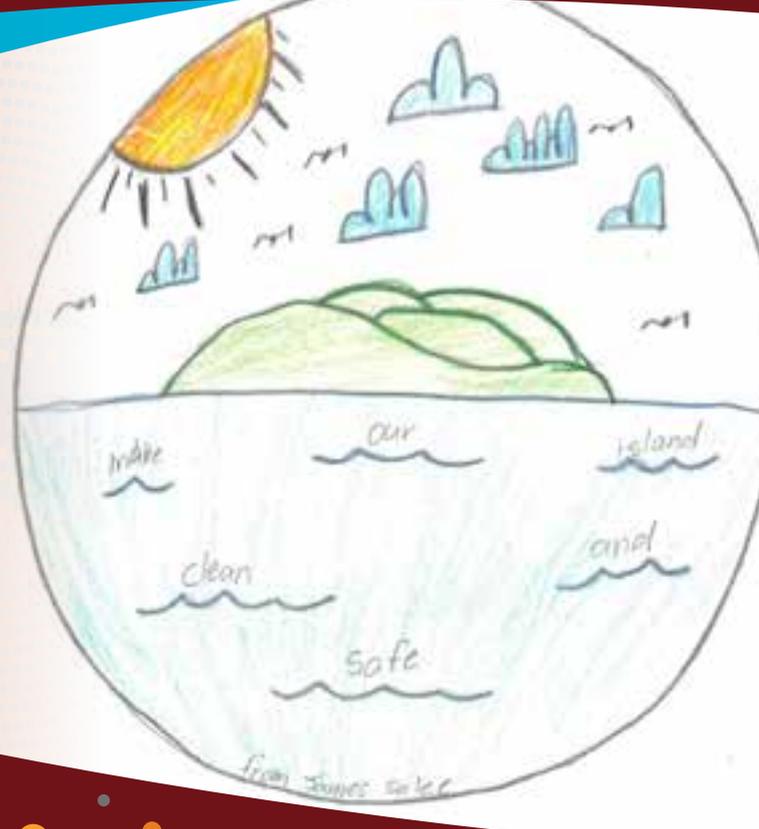


DRAFT

Yumpla Coast Strategic Plan 2021-2030

Coastal Hazard Adaptation Strategy

Make Yumpla Coast Clean and Safe



Acknowledgement to Country

We acknowledge the Anggamuthi, Atambaya, Wuthanthi, Yadaigana and Gudang Peoples as the Traditional custodians of the Northern Peninsula Area. We pay our respects to their Elders past, present and emerging.

We also acknowledge the connection to Country by all Aboriginal and Torres Strait Islander Peoples of this region and their role in caring for and maintaining Land and Sea Country over thousands of years.

Front Cover Artwork:

TOP - Torres Ransfield

BOTTOM - James Salee

Making Yumpla Coast Clean and Safe: Summary

Situated at the northern tip of the Australian mainland continent, the Northern Peninsula Area Regional Council's (NPARC) coastal areas are home to a unique landscape, history and people. Surrounded by tropical seas, with the Gulf of Carpentaria to the west, Torres Strait to the north, and the Coral Sea to the east, the Northern Peninsula Area is a truly distinctive country where both oceans and cultures mix and thrive together.

The communities of Injinoo, Umagico, Bamaga, New Mapoon and Seisia enjoy safe and easy access to the coast, maintaining important cultural connections to the sea. Fishing, hunting, and spending time by the water are valued activities. The coastal areas are also home to many culturally and ecologically important plants and animals such as sea turtles and dugong that are part of the unique and cherished ecosystem.

Coastlines are dynamic, ever-changing with each tide and storm event. Erosion and flooding by sea water (also referred to as storm tide inundation) are natural processes that have shaped and will continue to shape the coast into the future.

These processes are referred to as coastal hazards when they impact on how we use and enjoy the coast. The NPARC coast is prone to coastal hazard impacts, driven by tropical cyclones, storm events and annual trade or 'Kuki' winds. Coastal hazard impacts are predicted to increase with a changing climate.

The Queensland Government and Local Government Association of Queensland (LGAQ) provided funding to Queensland coastal councils to develop a strategic long-term approach to managing coastal hazards. With the funding awarded to NPARC, we have been able to develop this Coastal Hazard Adaptation Strategy – Yumpla Coast Strategic Plan.

The Yumpla Coast Strategic Plan enables us to be better prepared in the future to reduce the negative impacts of coastal hazards on our communities, environment, cultural values, infrastructure, liveability and essential services. This Strategy is designed to benefit the Northern Peninsula Area community both now and into the future (to 2100) so that our children and their children can maintain their connection to Land and Sea Country.

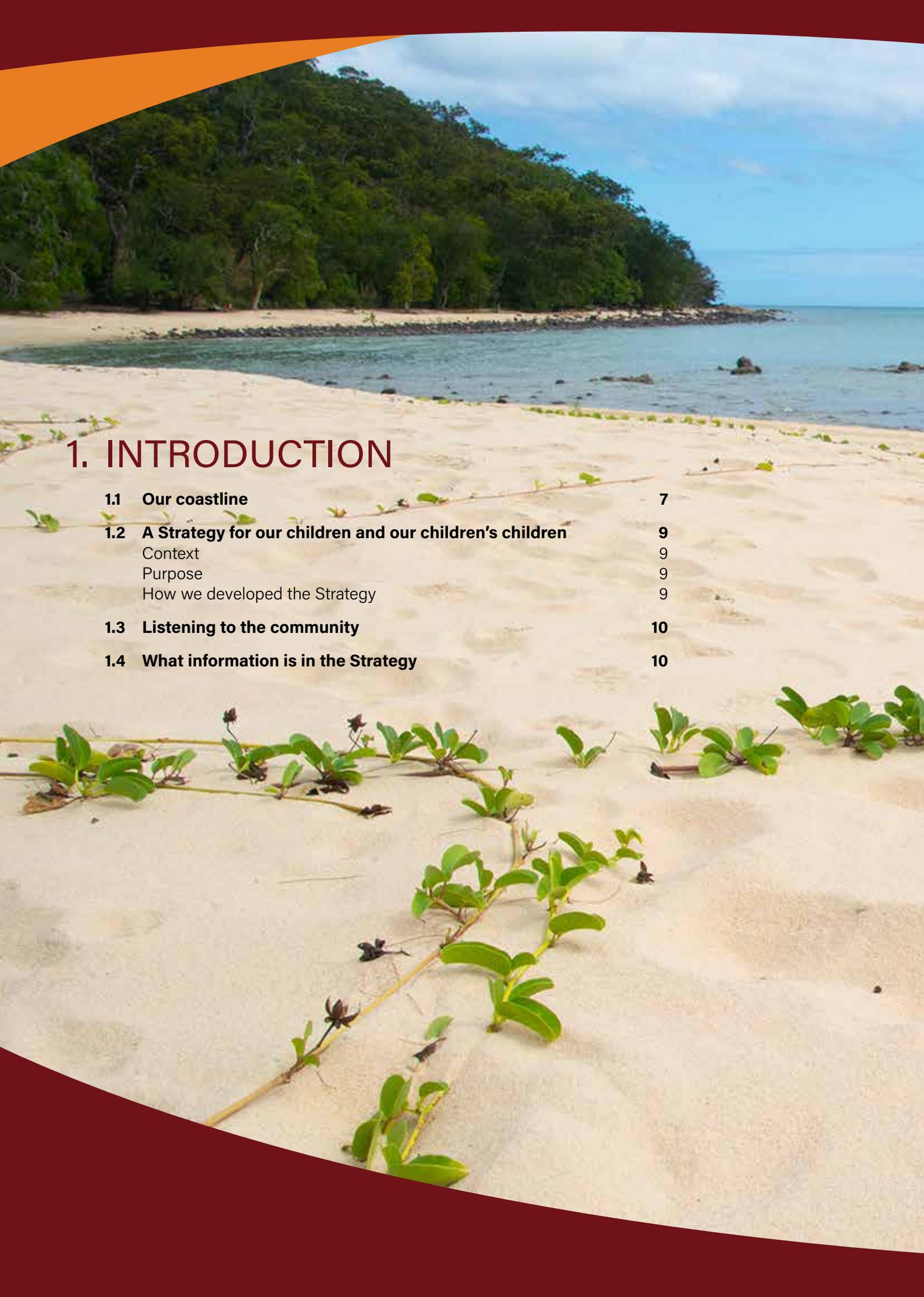
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1. INTRODUCTION

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1.1 Our coastline

The coastline of the Northern Peninsula Area Local Government Area extends over 280 km along the tip of Cape York Peninsula from Vrilya Point on the western side, to Somerset and the northern side of Jackey Jackey Creek on the eastern side. This includes key features such as Crab Island, the mouth of the Jardine River, and the communities of Injinoo, Umagico, Bamaga, New Mapoon and Seisia (Figure 1).

The coastal zone holds special significance for both the local community and visitors to the region.

The sandy beaches, rocky reefs, and mangrove lined shores are defining features of the coastal landscape, along with the Jardine River and numerous other local creeks. The coastline is also home to vulnerable and valuable ecosystems, including mangroves, saltmarsh and coastal wetlands.

The landscape has been shaped through the millennia by natural processes involving the wind, water and waves. The continual cycles of sand loss (erosion) and rebuilding (accretion) of the shoreline, and flooding of coastal areas by sea water and king tides, are all part of these natural processes. These processes are referred to as coastal hazards when they have the potential to impact on infrastructure, access, services, our lifestyle and the economy.



Figure 1. Northern Peninsula Area region LGA

The Northern Peninsula Area is the traditional home of the Angkamuthi, Atambaya, Wuthathi, Yadaigana and Gudang Peoples for many thousands of years. In more recent history, the region has also seen the migration of other displaced Aboriginal Peoples, and residents from Saibai and other Torres Strait islands who have already experienced the impacts of coastal hazards making it a both a rich cultural and ecological place of significance.

The coastal landscape has significant cultural, social and economic significance for the local community, who value the protection and sustainability of the Land and Sea Country.

Important environmental features of the Northern Peninsula Area coastline include:

- diverse coastal landscapes including sandy beaches, headlands, offshore reefs and sand bars
- high ecological significance freshwater and intertidal wetlands, seagrass and mangrove forests
- endangered or vulnerable wildlife who depend on the ocean and coastal zone for food, breeding and protection
- river and creek entrances
- healthy coastal dune systems.

Northern Peninsula Area communities are located on traditionally owned land under five Deeds Of Grant In Trust (DOGITs) where NPARC, as the local government, must provide certain services for operation on the land.

The DOGITs were granted by the Queensland Government in 1986 (1987 for Seisia) establishing the then councils (now NPARC) as trustees of the land (Figure 2). This arrangement has governance implications in matters such as leasing and development of land that may be subject to coastal hazards.

Tourism, and its associated businesses, is important to the Northern Peninsula Area economy and is highly dependent on a healthy coastline. Visitors travel to the region to visit Pajinka, also known as 'the Tip', as well as to experience the pristine beaches, diverse wildlife and world-renowned fishing. The estimated value of tourism to the region is \$3.6 million per annum and is an important contribution to the region's economy (NPARC 2021a).

Seisia Wharf is the main delivery point for freight to the region as transport via road is restricted. The Wharf is also used to transport passengers and goods to the neighbouring Torres Strait Islands. Approximately 30,000 passengers use the Wharf each year and between 1,500 and 2,500 tonnes of freight arrives per month (combined total of both freight companies and seasonally variable).

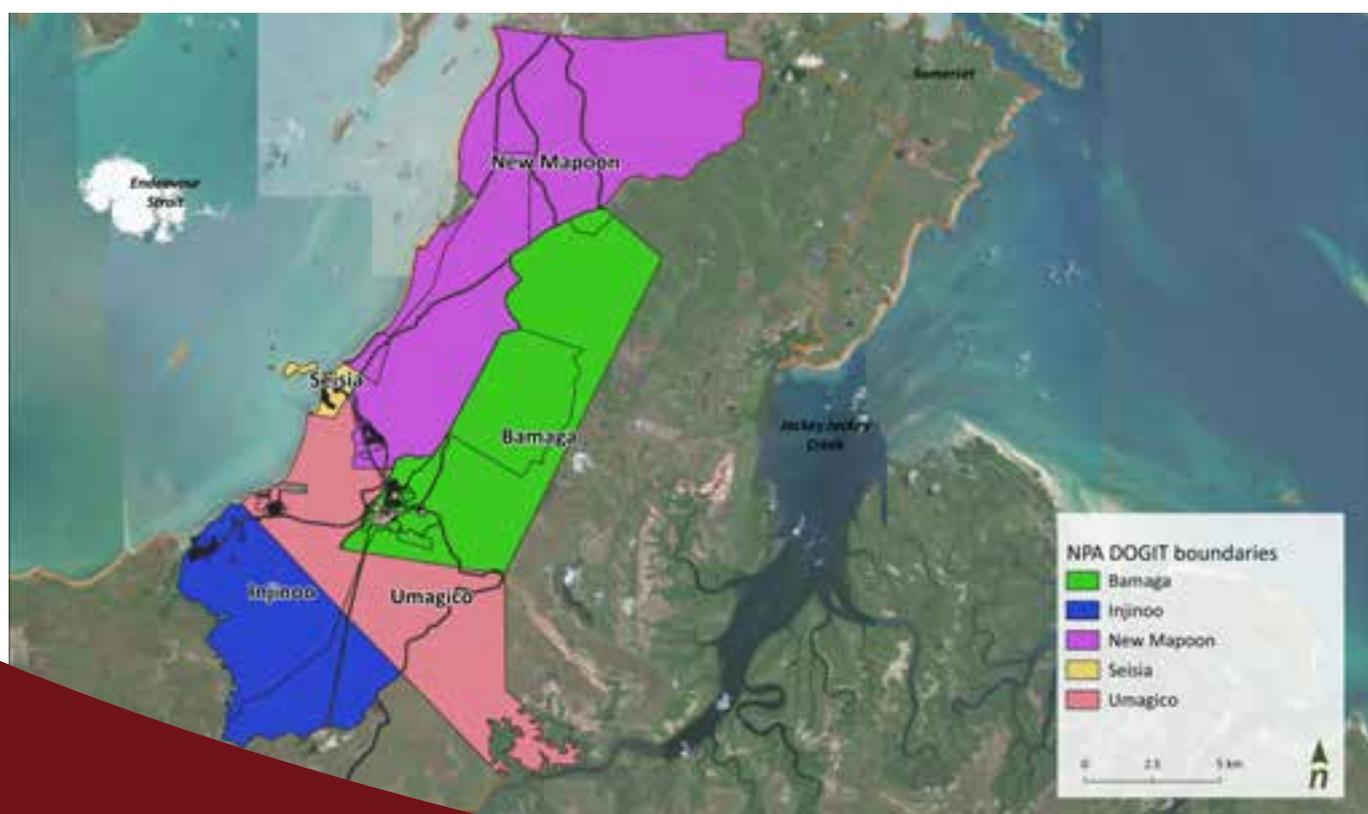


Figure 2. DOGIT areas in NPARC

1.2 A Strategy for our children and our children's children

Context

The QCoast₂₁₀₀ program is a state-wide initiative of the Queensland Government and Local Government Association of Queensland (LGAQ). Its purpose is to help coastal councils proactively plan for managing coastal hazard impacts, from present day to 2100.

The Northern Peninsula Area Regional Council was awarded funding through the QCoast₂₁₀₀ program to establish the Yumpla Coast Strategic Plan and develop a locally specific Coastal Hazard Adaptation Strategy (CHAS).

The Yumpla Coast Strategic Plan (the Strategy) has been:

- developed to proactively manage the impact of coastal hazards for our children and our children's children
- developed in close consultation with Council, Traditional Owner groups, and local stakeholders and community members
- tailored to include the whole coastal landscape and community.

Purpose

The purpose of Yumpla Coast Strategic Plan (and Coastal Hazard Adaptation Strategy) is to:

- inform future decisions regarding the protection and management of our coast and foreshore areas
- inform future land use and master planning
- guide the management of public utilities, facilities and services such as water supply, wastewater, roads and boat ramps
- inform the management of areas of environmental and cultural significance
- foster collaboration and the shared custodianship of our coastline.

How we developed the Strategy

The Yumpla Coast Strategic Plan has been developed using a specific process outlined in the QCoast₂₁₀₀ Minimum Standards and Guidelines (Figure 3).

The process has included a series of technical studies and activities that sought to:

- identify coastal hazard areas
- understand vulnerabilities and risks to local community assets and infrastructure (e.g. roads and boat ramps)
- engage with the community to understand their preferred approach to managing coastal hazards known as adaptation
- determine adaptation actions, costs, priorities, and timeframes for implementation.

