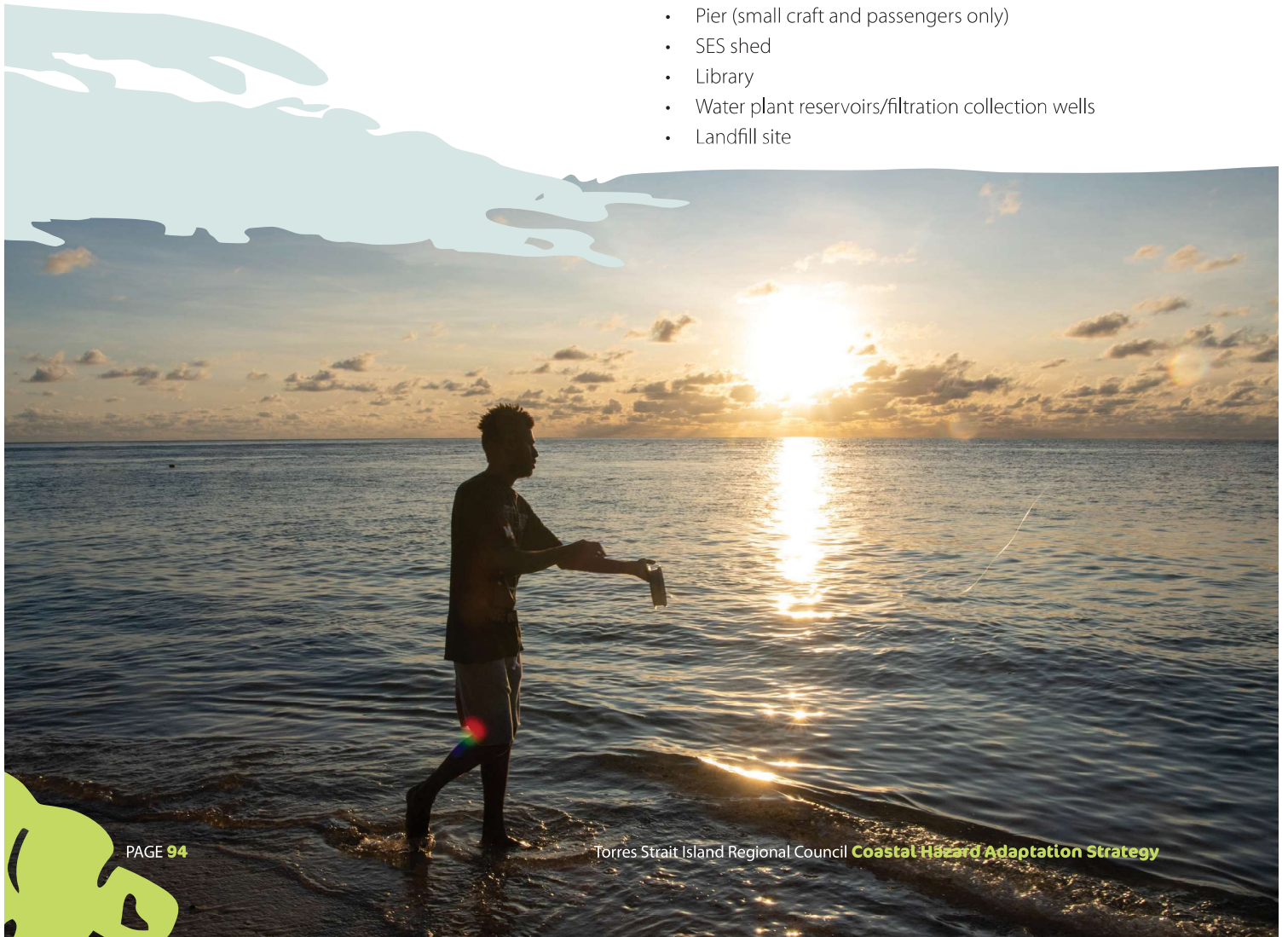
Community overview

Community	English name	Cluster	Type
lama	Yam	Central	Continental volcanic and granitic rock island

lama is part of the central cluster of the Torres Strait islands. The island is approximately 2 km² in size, with the population of 275 people (ABS, 2021) generally focussed in the main township on the western side of the island. The island is a continental type island that has mangrove forests extending to the north and east. Smaller islands to the northeast and east are connected by mangrove forests. There is a continuous fringing reef surrounding the island (broken only by the barge ramp access), which mitigates coastal erosion along some of the coastline. Much of the undeveloped interior of the island is steep, with construction activities inherently difficult due to the slope and geology.