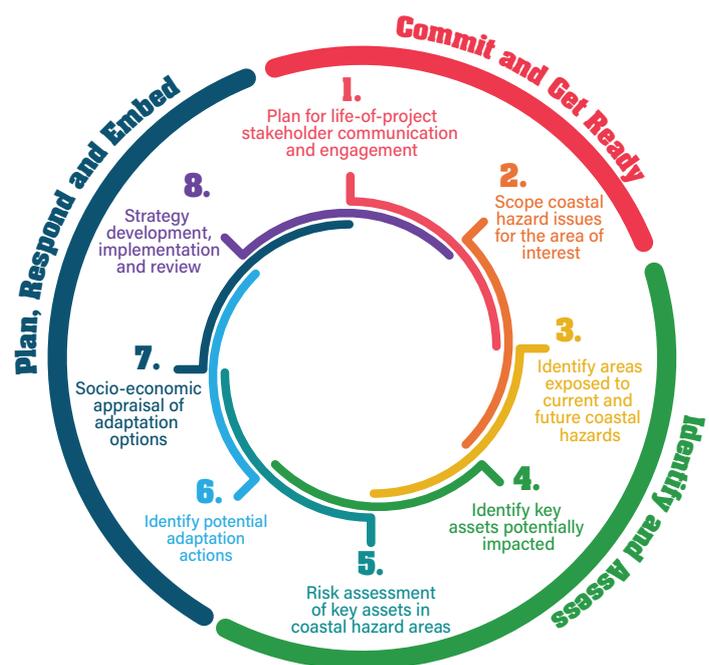


Figure 3. QCoast₂₁₀₀ process for developing a Coastal Hazard Adaptation Strategy

1.3 Listening to the community

The *Yumpla Coast Strategic Plan* has been informed by many conversations with Council, community leaders key stakeholder groups over a period of nearly 12 months in 2020-2021.

Many engagement activities were undertaken during the development of the Strategy including:

- targeted conversations with Councillors, Traditional Owners, community leaders and business owners
- an art and story competition with local school children to help create the Strategy logo
- community listening and pop-up events in November 2020 at multiple venues, including Umagico Hall, New Mapoon Hall, Injinoo Hall, Bamaga Indigenous Knowledge Centre and Seisia Knowledge Centre
- targeted conversations with Ipima Ikaya Aboriginal Corporation, Apudthama Land Trust, Angkamuthi Tribal Aboriginal Corporation and Gudang/Yadhaykenu Aboriginal Corporation in November 2020
- a four week public exhibition period in early 2021. The engagement activities and events were supported with a project specific web site <https://nparc.engagementhub.com.au/coastlines>, regular project updates as well as a series of tailored fact sheets relevant to coastal hazard adaptation.

The fact sheets are provided as Supplement A to this Strategy. The fact sheets include:

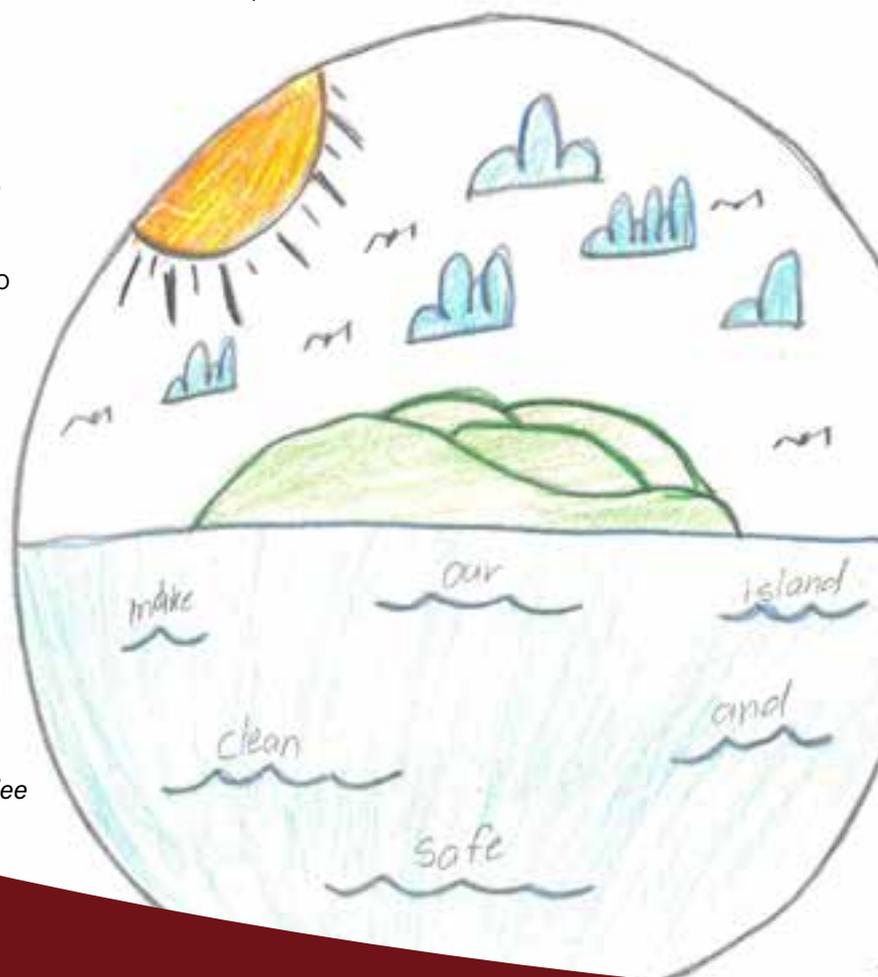
- Fact Sheet 1: What is a Coastal Hazard Adaptation Strategy
- Fact Sheet 2: Sand dunes
- Fact Sheet 3: Resilient homes.

Local radio, as well as Council's website and social media pages were used to publicise specific events, share information, and encourage participation.

1.4 What information is in the Strategy

The Strategy includes an overview of:

- coastal features that are important and meaningful to the local community (values)
- a description of the types of coastal hazards that may be experienced in the Northern Peninsula Area including areas that may be exposed in the future to erosion and flooding by sea water (or tidal inundation)
- the implications of this exposure (risk) including potential cultural, environmental and economic impacts
- Council's approach to managing these impacts and details on how the Council and community can adapt to future coastal hazards, including a framework for shared responsibilities, adaptation responses and options
- location summaries with specific adaptation actions for each community
- a plan for implementation and continual review and improvement.



Artwork: James Salee

2. A VISION FOR A CLEAN AND SAFE NORTHERN PENINSULA AREA COAST

- | | | |
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| 2.3 | What are our goals and aspirations for a clean and safe or resilient coast? | 14 |

Artwork: Isabella Morseu



During the development of the Strategy, the community were invited to:

- identify why the coast was important to them
- what their vision was for a 'clean and safe' or resilient coast
- what issues were currently a cause for concern.

This information provides that foundation of the Strategy, ensuring that the values and needs of the local community lie at the heart of future management and investment.

2.1 What is a resilient coast?

The coastline experiences constant and often rapid change. Wind, waves, tides and currents continually work to move sand and sediment to shape the shoreline. Extreme weather events such as tropical cyclones can periodically result in significant erosion and flooding by sea water. When these processes threaten local values, properties, or our local way of life, they can be considered coastal hazards.

A clean and safe resilient coast has social, economic and environmental strategies in place to avoid, and reduce the impact of hazardous events or disturbances (e.g. coastal hazards). These strategies are discussed in Section 4. Caring for our coast and keeping it clean and healthy increases the natural resilience of our coast. Understanding natural processes helps to avoid and reduce exposure to coastal hazards, making our beaches safer and more resilient.

Resilience also means the ability for the beaches and coastlines to respond to or reorganise in ways that maintain natural processes and the values of the region, while also being able to proactively adapt to change.

2.2 What the community values about their coastline

The rich and diverse community and landscape of the Northern Peninsula Area supports a number of interrelated values. Values are those aspects that the local community has identified as being important and meaningful to their lifestyle and wellbeing.

The coastal values identified by the local community are provided in Figure 4.

Opposite Page - Figure 4. What is important and meaningful to the Northern Peninsula Area community



RESILIENCE

Resilience is the ability for something to withstand stress and continue to function and recover from damage. Resilience applies to the coastal environment as well as the community. Resilience happens when coastal ecosystems are clean and healthy, and when the community is prepared and safe for coastal hazards.



What is important and meaningful to our people?

Healthy habitats and ecosystems that support important totem species and other native plants and animals

Access to plants and animals for harvesting, including culturally important bush tucker and medicinal plants



Maintaining traditional ways of life, connections to Land and Sea Country including traditional hunting and harvesting practices

Special meeting and 'story places' for men and women



Midden sites, unmarked burial sites and other sites of cultural significance

Churches, places of worship and cemeteries

Safe access and transport to surrounding areas and islands to visit family and other community services

Seasonal fishing and camping adjacent to the sea and beaches



Jobs and opportunities for young people to stay close to families and cultural connections

Safe housing and access to essential services during and following extreme events

Jobs and opportunities for local and regional economic growth

A strong sense of community, understanding and respect for traditional knowledge and cultural values



Safe housing and access to essential services during extreme events



2.3 What are our goals and aspirations for a *clean and safe* or resilient coast?

The goals and aspirations (Figure 5) of the community have informed the development of number of objectives for future coastal hazard adaption, management and investment. The goals and aspirations represent what the community want the coastline to look like for their children and their children's children.

Community concerns and threats to achieving these goals and aspirations have also been identified and will also help to prioritise the selection of adaptation options. The threats directly and indirectly relate to the risk of coastal hazards in the Northern Peninsula Area.

Sites of cultural significance are recorded and protected



Burial sites / cemeteries (marked and unmarked) are protected

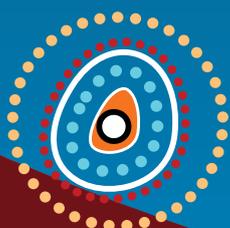


Continual connection and access to places of spiritual and cultural significance

Strong tourism industry / local economy



Clean healthy beaches



What a 'clean and safe' or resilient coastline will look like for our children and our children's children?



Access for boating and to traditional hunting and fishing sites



Access to beaches for huts, seasonal camping & fishing



Waterways, wetlands and ocean support healthy fisheries and aquatic wildlife



Genuine collaboration regarding the management of natural resources, community infrastructure and services.



Homes are built strong and can withstand natural disasters

Access to safe refuge and emergency services during natural disasters



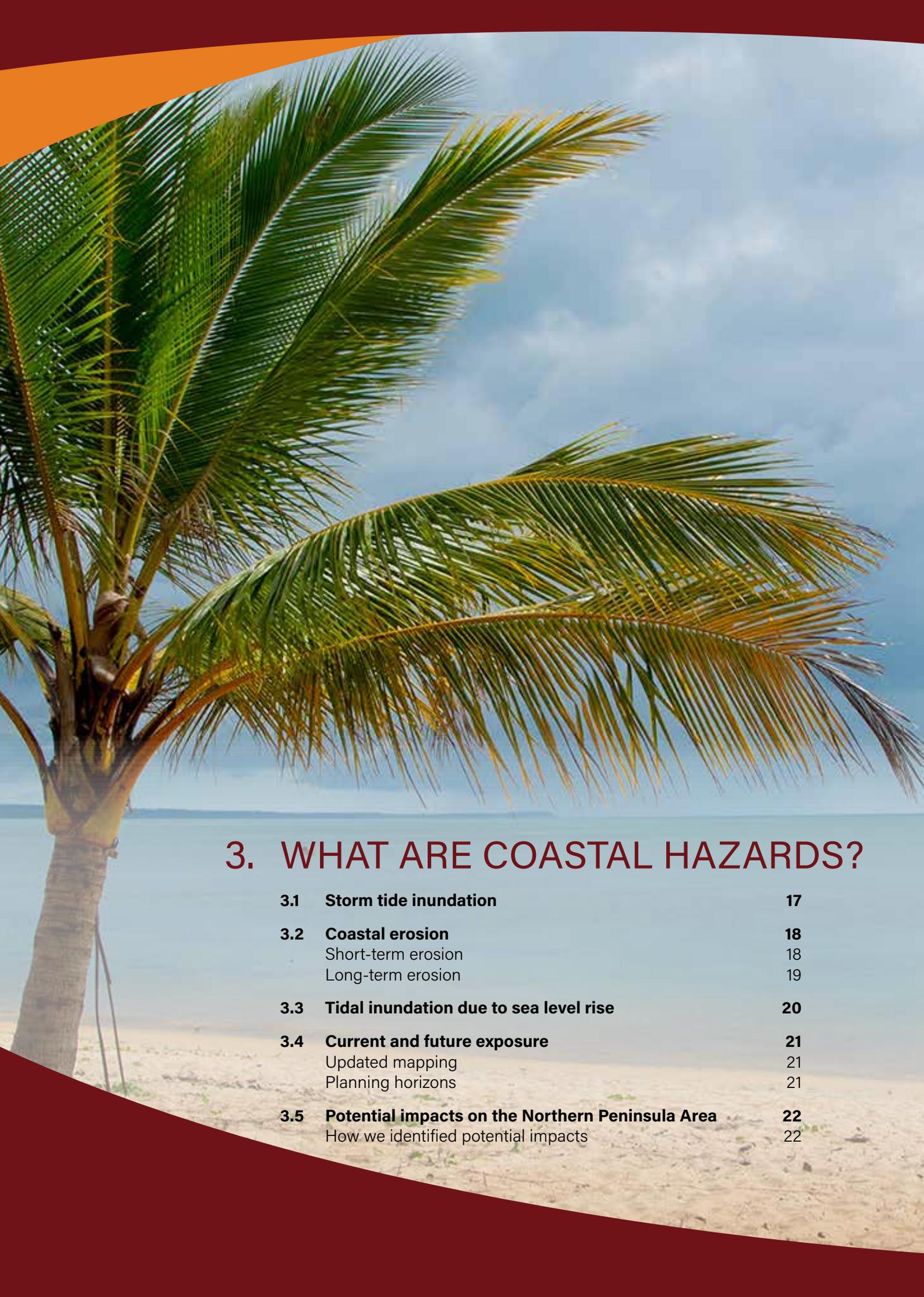
Beaches and coastal habitats protected including for wildlife nesting, refuge and feeding



Protection of natural resources and local environments to ensure sustainable fishing and tourism industries.



Figure 5. Northern Peninsula Area coastal goals and aspirations



3. WHAT ARE COASTAL HAZARDS?

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Coastal hazards include temporary flooding of low-lying coastal land (storm tide inundation), and/or erosion of the shoreline (both short-term and long-term).

Inundation and erosion are natural processes that contribute to shaping the unique landforms of our coast. However, when these processes have an adverse impact on communities, infrastructure and some natural assets, they are considered coastal hazards. In the Northern Peninsula Area, major coastal hazard impacts are typically associated with monsoon weather patterns and tropical cyclones.

3.1 Storm tide inundation

Storm tide inundation is the temporary flooding of low-lying coastal land from a locally raised sea level (the 'storm tide'). The storm tide is a combination of the normal tide, storm surge, and wave action (Figure 6). Storm surge is driven by the low atmospheric pressure and high winds associated with events such as tropical cyclones.

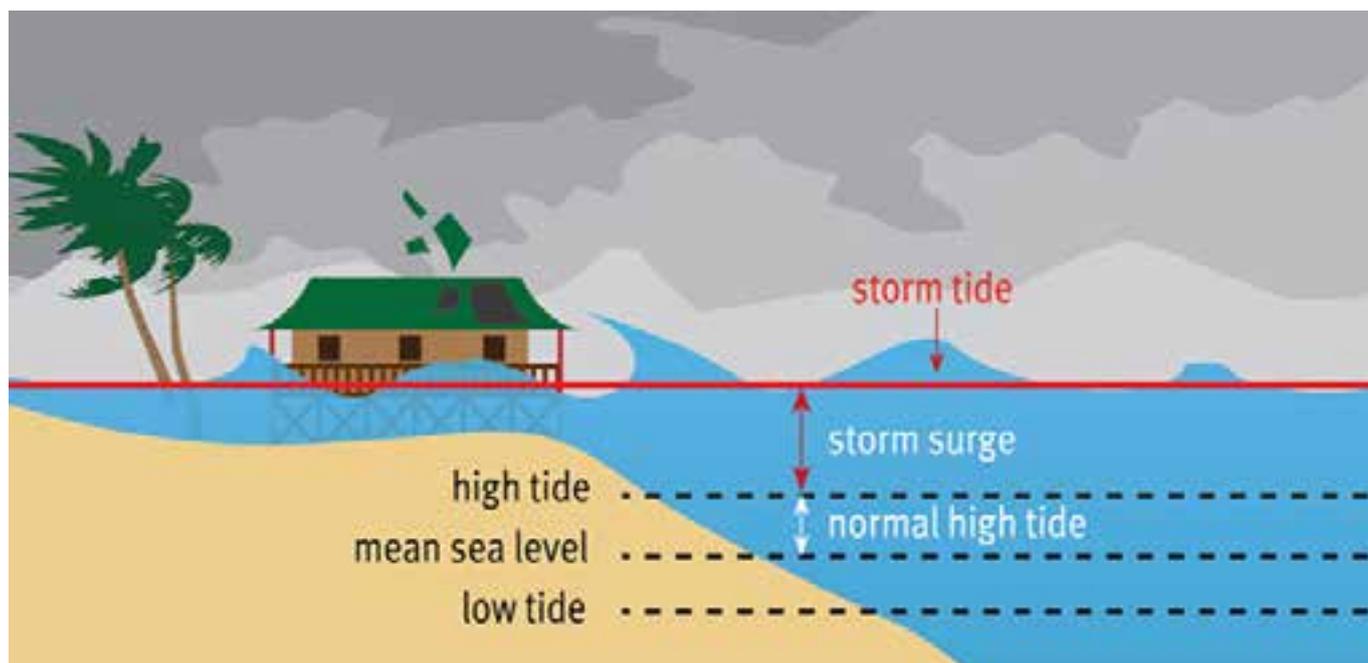


Figure 6. Components of storm tide (Source: coastadapt.com.au)



COASTAL HAZARDS

Coastal hazards are when natural coastal processes threaten local values, properties, or our local way of life. Some coastal hazards include storm tide inundation, erosion, and tidal inundation.

STORM TIDE INUNDATION

Storm tide inundation is when big storms cause temporarily higher water levels leading to flooding of normally dry land. Storm tide inundation is often accompanied by big waves and strong winds which together can cause widespread destruction.

3.2 Coastal erosion

Coastlines naturally erode and accrete periodically over time, driven by sediment supply, tidal currents and waves.

Short-term erosion

Coastal erosion occurs when winds, waves and coastal currents take sand away from the shoreline. This can be a temporary change, often associated with storm activity (termed storm bite), and the beach will then gradually rebuild (Figure 7).

When a beach is stable, all the sand moved offshore during a storm eventually moves back onto the beach (potentially taking months to years). In this case, short-term beach erosion does not result in a long-term landward movement of the shoreline.

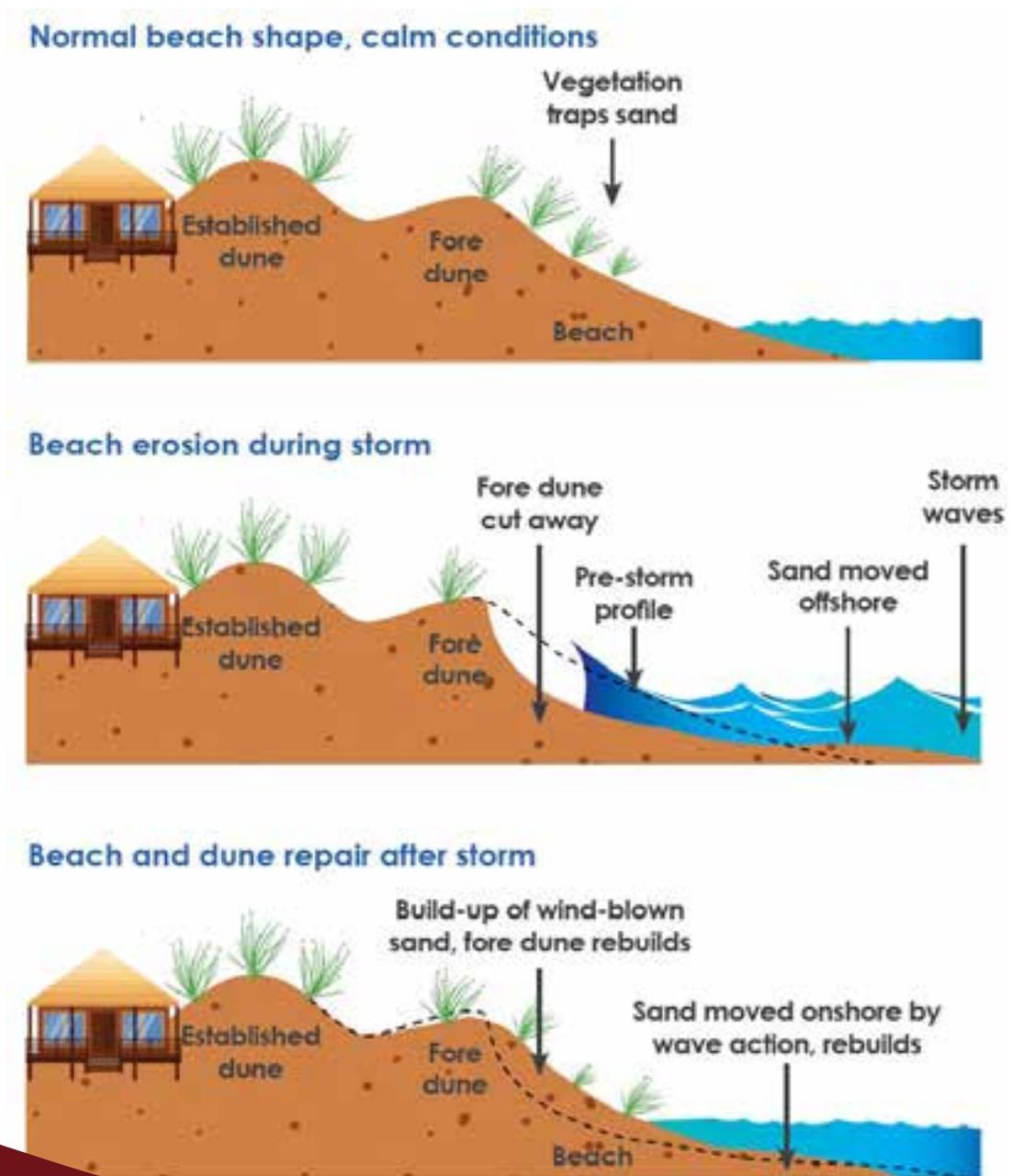


Figure 7. Natural short-term erosion and dune rebuilding process

THE SEASONS

There are four seasons primarily Torres Strait Islanders associate with the wind changes in the environment - Kuki, Sager, Zey and Nay Gay.

Kuki (pronounced Cook-ee):

- North-West winds (strong winds)
- Blows from January until April
- Wet Season (monsoon)

Sager (pronounced Sa-gerr):

- South-East trade winds
- Blows from May until December
- Dry season

Zey (pronounced Zay):

- Southerly winds
- Blow randomly throughout the year

Nay Gay (pronounced Nai-gai):

- Northerly winds
- Blows from October until December
- Season when both heat and humidity are at their highest

<http://www.gabtitui.gov.au/torres-strait>

Long-term erosion

In other cases, due to changing sediment supply or climate conditions, the beach may not be able to rebuild between storm events. Without intervening, long term erosion (termed recession) may occur, which is the landward movement of the shoreline over a longer timeframe (decades).

Both short term and long-term erosion processes may impact on coastal assets, depending on how close to the shoreline assets are located.



EROSION

Erosion is when coastal forces such as waves, winds, tides and currents remove sand from the beach and move it offshore. This can cause the shoreline position to move landwards. Big erosion events can threaten buildings, roads and important cultural areas.



3.3 Tidal inundation due to sea level rise

Tidal inundation is regular flooding from the tidal cycle, including up to the Highest Astronomical Tide (HAT). Very high tides, also known as king tides, can impact low lying areas. This can lead to increased damage especially if a king tide coincides with a cyclone or other storm. Areas of low-lying coastal land will experience increasing tidal inundation with sea level rise.

A 0.8 m sea level rise by 2100 is currently planned for by the Queensland State Government.



TIDAL INUNDATION

Tidal inundation is when normal astronomical tides cause flooding of low-lying coastal land. Areas exposed to tidal inundation are expected to periodically flood. With global average sea levels expected to rise, areas effected by tidal inundation are also expected to increase.



Artwork: Marjoire Isua

3.4 Current and future exposure

Updated mapping

The Northern Peninsula Area coastline occasionally experiences cyclone and storm events which can cause erosion and inundation. King tides associated with the complex Torres Strait tidal patterns also cause flooding. Coastal hazard impacts are predicted to increase with a changing climate and rising sea levels.

As part of the Yumpla Coast Strategic Plan, the existing mapping for Erosion Prone Areas and predicted storm tide inundation zones have been updated for the coastline in front of the NPARC communities between Cowal Creek and Patterson Creek. These updates are based on the best available technical data, and have included:

- new modelling of open coast erosion
- application of the Queensland Government approach to defining Erosion Prone Areas, tailored to NPARC in consultation with State and LGAQ.

Based on the state-wide approach to mapping, the Erosion Prone Area includes components of:

- **Open coast erosion:** A calculated component of open coast erosion potential, informed by erosion modelling
- **Tidal areas:** the combined area inundated by the Highest Astronomical Tide plus a defined horizontal buffer, plus any additional area inundated due to sea level rise.

As required by the Queensland Government, a projected sea level rise of 0.8 m by 2100 has been adopted for the Yumpla Coast Strategic Plan (with 0.3 m by 2050).

Planning horizons

Mapping for both erosion and storm tide inundation includes multiple planning timeframes or horizons and event likelihoods (Table 1).

Table 1. Likelihood of occurrence scenarios

Likelihood of occurrence	Hazard AEP	Planning horizons
Likely	5%	Present-day, 2050, 2100
Possible	1%	Present-day, 2050, 2100
Rare	0.2%	Present-day, 2050, 2100

Maps of the 2100 1% AEP are provided in Supplement B to the Strategy.

Erosion Prone Areas and storm tide inundation zones do not represent a predicted loss of coastal land. The maps provide an indication of areas that may be exposed to erosion or inundation processes (now or in the future), and in many cases the impacts can be avoided, minimised or managed through adaptation planning.

Additional detail on the mapped components and the approach is provided in the Phase 3 summary report (NPARC 2020a).



LIKELIHOODS

Likelihoods are words to describe how common or rare an event is. Likely events are expected to happen regularly and multiple times within the average lifespan. Possible events are expected to happen every so often and a few times in the average lifespan. Rare events are unusual and might occur once or twice in the average lifespan.

AEP

Annual Exceedance Probability, or AEP, is the likelihood that certain conditions will occur in a given year. AEP values are based on computational modelling that considers measured coastal data and multiple thousands of simulated scenarios.

PLANNING HORIZONS

Planning horizons are points in the future for which strategic decisions are made. This Strategy considers planning horizons of present day (2020), 2050, and 2100.

FUTURE IMPACTS

Projected sea level rise and an increase in cyclone intensity for the Queensland coastline is anticipated to increase the extent and impact of coastal hazards.

Coastal erosion:

- Increased water levels will accelerate coastal erosion
- Sediment transport patterns may be altered by shifts in wave direction, triggering changes to the form and location of shorelines
- Low-lying land may be permanently inundated
- Increased cyclone and storm activity will escalate the severity of coastal erosion events

Storm tide inundation:

- Sea level rise will increase the apparent severity and frequency of storm tide inundation and will cause inundation to occur further inland
- Increased cyclone and storm intensity will add to the magnitude of storm tide events and the extent of inundation.

Source: Coastal Hazard Technical Guideline (DEHP 2013)

3.5 Potential impacts on the Northern Peninsula Area

How we identified potential impacts

Coastal hazards have the potential to negatively impact Northern Peninsula Area communities, infrastructure, essential community services such as water supply, and our lifestyle today and long into the future.

As part of the Yumpla Coast Strategic Plan, technical assessments have been used to determine the coastal hazard risk for a range of assets that exist in the communities. Risk is the possibility of loss, damage, or injury. In a coastal context, risk arises from exposure to coastal hazards such as storm tide inundation, and erosion. Risk can be measured by considering both the likelihood and consequence of loss, damage, or injury.

The risk assessment has included analysis of:

- data on infrastructure assets (drainage, sewerage, electricity, telecommunications, stormwater, water supply, and roads)
- information on homes and other buildings (e.g. building type, material, and indicative floor level)
- coastal protection structures such as sea walls and other beach and foreshore assets such as boat ramps
- cultural heritage sites and sites of cultural and historical significance
- the NPARC Planning Scheme and Master Plan.

Risk is assessed based on the likelihood of an asset being exposed to a coastal hazard, combined with the consequence of that exposure.

Table 2. Risk matrix

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost certain (HAT)	Medium	Medium	High	Very High	Very High
	Likely 10% AEP	Medium	Medium	High	High	Very High
	Possible 1% AEP	Low	Medium	Medium	High	High
	Unlikely 0.2% AEP	Low	Low	Medium	Medium	High

3.5 Potential impacts on the Northern Peninsula Area (cont.)

A tailored approach to assessing consequence was developed, based on community feedback on the important elements for the coastal zone (lifestyle, coastal access, public safety, environmental values, cultural landscapes, property and infrastructure, and economy and growth) (Table 3).

To complete the risk assessment:

- The likelihood of exposure (likely, possible, rare) was determined for each asset / land parcel, separately for erosion and inundation
- The consequence of exposure (insignificant, minor, moderate, major, catastrophic) was determined for each asset / land parcel, separately for erosion and inundation
- Coastal hazard risk was assessed (low, medium, high, very high), based on the likelihood and consequence for each asset / land parcel, separately for erosion and inundation.

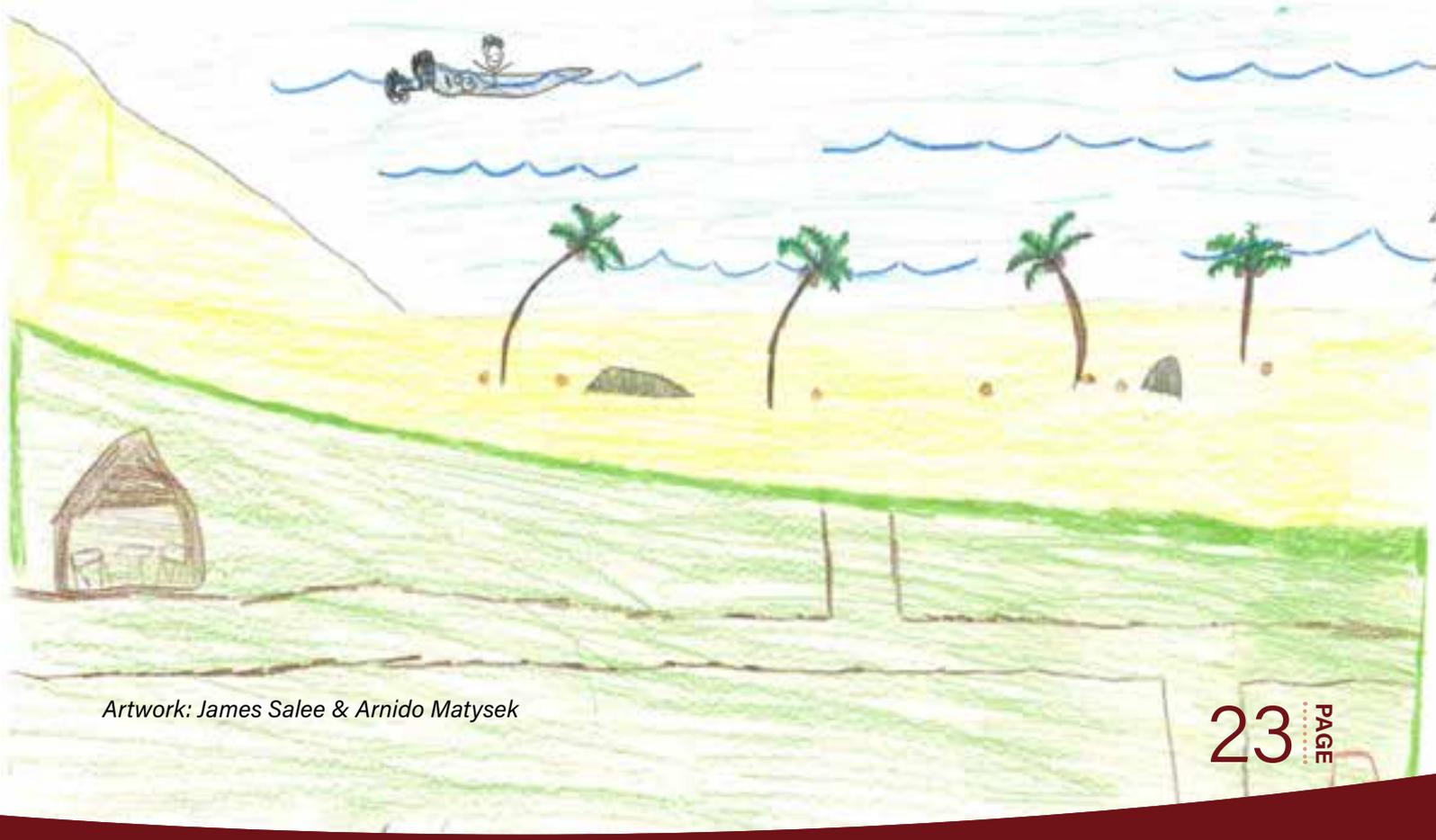


Table 3. Consequence categories (modified from LGAQ and DEHP 2016)

	Community and lifestyle		
	Lifestyle	Access	Public safety
Consequence	Considers elements of modern and traditional lifestyle such as community services, cultural connection, recreational and social activities and day to day business activities.	Considers access for recreational activities such as boating and fishing, as well as access to areas used for hunting, gathering and cultural / ceremonial sites.	Considers threats to human health and safety such as injury, disease, mental and physical wellbeing.
Catastrophic	Widespread semi-permanent impact (~1year) to highly utilised community services, wellbeing, or culture of the community with no suitable alternatives.	Widespread and permanent impact on access to key sites and activities Recovery unlikely.	Loss of lives and/or permanent disabilities.
Major	Major widespread long-term (~1 month) disruption to well-utilised services, wellbeing, or culture of the community with very few alternatives available.	Severe and semi-permanent impact on access to key sites and activities Full recovery may take many years.	Widespread serious injuries/ illnesses.
Moderate	Minor medium-to long-term (~1 week) or major short-term disruption to moderately utilised services, wellbeing, or culture of the community with limited alternatives.	Substantial impact on access to key sites and activities requiring significant works to repair or restore access. Full recovery may take less than 1 year.	Isolated serious injuries/illnesses and/or multiple minor injuries/illnesses.
Minor	Small to medium short-term disruption (~1 day) to moderately utilised services, wellbeing, finances, or culture of the community with some alternatives available, or more lengthy disruption of infrequently utilised services.	Small to medium short-term disruption of access to key sites and activities which may require some works to repair or restore access.	Minor and isolated injuries and illnesses.
Insignificant	Very small short-term disruption (~1 hour) to services, wellbeing, finances, or culture of the community with numerous alternatives available.	Very little to no impact on access to key sites and activities.	Negligible injuries or illnesses.