Key infrastructure on lama includes:

- Airport
- Regional council office
- State school (years pre-prep to 7)
- Health centre with permanent nurse
- IBIS grocery store
- Sporting facilities - indoor and outdoor multipurpose courts, rugby league oval
- Guest house - five rooms
- Augustine Lodge - five rooms
- Barge ramp
- Workshop facility
- Power station
- Pier (small craft and passengers only)
- SES shed
- Library
- Water plant reservoirs/filtration collection wells
- Landfill site



Risk

lama is presently considered at medium-high risk from coastal hazards. Existing protection structures mitigate the threat from erosion however they will need to be upgraded in the future to maintain their function. Risk from storm tide inundation is high and expected to increase substantially in the medium to long term. Council's ongoing coastal protection works program has been occurring in parallel with development of this Strategy. New works, such as the seawall planned for 2023/24, have the potential to reduce the risk once constructed.




Coastal hazards risk profile for lama from present day to 2100

lama Risk Profile	Present Day	2050	2100
Open coast erosion	Medium	High	High
Tidal inundation	Medium	High	Very High
Storm tide inundation	High	Very High	Very High

Adaptation response

A strategic adaptation response has been developed for lama 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 present day adaptation response for lama is to actively manage identified risks, through a range of initiatives including education, nature based and structural engineering solutions. By 2050, the coastal hazard risk profile for some parts of lama may become too high and some active management options may no longer be feasible (due to economic or other factors), triggering a change into a 'transition' adaptation approach. At this time a broad range of adaptation options exist including engineering options, transition of current land use and relocating current assets to lower risk areas. A strategic decision will need to be made in consultation with the local community and consider the socio-economic, cultural and environmental values of the lama area. The 'transition' adaptation pathway approach will continue to be implemented in 2100.

Adaptation response for lama

Present day	2050	2100
Actively manage 	Transition and change 	Transition and change 

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 lama 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 lama 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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NORTHERN TOWNSHIP

Overview of assets and values at risk

- The northern end of the beach has a seawall of unknown design in place that is in a state of disrepair. At the northern termination of the seawall, erosion of the adjacent beach is causing washout from behind the seawall.
- There has also been concern over the seawall near the desalination plant (adjacent to barge ramp).
- Residents also commented during previous consultations that, during king tides, inundation can occur from the eastern side of the spit, as well as overtopping the seawall itself.
- Possible engineering solutions to assist with this are introducing a wave return wall to the northern seawall, with an earth embankment constructed on the eastern side to protect from inundation. Top up of the seawall near the desalination plant was also suggested during previous consultation.



Pathway description

In the northern township on Iama, initial actions can involve dune and mangrove management to increase natural resilience. Trigger points have been reached and there are plans in place to upgrade the existing seawalls and revetments, as well as a bund surrounding most of the township. Moving forward, the community will need to decide whether to continue to maintain and upgrade any new protection structures, relocate or redesign assets. Input into this decision will involve consideration of sea level rise, and island geomorphology and sediment dynamics. Ongoing custodianship and monitoring should be maintained, avoiding new development in hazard-prone areas.

Iama – Northern Township

			Present Day	2050	2100
— Prepare	Ongoing monitoring and review	Pause and review adaption actions	Actively manage 	Transition and change 	Transition and change
→ 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		Mangrove and dune management			
	Coastal engineering	Maintain existing seawall			
Upgrade seawall					
Bund, levee, ground raising and drainage					
Transition		Relocate assets			
		Redesign for resilience			

CENTRAL TOWNSHIP

Overview of assets and values at risk

- The back of the village has experienced inundation during king tides and storm tides in the past and now has a double line of defence. The low seawall (unknown design) facing the mangroves is considered the first line of defence to stop the majority of high tides running up onto the road.
- The second line is a seawall along the road installed to protect the community during king tides. The 'high tide' boat ramp is located here because of the protected location; however, the area is extremely low-lying and does not have substantial freeboard during a high tide. The high tide boat ramp is being increasingly used during rough conditions, as the community has advised the breakwater (unknown design) protecting the barge ramp (also community boat ramp) is not very effective. This is a safety issue for the community as small craft navigating around the northern spit, particularly at night, is hazardous.