Environment	Place and planning		
Environmental values	Cultural landscapes	Property and infrastructure	Economy and growth
<p>Considers elements such as ecological values, ecosystem services, and cultural and traditional uses.</p>	<p>Specific consideration of traditional cultural values and the ability to maintain and pass on traditional knowledge and practices to future generations</p>	<p>Considers the threat of damage to built assets and any interdependencies such as regional access and ability to deliver critical services</p>	<p>Includes existing business and potential economic growth opportunities, especially for locally owned and operated enterprises.</p>
<p>Severe and widespread, permanent impact on multiple regionally or nationally significant environmental values of the region. Recovery unlikely.</p>	<p>Severe and widespread, permanent impact on multiple sites of cultural significance, including loss of land, connection to land, and ability to continue traditional practices. Recovery unlikely.</p>	<p>Widespread major damage or loss of property or infrastructure with total value >\$5 million. Full recovery/repair may take many years. interdependencies such as regional access and ability to deliver critical services</p>	<p>Regional economic decline, widespread business failure and impacts on state economy.</p>
<p>Severe and widespread semi-permanent impact on one or more regionally or nationally significant environmental values of the region. Full recovery may take many years.</p>	<p>Severe and widespread semi-permanent impact on one or more sites of cultural significance, including loss of land, connection to land, and ability to continue traditional practices. Full recovery may take many years.</p>	<p>Major damage or loss of property or infrastructure with total value >\$1 million. Full recovery/repair may take several years.</p>	<p>Lasting downturn of local economy with isolated business failures and major impacts on regional economy.</p>
<p>Substantial impact on one or more locally significant environmental values of the region. Full recovery may take several years.</p>	<p>Substantial impact on one or more sites of local cultural significance. Full recovery may take several years.</p>	<p>Moderate - major damage to property or infrastructure with total value >\$250,000. Full recovery may take less than 1 year.</p>	<p>Significant impacts on local economy and minor impacts on regional economy.</p>
<p>Small, contained and reversible short-term impact on isolated ecosystem services and natural features of the region. Full recovery may take less than 1 year.</p>	<p>Small, contained and reversible short-term impact on sites of cultural significance. Full recovery may take less than 1 year.</p>	<p>Minor damage to properties or infrastructure with total value >\$100,000. interdependencies such as regional access and ability to deliver critical services</p>	<p>Individually significant but isolated impacts on local economy.</p>
<p>Little to no environmental impact.</p>	<p>Little to no impact to sites of cultural significance.</p>	<p>Minimal damage to properties or infrastructure with total value >\$25,000. interdependencies such as regional access and ability to deliver critical services</p>	<p>Minor short-term impact on local economy.</p>

4. HOW CAN WE ADAPT TO FUTURE COASTAL HAZARDS?

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4.1 Framework for adaptation

A strategic approach

Across Australia and internationally, coastal land managers are taking a strategic approach to managing the risk of coastal hazards and enhancing the resilience of our coastal zones.

Common elements of this strategic approach include:

- Identifying adaptation objectives that align and support community values, goals and aspirations.
- Assigning a strategic adaptation response to different localities, to guide decision making with a pathways approach across present day, intermediate and 2100 planning horizons.
- Assessing the range of adaptation options suitable in different locations to help avoid, mitigate, and manage the risk of coastal hazards.
- Developing a strategic plan (this document) for coastal adaptation, with prioritised actions over a 5–10 year timeframe.

A tailored approach has been developed to guide decision making on adaptation response and options across the Northern Peninsula Area coastal zone.



ADAPTATION

Adaptation is adjusting to actual or expected conditions and events. Adaptation can have good or bad outcomes and should be guided by understanding the desired state of being. Good adaptation to coastal hazards means taking action to reduce risk and increase resilience.

Adaptation objectives

The purpose of clarifying adaptation objectives is to help guide an appropriate adaptation response, and to screen adaptation options, across different localities.

Objectives for the Yumpla Coast Strategic Plan, as informed by consultation with stakeholders and the community, include:

- Clean healthy beaches
- Beaches and coastal habitats protected including for wildlife nesting, refuge and feeding
- Waterways, wetlands and ocean support healthy fisheries and aquatic wildlife
- Sites of cultural significance are recorded and protected
- Burial sites / cemeteries (marked and unmarked) are protected
- Continual connection and access to places of spiritual and cultural significance
- Access for boating, traditional hunting and fishing sites
- Access to beaches for huts, seasonal camping & fishing
- Homes are built strong and can withstand natural disasters
- Access to safe refuge and emergency services during natural disasters
- Protection of natural resources and local environments to ensure sustainable fishing and tourism industries.
- Strong tourism industry / local economy
- Genuine collaboration regarding the management of natural resources, community infrastructure and services.

These objectives provide a reference for considering the suitability of different coastal hazard adaptation options across the Northern Peninsula Area region.

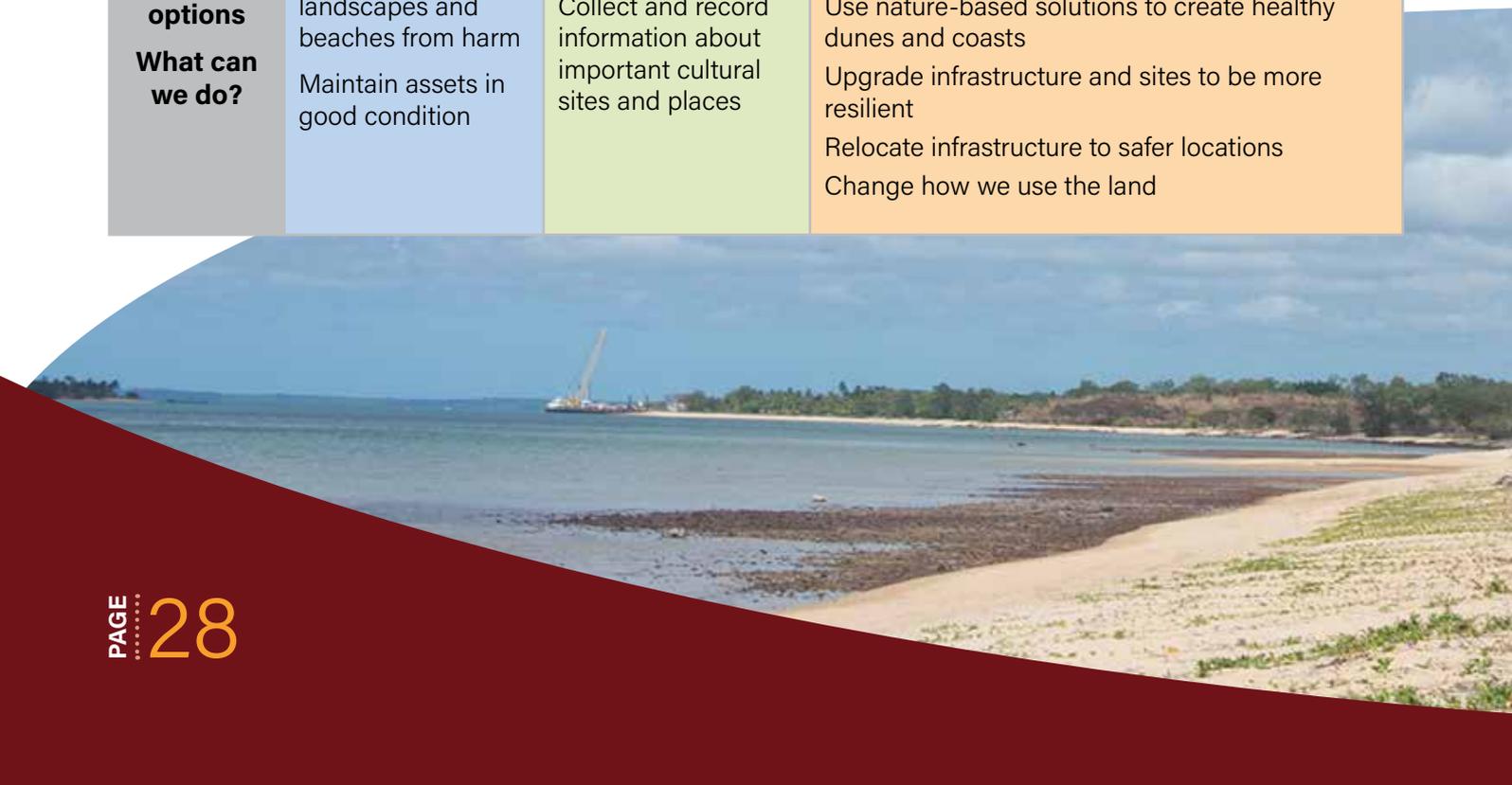
Adaptation response

The tailored framework for the *Yumpla Coast Strategic Plan* includes four adaptation responses - **Avoid (and maintain), Monitor (look and learn), Actively manage, and Transition and change**

(Table 4). A general adaptation response was determined for each Northern Peninsula Area community and for each time frame (planning horizon) (Table 5). This helps to determine the appropriate approach for each community.

Table 4 Adaptation responses for NPARC

		Increasing risk as a result of coastal hazards 			
		Avoid (and maintain)	Monitor (look and learn)	Actively manage	Transition and change
Adaptation response - How do we respond and adapt to coastal hazards?		Prevent new risks from occurring and avoid placing new development or assets in coastal hazard areas.	Monitor the risk of coastal hazards. Monitor until local trigger levels are reached to initiate mitigation.	Proactively manage or mitigate the risk of coastal hazards through a range of adaptation options. Mitigate until management options are no longer socially, culturally or economically feasible or local trigger levels are reached to initiate transition.	A strategic decision to transition or change a specific land use (or location) to an alternative land use. Active management or mitigation may be part of the transition process.
Adaptation options What can we do?		Apply land use and development planning controls Protect natural landscapes and beaches from harm Maintain assets in good condition	Watch for any changes to the coast that might indicate a change in the risk Collect and record information about important cultural sites and places	Create community custodians & educate people about coastal hazards and how to care for our coasts Plan for possible natural disasters Use nature-based solutions to create healthy dunes and coasts Upgrade infrastructure and sites to be more resilient Relocate infrastructure to safer locations Change how we use the land	





Avoid (and maintain)

The general first principle is to avoid placing new development or built assets in coastal hazard areas. The preference is to develop (or transition over time) land use in coastal hazard areas to locations with lower risk for coastal hazard impacts, while allowing for uses that maximise economic, cultural, social and environmental value to region. Any new development or infrastructure in coastal hazard areas must be in accord with local and State Planning Policy and approvals requirements and include necessary mitigation measures.

It is also important to avoid creating new risks or increasing existing ones. Maintaining infrastructure in good condition and protecting coastal areas from future harm will increase the natural resilience and help to avoid or delay the need for more active management.

Monitor (look and learn)

At localities where the coastal hazard risk profile is low, the adaptation response is to monitor risk by observing changes and regularly reviewing what these changes mean in terms of changing risk – look and learn. Best practice is to undertake maintenance/asset management activities and continue active stewardship of the coastal zone. Where these observations suggest an increased risk (as indicated by local trigger levels), then the adaptation response may change to active management.

Continuing to collect and record data on culturally significant sites and places, and places of high environmental value will help to grow knowledge and inform future decisions.

Actively manage

At localities where coastal hazard risks have been identified, the adaptation response is to proactively manage the risk through implementing a range of adaptation options. Adaptation options will be tailored to each locality, incorporating site-specific processes, community input, and statutory planning considerations. If, over time, the risk profile is observed to increase (as indicated by local trigger levels), and active management becomes infeasible (due to economic or other factors), then the adaptation response may shift to transition requiring a change in land use or relocation of assets.

Transition and change

In some specific areas within a locality, if the coastal hazard risk profile is very high, and active management becomes infeasible (due to economic or other factors), a strategic decision may be made in consultation with the local community to transition to an alternative land use. Transition is likely to be a gradual process over time, where mitigating hazards for a period is part of the transition process. A range of adaptation options will be part of the transition process.

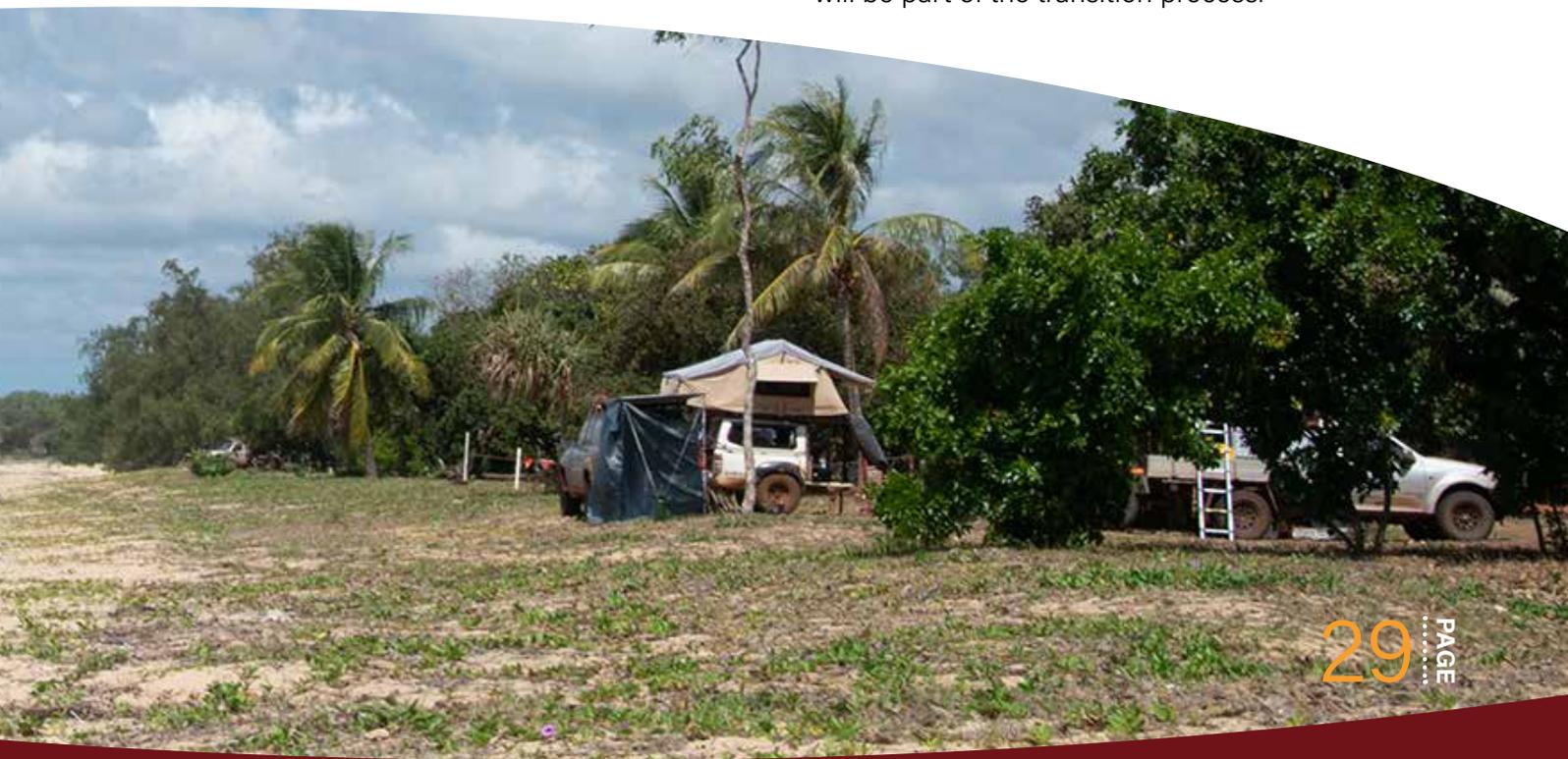


Table 5. Adaptation response for each NPA community

Locality	Present day	2050	2100	Comment
Loyalty Beach	Monitor (look and learn)	Actively manage	Actively manage	Risk from open coast erosion is currently medium with high risk expected by 2100. Storm tide and tidal inundation pose less risk but are also expected to increase by 2100.
Seisia	Actively manage	Actively manage	Transition and change*	A number of important assets are currently at high risk from coastal erosion. Inundation hazard risk moderately increasing for some low-lying areas by 2050 and substantially by 2100.
Umagico (Alau)	Monitor (look and learn)	Actively manage	Actively manage	Risk from open coast erosion is currently medium with high risk expected by 2100. Storm tide and tidal inundation pose less risk but are also expected to increase by 2100.
Injinoo	Actively manage	Transition and change*	Transition and change*	Risk from open coast erosion is currently medium with very high risk expected by 2100. Storm tide and tidal inundation pose less risk but are also expected to increase by 2100.

* A transition and change response may be appropriate for a specific area within the locality

Adaptation options

Five themes of adaptation options have been defined for the Strategic Plan, with a range of options that relate to avoiding, mitigating and managing the risk of coastal hazards. The themes are:

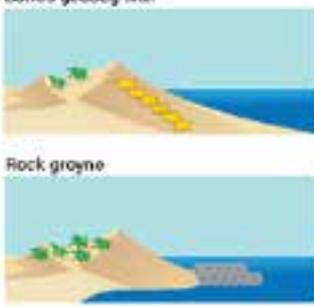
1. Council-wide initiatives to enhance community custodianship
2. Planning updates
3. Maintaining and improving existing infrastructure
4. Nature-based coastal management
5. Coastal engineering.

The range of common adaptation options across these themes are described in Table 6. More detailed descriptions of the options are provided in Supplement C to the Strategic Plan, along with preliminary screening of the relevance of options to different localities.



Table 6. Adaptation options by theme

Theme	Adaptation options	Description	Supplement C summary sheet number
Council-wide initiatives to enhance custodianship	Community custodianship	Developing programs and partnerships to enhance stewardship of the coastline	Sheet 1
	Education and knowledge sharing 	Facilitating knowledge sharing and education on coastal values, hazards and adaptation	Sheet 2
	Monitoring 	Monitoring changes in coastal hazard risk and effectiveness of a daptation.	Sheet 3
Planning updates	Land use planning 	Informing statutory planning and strategic plans such as the NPARC Master Plan Includes consideration of land purchase or land swap/ relocation	Sheet 4
	Disaster management	Updating emergency response planning	
Maintaining and improving infrastructure	Increase infrastructure resilience  	<ul style="list-style-type: none"> Modifying critical infrastructure (e.g. raising floor levels) Modifying drainage networks Building resilient homes 	Sheet 5
	Relocate infrastructure 	<ul style="list-style-type: none"> Relocating critical infrastructure 	

Theme	Adaptation options	Description	Supplement C summary sheet number	
Nature-based coastal management	<p>Dune protection and maintenance</p>  <p>Dune revegetation and maintenance</p>	Minimising dune disturbance, maintaining vegetation	Sheet 6	
Coastal engineering	<p>Beach or sand nourishment</p>  <p>Beach or sand nourishment</p>	Providing additional sand to the beach	Sheet 7	
	<p>Structures to assist with sand retention</p>  <p>Buried geobag wall</p> <p>Rock groyne</p>	Using structures (groynes, sand fencing) to help retain sand	Sheet 8	
	Structures to dissipate wave energy	Constructing offshore breakwaters or artificial reefs to dissipate wave energy (submerged or exposed)	Sheet 9	
	Last line of defence structures	<p>Rock seawall</p>  <p>Rock seawall</p>	Constructing seawalls / revetments	Sheet 10
	Structures to minimise inundation	<p>Earth bund or levee</p>  <p>Earth bund or levee</p>	Constructing levees / dykes	Sheet 11

4.2 Determining adaptation actions

A range of adaptation actions have been identified to enable a strategic approach to coastal hazard adaptation across the Northern Peninsula Area coast and to ensure we achieve the goals and aspirations of the community (Section 2.3). A suite of priority actions across the five themes (Table 6) have been defined at a regional and locality scale as part of the adaptation response pathway.

The following sections (Sections 5, 6, 7, 8 and 9) provide an overview of the Northern Peninsula

Area-wide actions, as well as the actions for each locality. The locality summaries identify exposure and risk to coastal hazards. Actions identified for present day should be considered priority with an aim to be implemented in the next 5 – 10 years.

The program of priority actions for each location has been informed by a suite of decision making processes and tools. The decision making process for determining recommended adaptation options for the NPARC CHAS is illustrated in Figure 8.

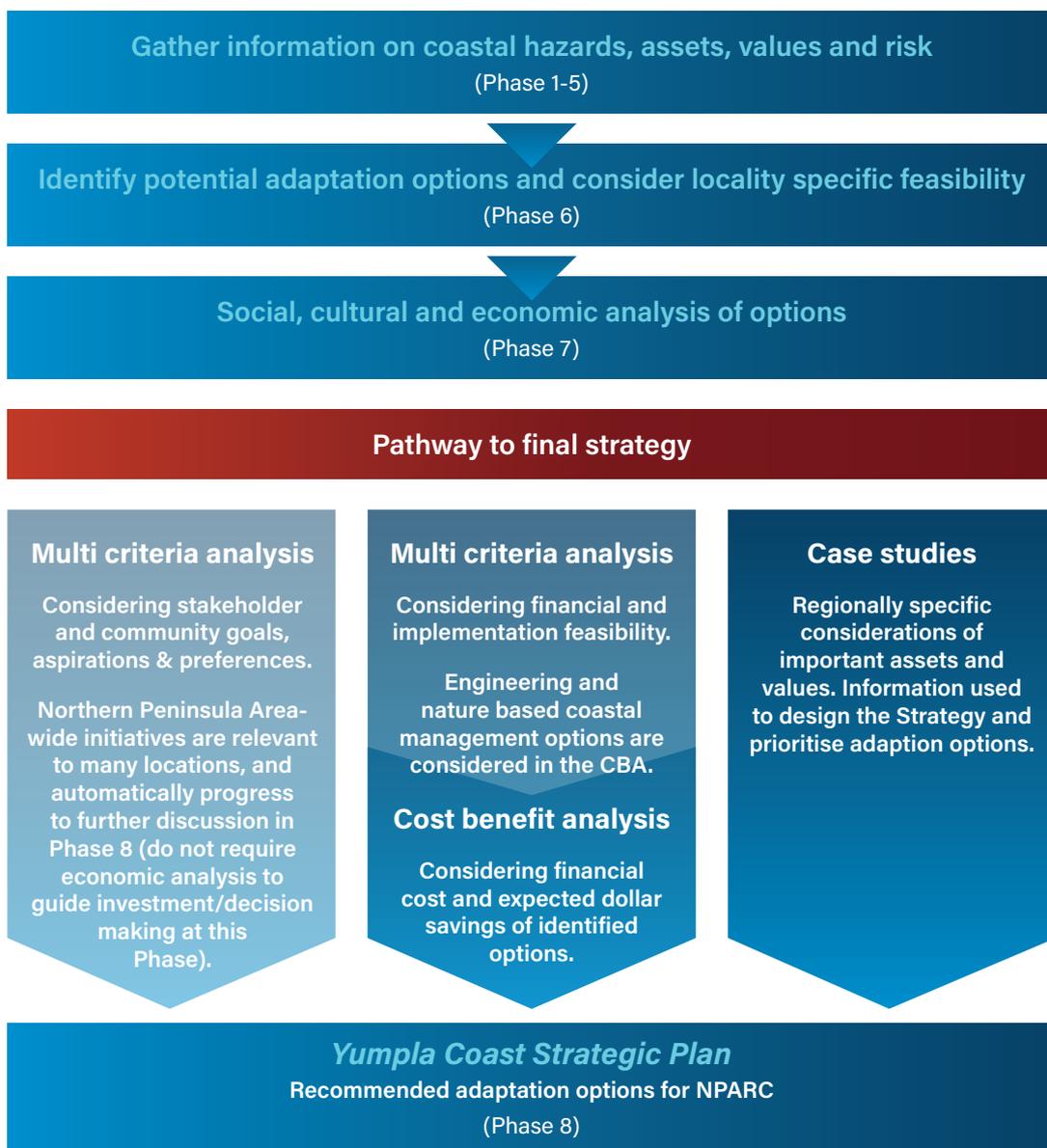


Figure 8. Decision making process for the identification of final adaptation options for Northern Peninsula Area

Multi Criteria Analysis

A Multi Criteria Analysis (MCA) considered the effectiveness of each action in achieving the adaptation objectives as well as general feasibility for the NPA region. This process enabled the identification of some actions that were subject to further economic analysis. It also shows that some actions if implemented would provide good value to the NPA community and help to achieve the adaptation objectives.

Cost Benefit Analysis

A Cost Benefit Analysis (CBA) compared the costs of building and maintaining certain nature-based coastal management and engineering options against the benefits in avoiding damage that each option provided. This analysis provided a purely financial perspective on the feasibility of certain options.

Supporting case studies

Two case studies were also used to consider in more detail the importance of certain assets in achieving the adaptation objectives. Information from these case studies helps to justify certain adaptation options that might not have been financially feasible.

CASE STUDY:

Cultural heritage assets in the NPA region

This case study examined the importance of cultural heritage to the NPA community. Protecting cultural heritage is important for the wellbeing of Aboriginal and Torres Strait Islander people as it provides a much-needed link to identity and country. Many built assets can be valued based on their cost of replacement. This approach is not appropriate for cultural heritage assets as if they are damaged or lost, they often cannot be replaced, and/or they have values beyond their physical form.

The Northern Peninsula Area is rich in Aboriginal and Torres Strait Island cultural heritage. There are many sites of cultural and spiritual significance known to the local community. Conversations with community leaders have identified the Anglican Church of St. Francis of Assisi at Seisia and its nearby burial ground, St Michael and All Angels Church at Injinoo, the Injinoo cemetery and the burial site at Umagico as being located in vulnerable locations and culturally important to the Northern Peninsula Area community.

There is not currently a strong economic case for major engineering or infrastructure-based interventions to manage coastal hazard risk for these cultural heritage assets, however this case study provides another lens through which to consider these options, and may provide justification for investing in them.

CASE STUDY:

Seisia Wharf

This case study examined the importance of the Seisia Wharf precinct to the NPA community. The wharf, boat ramp and barge ramp serve many purposes for the NPARC community. Almost all freight delivered to the NPA comes via Seisia Wharf. The wharf also provides access to Thursday Island and other Torres Strait Islands. Local residents launch boats from the boat ramps for fishing and travel to Islands, and tourism operators use the wharf as a launching point for expeditions.

The importance of the Seisia Wharf precinct to the NPARC community and greater region means that protecting and upgrading it is a high priority. Upgrades in 2020 to the wharf precinct have accomplished this objective for the short term, but the condition of the site, especially following large storms should be monitored and addressed accordingly.

Combining these decision making tools

These tools were used together to determine a recommended program of actions that meets the needs of the NPA communities and aim to effectively accomplish the adaptation objectives of the Strategy.

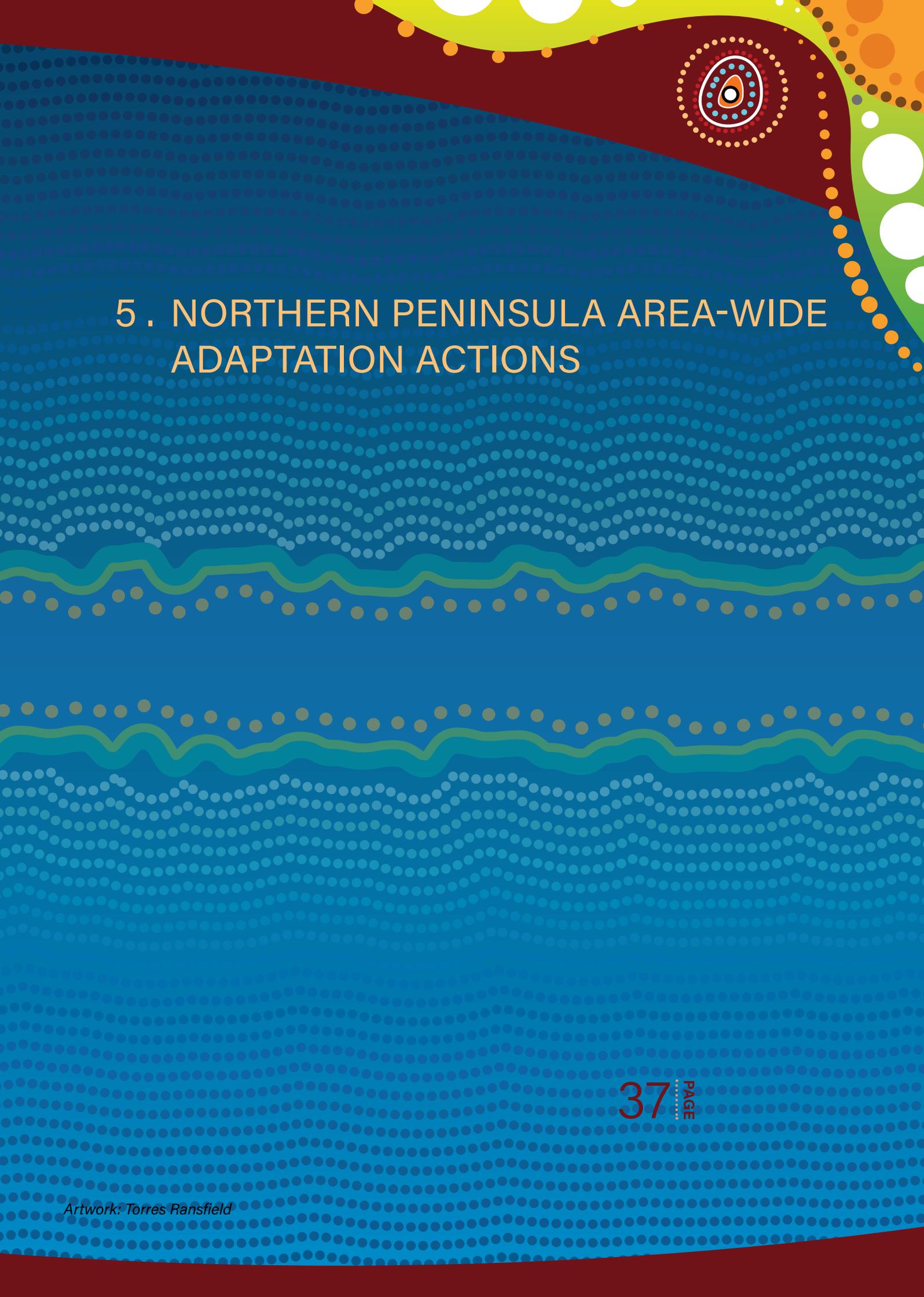
Actions across capacity building, land use planning and modifying infrastructure are the core focus for most localities, combined with some site-specific targeted investigations to inform future updates to the adaptation pathways.

Baseline actions of dune protection and maintenance, and will be critical for enhancing resilience.

There is currently not a strong financial case for structural (engineering) adaptation options in present day, however, some structural options are expected to become economically viable over time as the risk continues to increase.

Importantly however, there are other drivers for considering the suitability of these options and willingness to invest in the short-term. This includes broader strategic initiatives to maintain access and cultural values.

Results may also change over time and should be the subject of future Strategic Plan reviews and updates.



5 . NORTHERN PENINSULA AREA-WIDE ADAPTATION ACTIONS

The Yumpla Coast Strategic Plan priority actions across the Shire include a range of actions relevant to the five themes identified for the plan:

- Council-wide initiatives to enhance custodianship
- Planning updates
- Maintaining and improving infrastructure
- Nature based coastal management
- Coastal engineering.