Pathway description

In lama's central township, initial actions can focus on mangrove management. Trigger points have been reached and there are plans in place to construct a bund surrounding most of the township. Another option would be to establish a living shoreline – a hybrid approach that constructs protection and fosters the establishment and enhancement of mangroves. This may offer additional protection from inundation from the east, reducing the burden on the planned bund, however this might affect the utility of the boat ramp. Moving forward, the community will need to decide whether to continue to maintain and upgrade any new protection structures, relocate or redesign assets. Input into this decision will involve consideration of sea level rise, and island geomorphology and sediment dynamics. Ongoing custodianship and monitoring should be maintained, avoiding new development in hazard-prone areas.

lama – Central Township

			Present Day	2050	2100
— Prepare	Ongoing monitoring and review	Pause and review adaption actions	Actively manage	Transition and change	Transition and change
→ 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		Mangrove protection			
		Living Shoreline: Mangrove enhancement, with supporting offshore protection			
Coastal engineering		Bund, levee, ground raising and drainage			
Transition		Relocate assets			
		Redesign for resilience			



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SOUTHERN TOWNSHIP

Overview of assets and values at risk

- An improvised non-engineered seawall and an offshore breakwater have protected the southern beach from erosion processes to some extent.
- The key infrastructure being protected is the road along the shore leading to several residences at the southern end of the beach. Residents report the beach fluctuates throughout the year depending on the seasonal winds.

Pathway description

In the southern township on Iama, initial actions can involve dune management to increase natural resilience. Trigger points have been reached and there are plans in place to upgrade the existing seawalls and revetments, as well as a bund surrounding most of the township. Moving forward, the community will need to decide whether to continue to maintain and upgrade any new protection structures, relocate or redesign assets.



Input into this decision will involve consideration of sea level rise, and island geomorphology and sediment dynamics. Ongoing custodianship and monitoring should be maintained, avoiding new development in hazard-prone areas.

Iama – Southern Township

			Present Day	2050	2100
— Prepare	Ongoing monitoring and review	Pause and review adaption actions	Actively manage 	Transition and change 	Transition and change
→ 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	Mangrove and dune management				
	Import sand to nourish the beach				
Coastal engineering	Maintain existing seawall				
	Upgrade seawall				
	Bund, levee, ground raising and drainage				
Transition	Relocate assets				
	Redesign for resilience				