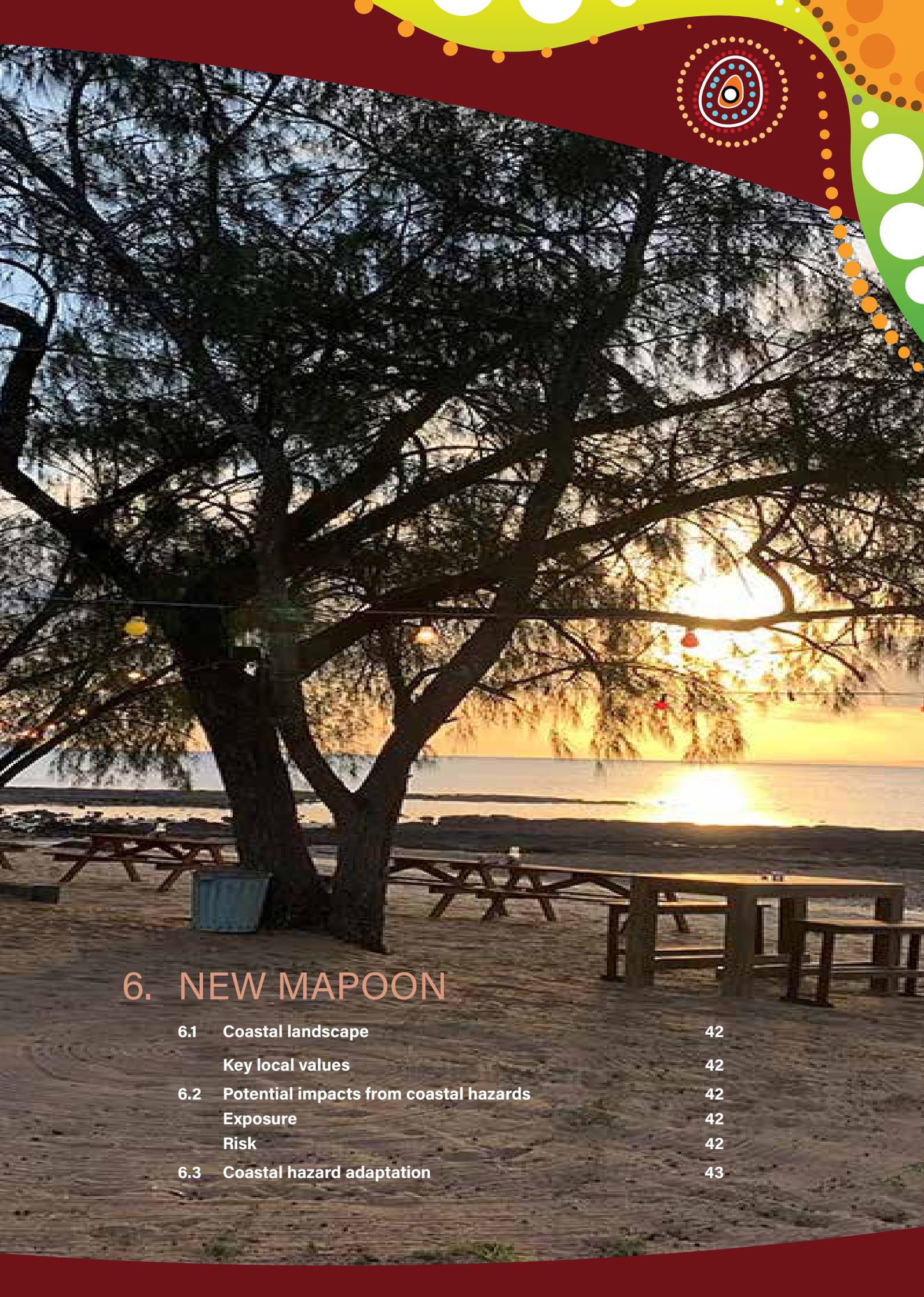
Priority 5 – 10 year actions for each of these themes are summarised in the tables below, with some additional information available in Supplement C. Adaptation response and actions specific to each locality are provided in the location summaries.

Adaptation actions	2020 Priority strategic actions (completed within 5 - 10 years) * denotes collaboration with other organisations and agencies required for implementation
1. Council-wide initiatives to enhance custodianship	
1.1. Community stewardship	1.1.1 Establish and implement a dune protection and maintenance program, including developing a seed bank and involving Traditional Owners, Indigenous Land and Sea Rangers and schools.*
	1.1.2 Seek co-funding/resources for further initiatives through grants and stakeholder partnerships.
	1.1.3 Promote coastal custodianship in the youth and future generations with community dune and coast care events.*
1.2. Knowledge sharing	1.2.1 Establish a coastal working group with key stakeholders (Traditional Owners, Council, research agencies and community) to collaborate and advise on the management of the Northern Peninsula coastline, including culturally significant sites.*
	1.2.2 Enhance community adaptive capacity to coastal hazards, including awareness of increasing coastal hazard exposure and risk, and way to improve individual preparedness and adaptive capacity through training, education and events.*
	1.2.3 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.*
	1.2.4 Promote cross-sector partnerships and initiatives to enhance resilience and strategic adaptation for transport infrastructure, including boating infrastructure.*



Adaptation actions	2020 Priority strategic actions (completed within 5 - 10 years) * denotes collaboration with other organisations and agencies required for implementation
1.3. Monitoring	1.3.1 Establish a system of photo monitoring points (CoastSnap, Fluker Post or similar) at beaches in the area.
	1.3.2 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.*
	1.3.3 Create a platform/process for data monitoring and management.
	11.3.4 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.*
2. Planning updates	
2.1. Land us planning	2.1.1 Submit updated Erosion Prone Area layers to State Government for formal update to the existing State-wide mapping.
	2.1.2 Use the updated Erosion Prone Area and storm tide mapping and outcomes of the Strategic Plan in current and future Planning Scheme and Master Plan updates to inform decisions on development areas and strategic land use planning.
	2.1.3 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 ▪ Implications for future development approvals and conditions.
2.2. Disaster management	2.2.1 Use the updated Erosion Prone Area and storm tide mapping, risk assessment and economic implications to update the Northern Peninsula Area Regional Council Local Disaster Management Plan.*
	2.2.2 Review the long-term adequacy of evacuation facilities and evacuation routes, including evacuation by land and sea.*
3. Maintaining and improving infrastructure	
3.1. Increasing infrastructure resilience	3.1.1 Review at-risk infrastructure (from Strategic Plan data outputs) and embed risks into current asset management plans/Master Plan (this could include 'betterment' at critical asset refurbishment/renewals points).
	3.1.2 Review access road renewals and upgrades (prioritisation), and upgrade design requirements and timing of upgrades.
	3.1.3 Promote resilient homes within the community.
	3.1.4 Consult with utility providers on future services and upgrades, and implications of coastal hazard areas.*

Adaptation actions	2020 Priority strategic actions (completed within 5 - 10 years) * denotes collaboration with other organisations and agencies required for implementation
3.2. Relocate infrastructure	3.2.1 Consider relocating/rebuilding at risk beach huts away from fragile and eroding foredunes and rehabilitate sand dunes.
4. Nature-based coastal management	
4.1. Dune protection and maintenance	4.1.1 Establish a dune protection and maintenance program.*
	4.1.2 Revegetate the dunes and foreshore along the shoreline where vegetation has been cleared.*
	4.1.3 Consider areas where fencing can be used to protect native dune vegetation.*
	4.1.4 Establish formal access paths and roads to the shore.*
5. Coastal engineering	
5.1. Coastal hazard reduction	5.1.1 Review and further examine the sediment dynamics around NPARC communities and the shoreline including: <ul style="list-style-type: none"> ▪ Geomorphic assessment ▪ Hydrodynamic modelling ▪ Shoreline Erosion Management Plan.



6. NEW MAPOON

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6.1 Coastal landscape

New Mapoon is the northernmost DOGIT area in the Northern Peninsula Area region. The main community is located away from the coast and does not directly experience the impacts of coastal hazards. However, Loyalty Beach is located along the New Mapoon coastline where there is a popular restaurant and campground.

Loyalty Beach is located between Paterson Creek to the north and New Mapoon township to the south. It is a low-energy section of the coastline and is a mixture of sand, low-lying rock and a grassed foreshore.

Key local values

There are several sites of cultural significance in the New Mapoon DOGIT, including burial sites. Loyalty Beach is a popular tourist destination, particularly during the winter months. Visitors come to the region for fishing and four wheel driving. The beaches are also valued by local residents, with a number of family beach huts along the shoreline north of Loyalty Beach. These beach huts also hold cultural value for local residents.

6.2 Potential impacts from coastal hazards

Exposure

The New Mapoon coastline is currently exposed to open coast erosion. This exposure is expected to increase by 2100. Much of the shoreline is also likely to be exposed to storm tide inundation at present. Exposure to storm tide and tidal inundation is expected to increase by 2100, particularly along the shoreline, and through the creek behind the campground and Paterson Creek.



Figure 9. Map of New Mapoon locality

Risk

Open coast erosion is the coastal hazard that poses the highest risk to assets along the New Mapoon coastline. The current risk is medium and is expected to increase to high by 2100. Storm tide and tidal inundation pose a lower risk, but this is also expected to increase by 2100.

Overview of assets and values at risk

Assets in the New Mapoon DOGIT that are currently at risk from coastal hazards include roads, cultural sites and buildings.

Sites with cultural significance include marked and unmarked burial sites.

The buildings impacted include family beach shacks amongst the dunes and the Loyalty Beach restaurant and campground facilities.

The risk to these assets increases by 2100 and a greater number and length of assets are also likely to become impacted by coastal hazards.

6.3 Coastal hazard adaptation

There is a number of priority actions relevant to the five themes identified for the Plan:

1. Enhancing custodianship
2. Planning updates
3. Maintaining and improving infrastructure
4. Nature-based coastal management
5. Coastal engineering.

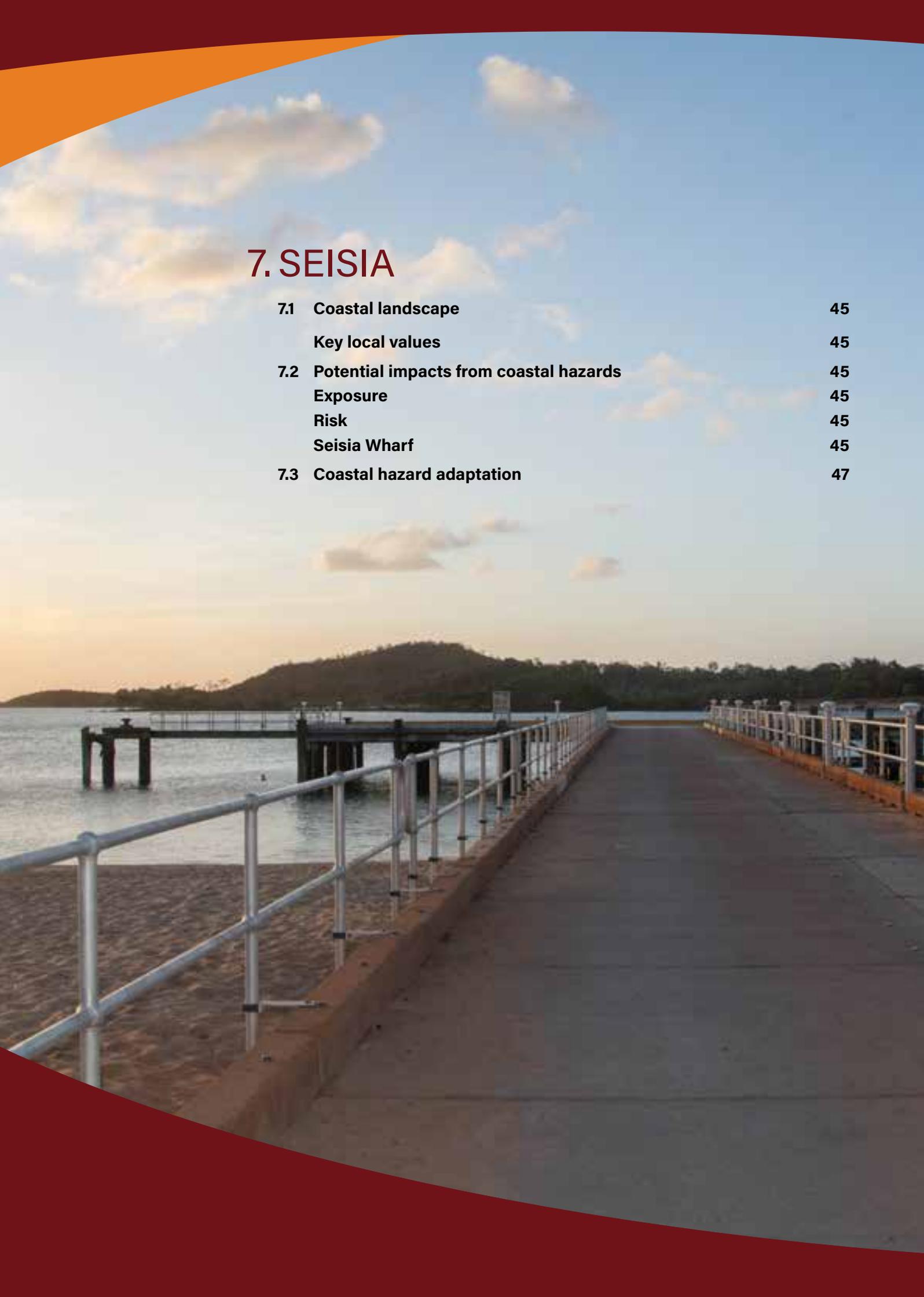
Recommended adaptation actions for the New Mapoon locality are summarised in Table 7.

Table 7. Adaptation pathway for New Mapoon coastline

	Present day	2050	2100
Adaptation response	Monitor (look and learn)	Actively manage	Actively manage
Adaptation Actions			
1. Council-wide initiatives to enhance custodianship	As per Northern Peninsula Area-wide actions		
2. Planning updates	As per Northern Peninsula Area-wide actions		
3. Maintaining and improving infrastructure	As per Northern Peninsula Area-wide actions 3.2.1 Consider relocating/rebuilding at risk beach huts away from fragile and eroding foredunes and rehabilitate sand dunes.		
4. Nature based coastal management	As per Northern Peninsula Area-wide actions 4.1 Dune protection and maintenance		
5. Coastal Engineering			
5.2 Coastal hazard protection works	As per Northern Peninsula Area-wide actions	Investigate construction of a geotextile sand container (GSC) seawall along the shoreline at Loyalty Beach in front of the restaurant, campsites, and sites of cultural significance.	

7. SEISIA

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7.1 Coastal landscape

Seisia is the northernmost coastal community in the Northern Peninsula Area and is based along the coastline. Seisia is another settlement of Saibai Island people. This settlement is at the site of the old Red Island Wharf and the new wharf at the same location provides shipping and ferry services to regional ports such as Thursday Island.

The coastline along Seisia is dynamic, with seasonal winds and currents influencing the sediment (sand) transport and accumulation. Sand is mobilised from the shore and deposited in offshore sandbars, particularly by the north to north-westerly winds from October to April. There are wetlands and endangered wildlife habitat areas along the Seisia coastline.

Key local values

The residents of Seisia place significant value on access to the coastal zone. Boat ramp access for fishing and visiting neighbouring Torres Strait Islands is important for continuing cultural practices and maintaining connection to family in the islands. The St. Francis of Assisi Church is also a culturally important place for the Seisia community.

The foreshore area also holds significant cultural value. Coconut trees planted by the original migrants from Torres Strait still grow along the foreshore. There is also a gravesite of one of the original migrants and a church on the shorefront.

The Seisia community serves as a transport and economic hub of the Northern Peninsula Area. During the wet season when southern roads are flooded, the Seisia Wharf serves as the only access point into the area. The Seisia Fishing Club, Holiday Park, and Knowledge Centre are important economic and community assets.



Figure 10. Map of Seisia locality

7.2 Potential impacts from coastal hazards

The Seisia community already observes and experiences the impacts of coastal hazards. There is frequent sand build up on the boat ramp adjacent to Seisia Wharf from the predominant winds and currents. Discussions with local residents revealed that a number of trees along the foreshore have been lost over the past ~20 years. A sandbar has also built up over a similar time period, affecting nearshore habitats for dugongs and fish and impacting fishing. King tides have also been observed coming within ~3 m of the St. Francis of Assisi Church at Seisia.

Exposure

Seisia already experiences inundation from storm tide in the present day. Areas around Seisia Wharf, the Holiday Park and along the foreshore currently become exposed during storm tide and big tidal inundation events. Exposure is likely to increase by 2100, increasing the area of exposure along the entire length of coastline.

Key buildings such as government buildings, community facilities, industrial and residential buildings are presently exposed to open coast erosion. Some evidence of erosion is noticeable around the Sea Swift Freight Yard.

Risk

Erosion and inundation both pose a risk to assets along the coastline at Seisia. The current coastal erosion risk is high and is likely to increase by 2100. Inundation hazards risk is moderate

at present, increasing for some low-lying areas by 2100 and substantially increasing by 2100.

Overview of assets at risk

Assets currently at risk from coastal hazards include cultural sites, roads, drains, electrical poles, playgrounds, and buildings, including the wharf and associated facilities. The number of assets potentially at risk by 2100 increases to include a larger number of buildings, greater lengths of road, as well as places of cultural significance.

There are a number of buildings that are likely to be currently impacted by coastal hazards. This includes the buildings at Seisia Wharf in the freight yard, amenities blocks at Seisia Holiday Park, Seisia Fishing Club, emergency services building, the church, recreation centre and several houses. By 2100, the number of buildings impacted by coastal hazards is likely to increase. The greatest change is the number of dwellings impacted by storm tide inundation increasing to around 24% of existing houses.

Transport routes throughout Seisia are likely to be, or are currently, affected by coastal hazards. Pathways and walkways are expected to be exposed to erosion and inundation, with increasing inundation risk by 2100. Private or restricted roads pass through Seisia Holiday Park and are at increasing risk of inundation by 2100. Property access roads include the main roads around Seisia and access roads to the wharf, and up to 24% of these roads are expected to be impacted by inundation by 2100.

Seisia Wharf

The marine facilities at Seisia Wharf are government owned and include a multi-purpose jetty, barge ramp and boat ramp. These assets are highly valued by the community as they provide access to fishing, hunting, and travel to nearby islands. The wharf is heavily relied upon for the services it provides to the region, including delivery of essential goods, access to the Torres Strait, tourism services and fishing services.

Most of the freight delivered to the region is delivered through Seisia Wharf. This is due to unreliable road access and vehicle limitations crossing on the Jardine River ferry. Deliveries from Cairns are received twice a week. Loss of the jetty would likely result in increased freight charges for essential deliveries. The cost of losing the key services that the wharf provides is estimated to be an average of \$4.5 million per month (Figure 11). Therefore, this is an important piece of infrastructure to protect.

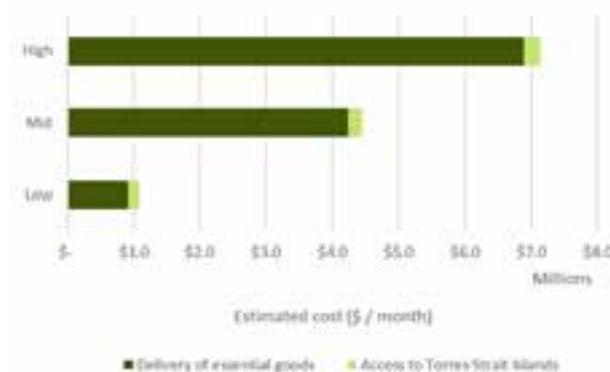


Figure 11. Estimated cost associated with a loss of services from Seisia Wharf (NPARC 2021a)

7.3 Coastal hazard adaptation

There is a number of priority actions relevant to the five themes identified for the Plan:

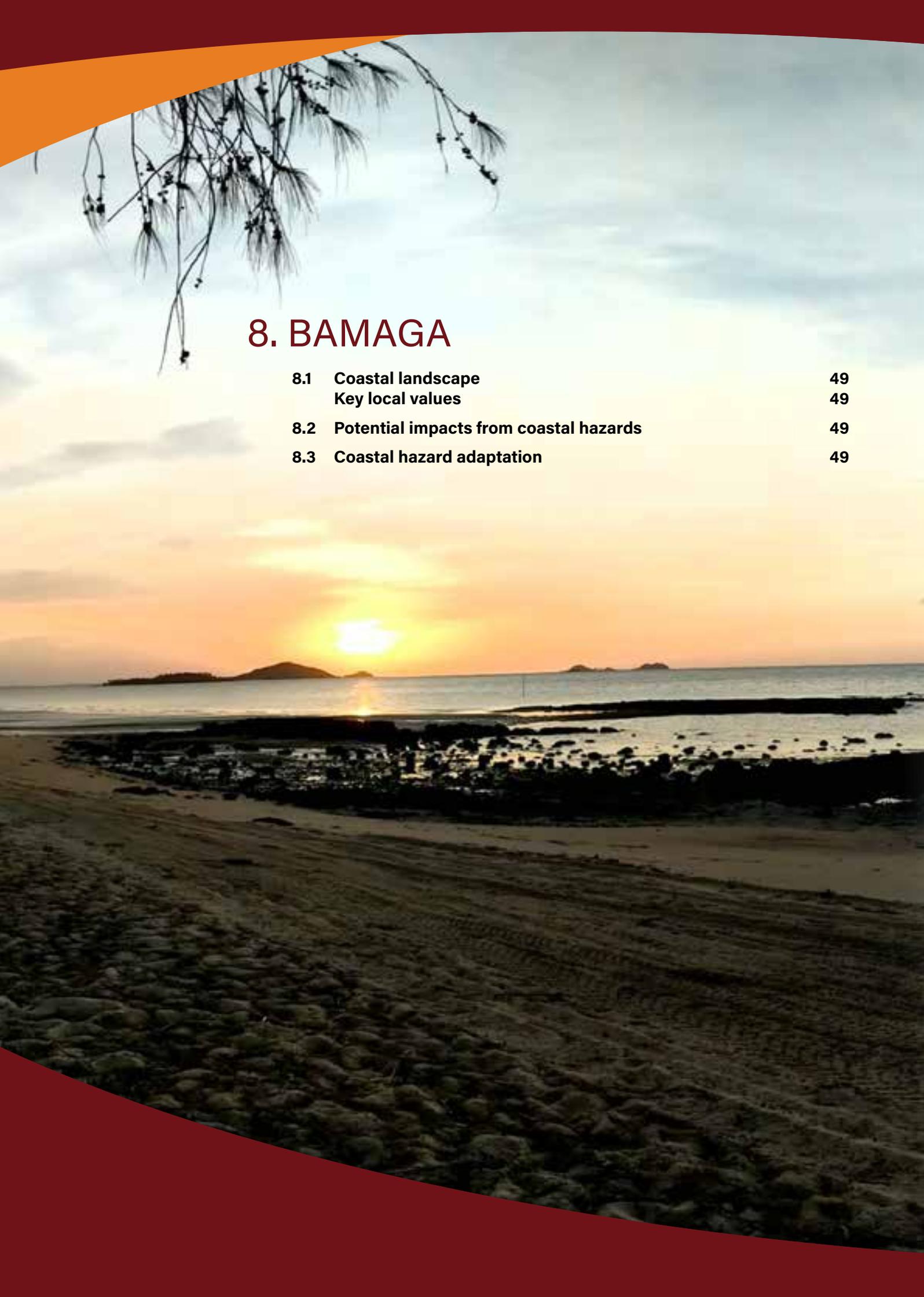
1. Enhancing custodianship
2. Planning updates
3. Maintaining and improving infrastructure
4. Nature-based coastal management
5. Coastal engineering.

Adaptation actions are summarised in Table 8.

Table 8. Adaptation pathway for Seisia coastline

	Present day	2050	2100
Adaptation response	Actively manage	Actively manage	Transition and change*
Adaptation Actions			
1. Council-wide initiatives to enhance custodianship	As per Northern Peninsula Area-wide actions		
2. Planning updates	As per Northern Peninsula Area-wide actions		
3. Maintaining and improving infrastructure	As per Northern Peninsula Area-wide actions 3.2.1 Consider relocating/rebuilding at risk beach huts away from fragile and eroding foredunes and rehabilitate sand dunes.		
4. Nature based coastal management	As per Northern Peninsula Area-wide actions 4.1 Dune protection and maintenance.		
5. Coastal Engineering			
5.1 Coastal hazard protection works	5.1.1. Design and construct a geotextile sand container (GSC) seawall along the shoreline at Seisia Holiday Park and south of the Wharf to the Church. 5.1.2. Design and construct a rock revetment along the shoreline at Seisia Wharf. 5.1.3. Design and construct a rock armour or GSC seawall with a raised crest level to minimise coastal inundation.	Review coastal hazard risk and CBA (or other) case for additional coastal hazard protection.	

* A transition and change response may be appropriate for a specific area within the locality.



8. BAMAGA

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8.1 Coastal landscape

Bamaga is the administrative and geographical centre of the Northern Peninsula Area region communities. The town is located inland from the coastline. The community was founded by Torres Strait Islanders from Saibai, who originally settled at Mutee Heads but later relocated to Bamaga.

Key local values

While there is no coastline at Bamaga, the coast is still highly valued by residents as it holds strong cultural significance through their ancestors. There are a number of cultural sites along the coast that are significant to residents of Bamaga. The coast is also used for fishing and to access the nearby Jackey Jackey Creek and Torres Strait Islands.

8.2 Potential impacts from coastal hazards

The Bamaga community is not directly exposed to coastal hazards and therefore does not have any assets at risk. However, the community may be indirectly impacted by coastal hazards at culturally significant sites in other areas of the region.



Figure 12. Map of Bamaga locality

8.3 Coastal hazard adaptation

While the town of Bamaga is not directly exposed to or at risk from coastal hazards, the community is still able to contribute to coastal hazard adaptation.

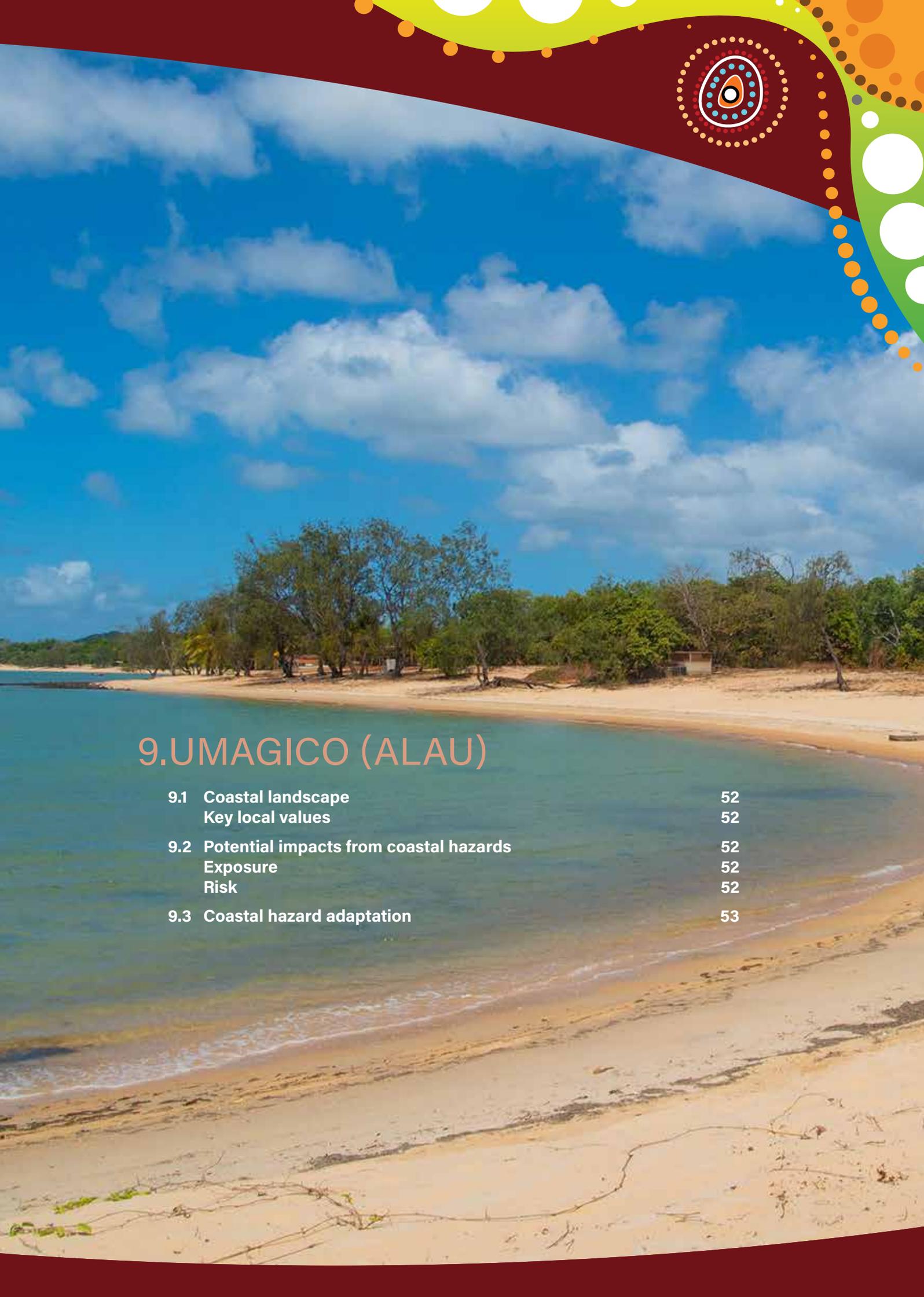
There is a number of priority actions relevant to the five themes identified for the Strategy:

1. Enhancing custodianship
2. Planning updates
3. Maintaining and improving infrastructure
4. Nature-based coastal management
5. Coastal engineering.

Adaptation actions are summarised in Table 9.

Table 9. Adaptation pathway for Bamaga

	Present day	2050	2100
Adaptation response	Monitor (look and learn)	Monitor (look and learn)	Monitor (look and learn)
Adaptation Actions			
1. Council-wide initiatives to enhance custodianship	As per Northern Peninsula Area-wide actions		
2. Planning updates	As per Northern Peninsula Area-wide actions		
3. Maintaining and improving infrastructure	As per Northern Peninsula Area-wide actions		
4. Nature based coastal management	As per Northern Peninsula Area-wide actions		
5. Coastal Engineering	N/A		



9.UMAGICO (ALAU)

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9.3 Coastal hazard adaptation	53

9.1 Coastal landscape

Umagico is a small coastal community in the Northern Peninsula Area. The community is locally known as Alau and the area is thought to have been occupied by Gumakudin People prior to European settlement in the area. Umagico was established in 1963 when Aboriginal people were relocated to the area from Lockhart River Mission, and later from Moa Island in the Torres Strait.

There is a gently sloping and narrow, sandy beach at Umagico. Several rocky outcrops occur along this stretch of coastline. The main township of Umagico is elevated above the shoreline and is mostly protected from the impacts of coastal hazards.

Key local values

The coastline is highly valued by the Umagico community. Local residents have beach shacks along the shore where frequent family gatherings occur. There are also sites of cultural significance within the coastal zone at Umagico, including burial sites along the shore.

Umagico also attracts a number of tourists, particularly in the winter months. The Alau Campground is a popular place for tourists and includes a number of campsites, a swimming pool and amenities blocks. There is also a burial site within the campgrounds.

9.2 Potential impacts from coastal hazards

The impacts of coastal hazards are already being experienced at Umagico. There is erosion occurring along the beach near the campground, which is also impacting the access road along the front of Alau campground. Vehicles frequently drive along the sand at Umagico, including steeper sections of the beach, further contributing to erosion.



Figure 13. Map of Umagico locality

Exposure

Coastal erosion is the main coastal hazard currently impacting the shoreline at Umagico. The entire width of the beach is likely to be impacted by erosion. The width of shoreline likely to be impacted by erosion is expected to increase in the future. Storm tide and tidal inundation do not currently have as much of an impact on the coastline as erosion however exposure to inundation is expected to increase by 2100.

Risk

The level of risk to open coast erosion is currently medium and is expected to increase to high by 2100. Storm tide and tidal inundation pose less risk currently but are also expected to increase by 2100.

Overview of assets and values at risk

Assets currently at risk from coastal erosion include roads, and telecommunications, sewage and electrical infrastructure. Beach shacks and campground buildings are also likely to be impacted by coastal erosion. The risk analysis estimates that up to 100 % of the beach shacks along the shoreline at Umagico are currently exposed to coastal erosion. The number of buildings exposed to coastal erosion is not estimated to increase by 2100, however, the risk to these buildings may increase.

The assets currently impacted by storm tide and tidal erosion are minimal. The number and length of assets impacted by storm tide and tidal inundation is expected to greatly increase by 2100. Those at

risk are likely to include roads, beach shacks, campground buildings, and sewage, telecommunication and electrical infrastructure.

9.3 Coastal hazard adaptation

There is a number of priority actions relevant to the five themes identified for the Plan:

1. Enhancing custodianship
2. Planning updates
3. Maintaining and improving infrastructure
4. Nature-based coastal management
5. Coastal engineering.

Adaptation actions are summarised in Table 10.

Table 10. Adaptation pathway for Umagico coastline

	Present day	2050	2100
Adaptation response	Monitor (look and learn)	Actively manage	Actively manage
Adaptation Actions			
1. Council-wide initiatives to enhance custodianship	As per Northern Peninsula Area-wide actions		
2. Planning updates	As per Northern Peninsula Area-wide actions		
3. Maintaining and improving infrastructure	As per Northern Peninsula Area-wide actions 3.2.1 Consider relocating/rebuilding at risk beach huts away from fragile and eroding foredunes and rehabilitate sand dunes.		
4. Nature based coastal management	As per Northern Peninsula Area-wide actions 4.1 Dune protection and maintenance.		
5. Coastal Engineering			
5.1 Coastal hazard protection works	As per Northern Peninsula Area-wide actions 5.1.1 Design and construct a geotextile sand container (GSC) seawall along the shoreline from Alau Campground to where beach shacks are located. 5.1.2 Design and construct a GSC seawall with a raised crest level to minimise coastal inundation.	Review coastal hazard risk and CBA (or other) case for additional coastal hazard protection.	