EAST ISLAND

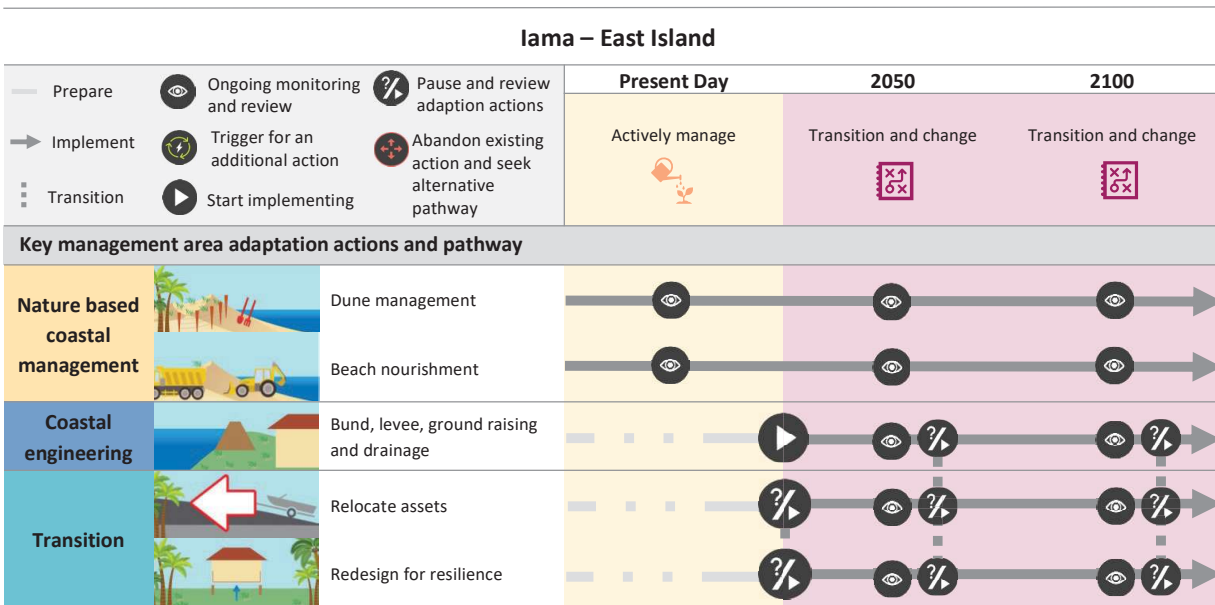
Overview of assets and values at risk

- This area is currently inundated during king tides and storm surges. This is a concern to the community as the infrastructure is at risk of being damaged during each monsoon season.
- The service area also leads to the sports stadium and eastern end of the aerodrome.
- With predicted increased inundation due to sea level rise and increased storm tide levels, this corridor may provide a path for water to impact further inland.



Pathway description

At lama's east island, the adaptation pathway begins with dune management on the beach. As trigger points are reached, the community can import sand to nourish the beach and manage erosion. For inundation, the community can implement ground raising measures along the roads and for key critical infrastructure. Moving forward, the community will need to decide whether to continue to maintain and upgrade any new protection structures, relocate or redesign assets. Input into this decision will involve consideration of sea level rise, and island geomorphology and sediment dynamics. Ongoing custodianship and monitoring should be maintained, avoiding new development in hazard-prone areas.



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lama Community Action Plan		Indicative cost
1. Council-wide initiatives to enhance custodianship (Priority actions to be implemented within 10 years, and ongoing)		
1.1. Community stewardship		
lama1.1a	See Council wide actions. Consider how these actions can be effectively used in lama.	
1.2. Education and knowledge sharing		
lama1.2a	See Council wide actions. Consider how these actions can be effectively used in lama.	
1.3. Monitoring		
lama1.3a	See Council wide actions. Consider how these actions can be effectively used in lama.	
2. Planning updates (Priority actions to be implemented within 10 years, and ongoing)		
2.1. Land use planning		
lama2.1a	See Council wide actions. Consider how these actions can be effectively used in lama.	
lama2.1b	Develop a "Priority Asset Relocation and Redesign Strategy" involving significant community consultation and input. This should identify potential new settlement zone on lama where a staged relocation of assets can occur. This plan should explore the opportunity for a "Floating Community", or an "Above Water Community".	\$\$
2.2. Disaster planning		
lama2.2a	See Council wide actions. Consider how these actions can be effectively used in lama.	
3. Resilient built environment (Priority actions to be implemented within 10 years, and ongoing)		
3.1. Maintaining and improving infrastructure		
lama3.1a	See Council wide actions. Consider how these actions can be effectively used in lama.	
lama3.1b	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 hazards in the Southern, Northern and Central Township KMAs.	\$\$



lama Community Action Plan		Indicative cost
4. Nature based coastal management (see adaptation pathways for timing)		
4.1 Dune, mangrove and reef protection and enhancement		
lama4.1a	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		
lama4.2a	Explore feasibility of an artificial reef to enhance fringing reef resilience, bolstering natural sediment supply and dissipating wave energy.	\$\$
4.3 Beach nourishment		
lama4.3a	Monitor beach profiles in the Southern Township, Northern Township and East Island 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 lama4.1.a.	\$\$
5. Coastal engineering (see adaptation pathways for timing)		
5.3 Last line of defence structures		
lama5.3a	Maintain and upgrade the sea wall in the Southern Township, Northern Township KMA, and near the barge ramp.	\$\$\$
5.4 Structures to minimise flooding		
lama5.4a	Proceed with plans to construct bunds around the township, cemetery, and East Island infrastructure.	\$\$\$



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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"> · Geomorphic assessment · Hydrodynamic modelling · Shoreline Erosion Management Plan. 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"> · Approval conditions for lots of undeveloped land, and · Implications for future development approvals and conditions. 	\$	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