* denotes a Transition and change response may be appropriate for a specific area within the locality

10. INJINOO

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10.1 Coastal landscape

Injinoo is the southernmost township in Northern Peninsula Area. It was the first established settlement in the region and was settled by the Anggamuthi, Atambaya, Wuthanthi, Yadaigana and Gudang Peoples. Their descendants are the Traditional Owners of the land.

The coastline at Injinoo includes estuarine and coastal environments, including rocky outcrops and sandy beaches. Cowal Creek flows to the ocean at the southern end of the Injinoo coastline near Injinoo Lookout.

Key local values

The coastal zone at Injinoo is highly valued by local residents and residents within the Northern Peninsula Area region. The coastline holds cultural, social and economic significance. There are culturally significant sites along the foreshore, including a cemetery near Injinoo Lookout. A number of families also have beach shacks along the shoreline, north of Injinoo Lookout towards Umagico.

Injinoo Lookout is also an important place in the region for ceremonies and gatherings. St Michael and All Angels Church is also a culturally important site for the Injinoo township.

10.2 Potential impacts from coastal hazards

The impacts of coastal hazards are already being experienced at Injinoo. A seawall was constructed during the 1980s around Injinoo Lookout to protect against erosion. A geotextile sand container (GSC) seawall has also been constructed along the beach at Injinoo Lookout to minimise erosion. Vehicles frequently drive along the sand from Injinoo Lookout, north towards Umagico, further contributing to erosion.



Figure 14. Map of Injinoo locality

Inundation, mostly from tides, also impacts the coast at Injinoo. Anecdotal reports suggest that tidal waters frequently come close to Injinoo school at the mouth of Cowal Creek.

Exposure

Coastal erosion is the main coastal hazard impacting the coastline at Injinoo. Most of the beach width is likely to be currently exposed to erosion. The area affected by erosion is expected to increase by 2100.

Exposure to storm tide and tidal inundation in Injinoo is relatively low, with few assets projected to be currently impacted. Storm tide and tidal inundation exposure are expected to increase by 2100.

Risk

The risk from open coast erosion is currently medium and is expected to increase to very high by 2100. Storm tide and tidal

inundation currently pose a lower risk but the risk is expected to increase by 2100.

Overview of assets at risk

Multiple key buildings are at risk from open coast erosion in Injinoo at present day with risk increasing slightly by 2050 and 2100. The total number of building assets at medium – very high risk in the present day includes 6 beach shacks, 7 buildings associated with the Injinoo Primary School, 1 basketball court, 1 lookout and 7 other buildings). There is a slight increase in risk by 2050 with an additional Injinoo Primary School building at risk. By 2100, this increases to include one further additional Injinoo Primary School building.

There is a number of cultural heritage sites that are already likely to be a risk from coastal erosion including Injinoo cemetery. Roads, and stormwater, electrical and water infrastructure are also at risk of exposure to coastal erosion. The length and number of assets impacted by coastal erosion is likely to increase by 2100. The risk level to these assets is also expected to increase.

Most buildings are expected to remain unaffected by storm tide inundation, currently and by 2100. Some beach shacks may become inundated by

2050, with the number increasing by 2100, however, more than half are likely to remain unaffected. The gazebos at Injinoo Lookout (other buildings) are expected to be affected by storm tide inundation by 2050.

A small number of roads, stormwater drains, and electrical cables are likely to be impacted by coastal inundation. The length of pathways exposed to inundation is estimated to increase from 11 % at present day to 21 % by 2100. The length of unlined open drains exposed to inundation is also expected to increase from 6 % at present day to 13 % by 2100.

10.3 Coastal hazard adaptation

There is a number of priority actions relevant to the five themes identified for the Plan:

1. Enhancing custodianship
2. Planning updates
3. Maintaining and improving infrastructure
4. Nature-based coastal management
5. Coastal engineering.

Adaptation actions are summarised in Table 11.

Table 11. Adaptation pathway for Injinoo coastline

	Present day	2050	2100
Adaptation response	Actively manage	Transition and change*	Transition and change*
Adaptation Actions			
1. Council-wide initiatives to enhance custodianship	As per Northern Peninsula Area-wide actions		
2. Planning updates	As per Northern Peninsula Area-wide actions		
3. Maintaining and improving infrastructure	As per Northern Peninsula Area-wide actions		
4. Nature based coastal management	As per Northern Peninsula Area-wide actions		
5. Coastal Engineering			
5.1 Coastal hazard protection works	<p>As per Northern Peninsula Area-wide actions including:</p> <p>5.1.1 Design and construct a geotextile sand container (GSC) seawall along the shore to the north of Injinoo Lookout.</p> <p>5.1.2 Design and construct a GSC seawall with a raised crest level along the shore to the north of Injinoo Lookout to minimise coastal inundation.</p> <p>5.1.3 Rebuild the existing rock revetment around Injinoo Lookout, including sections along Cowal Creek mouth.</p> <p>5.1.4 Design and construct a rock revetment with a raised crest level or wave return wall around Injinoo Lookout to minimise coastal erosion and inundation.</p> <p>5.1.5 Design and construct a levee to minimise coastal inundation at Injinoo school. Design and construct a GSC seawall with a raised crest level to minimise coastal inundation.</p>		

11. IMPLEMENTATION

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11.1 Working together

Northern Peninsula Area Regional Council recognises a shared responsibility is required for the successful management of coastal hazard risk in the region.

Successful implementation will require continual collaboration and careful coordination between a large number of agencies and organisation as well as a commitment by the local community to protect and look after these fragile environments. Key organisations and their key roles and responsibilities are outlined in Table 12.

Table 12. Key organisations with shared roles and responsibilities for adaptation

Organisation	Key roles and responsibilities in relation to coastal hazard adaptation
Northern Peninsula Area Regional Council	<p>Council will provide oversight and lead the coordination for the Yumpla Coast Strategic Plan implementation.</p> <p>Council's primary responsibility is the maintenance and protection of Council land and assets, and to inform statutory land use planning. Council will implement the Yumpla Coast Strategic Plan through a range of mechanisms including:</p> <ul style="list-style-type: none"> ▪ embedding outcomes and actions from the Strategic Plan into existing Council process and activities; and ▪ implementing new initiatives from the Strategic Plan. <p>Council's role in adapting to climate change and coastal hazards varies depending on the type and ownership of different assets. Council's role includes to:</p> <ul style="list-style-type: none"> ▪ Inform the community and all stakeholders the outcomes of relevant Council-led investigations on coastal hazard risk, planning and adaptation options. ▪ Observe and monitor coastal hazard risk for Council-managed land and assets. For land and assets owned or managed by others, NPARC may, as part of everyday activities, observe a risk from coastal hazards and will notify the relevant landowner/manager. ▪ Proactively plan and implement strategic planning measures to reduce the risk of coastal hazard impacts on Council managed land and assets, inform appropriate land use and master planning across the region and work together with other agencies and organisations to manage their own risks ▪ Act by implementing strategic planning measures and actions to reduce the risk of coastal hazard impacts on Council managed land and assets, and to inform appropriate land use planning across the region.

Ipima Ikaya Aboriginal Corporation and other Registered Native Title Body Corporates / Traditional Owner groups	<p>The Ipima Ikaya Aboriginal Corporation holds Native Title over land and waters on the northern tip of the Cape York Peninsula in trust for the McDonnell Atampaya, Gudang Yadhagana and Angkamuthi Seven Rivers groups.</p> <p>As Traditional Owners they have a cultural mandate and responsibility to be proactively engaged in all initiatives that arise from this Strategy. They play an important role in promoting culturally significant custodianship and care for Country.</p>
Apudthama Lands Trust	<p>The NPARC Apudthama Land and Sea Ranger Program is jointly run with Custodians of the land, The Apudthama Lands Trust, to manage local natural resources. The area patrolled covers approx 250, 000 Ha, including 300km of coast line.</p> <p>The program currently employs 9 rangers who undertake activities including camp ground management, removal and recording of ghost nets, weed and fire management. The rangers also undertake pest management through sampling, collection, identification and removal and are responsible for the signage and fencing of culturally significant sites.</p>
Local Disaster Management Group (LDMG)	<p>LDMGs are established by local governments to support and coordinate disaster management activities for their respective LGAs. In addition to a large number of legislated responsibilities, the LDMG regularly reviews different risks to the community including those associated with coastal hazards.</p> <p>The information in the Yumpla Coast Strategic Plan and associated technical reports should be used to update and inform future risk assessments, planning and response initiatives.</p>
State agencies	<p>DATSIP is now Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships. One of their many roles is to provide whole-of-government leadership in Aboriginal and Torres Strait Islander policy, coordination and monitoring, and the delivery of services in relation to the Yumpla Coast Strategic Plan.</p> <p>Department of Environment and Science DES - role is to provide scientific and technical support to NPARC to monitor coastal conditions, implement further studies, and designing coastal engineering adaptation options.</p> <p>Transport and Main Roads (TMR) are responsible for access assets such as roads, Seisia Wharf, and boat ramps.</p>
Local business and private asset owners	<p>Local business and private asset owners should have regard to the information in this Strategy and take steps to incorporate coastal hazard resilience into asset maintenance or development plans, as well as encourage active participation in custodianship and knowledge exchange initiatives.</p> <p>Fact Sheet 3 'Resilient homes' provides some basic information on how buildings can adapt to coastal hazards and become more resilient.</p>

11.2 Summary of priority actions across the Northern Peninsula Area region

To guide implementation, a detailed action plan will be developed that includes additional detail on:

- Timeframes for actions
- Costing for priority 5 – 10 year actions
- Instruments, plans and processes (existing, modified, new) required to deliver adaptation options
- Potential funding sources
- Monitoring and evaluation
- Barriers to implementation and change management actions
- Partnership opportunities with stakeholders.

A summary of the priority actions by locality and recommended timeframe for implementation is provided in Table 13.

 **High priority
(to be implemented within 5 years)**

 **Medium priority
(to be implemented within 10 years)**

Table 13. Summary of adaptation actions by locality

Adaptation actions	2020 strategic adaptation actions
Northern Peninsula Area Regional Council	Council will provide oversight and lead the coordination for the Yumpla Coast Strategic Plan implementation.
1. Council-wide initiatives to enhance custodianship	
1.1. Community custodianship	1.1.1 Establish and implement a dune protection and maintenance program, including developing a seed bank and involving Traditional Owners, Indigenous Land and Sea Rangers and schools.*
	1.1.2 Seek co-funding/resources for further initiatives through grants and stakeholder partnerships.
	1.1.3 Promote coastal custodianship in the youth and future generations with community dune and coast care events.*
1.2. Knowledge sharing	1.2.1 Establish a coastal working group with key stakeholders (Traditional Owners, Council, research agencies and community) to collaborate and advise on the management of the Northern Peninsula coastline, including culturally significant sites.*
	1.2.2 Enhance community adaptive capacity to coastal hazards, including awareness of increasing coastal hazard exposure and risk, and way to improve individual preparedness and adaptive capacity through training, education and events.*
	1.2.3 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.*
	1.2.4 Promote cross-sector partnerships and initiatives to enhance resilience and strategic adaptation for transport infrastructure, including boating infrastructure.*
1.3. Monitoring	1.3.1 Establish a system of photo monitoring points (CoastSnap, Fluker Post or similar) at beaches in the area.
	1.3.2 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.*
	1.3.3 Create a platform/process for data monitoring and management
	1.3.4 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.*
2. Planning updates	
2.1. Land use planning	2.1.1 Submit updated Erosion Prone Area layers to State Government for formal update to the existing State-wide mapping.
	2.1.2 Use the updated Erosion Prone Area and storm tide mapping and outcomes of the Strategic Plan in current and future Planning Scheme and Master Plan updates to inform decisions on development areas and strategic land use planning.
	2.1.3 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 • Implications for future development approvals and conditions.
2.2. Disaster management	2.2.1 Use the updated Erosion Prone Area and storm tide mapping, risk assessment and economic implications to update the Northern Peninsula Area Regional Council Local Disaster Management Plan.*
	2.2.2 Review the long-term adequacy of evacuation facilities and evacuation routes, including evacuation by land and sea*

Adaptation actions	2020 strategic adaptation actions
3. Maintaining and improving infrastructure	
3.1. Increasing infrastructure resilience	3.1.1 Review at-risk infrastructure (from Strategic Plan data outputs) and embed risks into current asset management plans/Master Plan (this could include 'betterment' at critical asset refurbishment/renewals points).
	3.1.2 Review access road renewals and upgrades (prioritisation), and upgrade design requirements and timing of upgrades.
	3.1.3 Promote resilient homes within the community.
	3.1.4 Consult with utility providers on future services and upgrades, and implications of coastal hazard areas*
3.2. Relocate infrastructure	3.2.1 Consider relocating/rebuilding at risk beach huts away from fragile and eroding foredunes and rehabilitate sand dunes.
4. Nature-based coastal management	
4.1. Dune protection and maintenance	4.1.1 Establish a dune protection and maintenance program.*
	4.1.2 Revegetate the dunes and foreshore along the shoreline where vegetation has been cleared.*
	4.1.3 Consider areas where fencing can be used to protect native dune vegetation.*
	4.1.4 Establish formal access paths and roads to the shore.*
5. Coastal engineering	
5.1. Coastal hazard reduction	5.1.1 Review and further examine the sediment dynamics around NPARC communities and the shoreline including: <ul style="list-style-type: none"> ▪ Geomorphic assessment ▪ Hydrodynamic modelling ▪ Shoreline Erosion Management Plan.
5.2. Coastal hazard protection works	5.1.2 Investigate construction of a geotextile sand container (GSC) seawall or other coastal protection along the shoreline.
	5.1.3 Investigate construction of flood defence levee
	5.1.4 Review coastal hazard risk and CBA (or other) case for additional coastal hazard protection.

11.3 Monitoring, evaluation, reporting and improvement

The Yumpla Coast Strategic Plan will be reviewed every 10 years as a minimum. The next scheduled review of the Plan will be in 2030. The review should include consideration of:

- The degree to which the adaptation actions (planned or unplanned) have been implemented.
 - Success of implementation of any adaptation actions to date, considering:
 - Integration into Council and stakeholder plans and processes
 - Delivery of on-ground activities
 - Community perspectives
 - Reduction in coastal hazard risk.

12. References

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13. Glossary

TERM	DEFINITION
Adaptation	Adaptation is adjusting to actual or expected conditions and events. Adaptation can have good or bad outcomes and should be guided by understanding the desired state of being. Good adaptation to coastal hazards means taking action to reduce risk and increase resilience.
Resilience	Resilience is the ability for something to withstand stress and continue to function and recover from damage. Resilience applies to the coastal environment as well as the community. Resilience happens when coastal ecosystems are clean and healthy, and when the community is prepared and safe for coastal hazards.
Coastal Hazards	Coastal hazards are when natural coastal processes threaten local values, properties, or our local way of life. Some coastal hazards include storm tide inundation, erosion, and tidal inundation.
Storm tide inundation	Storm tide inundation is when big storms cause temporarily higher water levels leading to flooding of normally dry land. Storm tide inundation is often accompanied by big waves and strong winds which together can cause widespread destruction.
Erosion	Erosion is when coastal forces such as waves, winds, tides and currents remove sand from the beach and move it offshore. This can cause the shoreline position to move landwards. Big erosion events can threaten buildings, roads and important cultural areas.
Tidal inundation	Tidal inundation is when normal astronomical tides cause flooding of low-lying coastal land. Areas exposed to tidal inundation are expected to periodically flood. With global average sea levels expected to rise, areas effected by tidal inundation are also expected to increase.
Likelihoods	Likelihoods are words to describe how common or rare an event is. Likely events are expected to happen regularly and multiple times within the average lifespan. Possible events are expected to happen every so often and a few times in the average lifespan. Rare events are unusual and might occur once or twice in the average lifespan.
AEP	Annual Exceedance Probability, or AEP, is the likelihood that certain conditions will occur in a given year. AEP values are based on computational modelling that considers measured coastal data and multiple thousands of simulated scenarios.
Planning horizons	Planning horizons are points in the future for which strategic decisions are made. This Strategy considers planning horizons of present day (2020), 2050, and 2100.
Risk	Risk is the possibility of loss, damage, or injury. In a coastal context, risk arises from exposure to coastal hazards such as storm tide inundation, and erosion. Risk can be measured by considering both the likelihood and consequence of loss, damage, or injury.
Avoid (and maintain)	Prevent new risks from occurring and avoid placing new development or assets in coastal hazard areas.
Monitor (look and learn)	Watch for any changes to the coast that might indicate a change in the risk; collect and record information about important cultural sites and places in a culturally appropriate manner.
Actively manage	Proactively manage or reduce the risk of coastal hazards through a range of adaptation options including custodianship, care for country, and in some cases, physical intervention.
Transition and change	Gradually change what an area is used for. This might include relocating buildings or assets to an area that is safe from coastal hazards.



Supplement A

FACT SHEETS

Supplement B

COASTAL HAZARD MAPPING

Supplement C

ADAPTATION ACTIONS - SUMMARY SHEETS

