# SUPPLEMENT A


Sunshine Coast COUNCIL | Our Resilient Coast. Our Future.

# COASTAL STORYLINE

## Caring for country

The coastal areas of the Sunshine Coast are the traditional lands of the Gubbi Gubbi or Kabi Kabi language group. For over 20,000 years they have hunted in the surrounding ranges, fished the rivers and gathered seafood from the oceans. We acknowledge the traditional Country of the Kabi Kabi and the Jinibara Peoples of the coastal plains and hinterlands of the Sunshine Coast, and recognise that these have always been places of cultural, spiritual, social and economic significance. We wish to pay respect to their Elders – past, present and emerging, and acknowledge the important role Aboriginal and Torres Strait Islander people continue to play within the Sunshine Coast community.

## Cyclones and flooding rains

The Sunshine Coast has always experienced the direct and indirect impacts of tropical cyclones and what we now call East Coast Lows. Extreme winds and flooding were recorded in 1887, 1893 and 1931. These early storms changed the course of many rivers and caused substaintial natural erosion of the coastal systems. As the landscape changed and the built environment increased so did the flooding and tidal innundation. While a constant threat, the 1970s saw a very lanrge number of near misses and extensive damage with TC Wendy, TC Pam, TC Wanda, TC Beth, TC David and TC Ruth all leaving their mark in local history. Most recently in 2019 Ex TC Oma made her presence felt on local beaches.

1700 | 1890 | 1980 | 2000 | 2020

### Exploring paradise

The first sightings and observations of the Sunshine Coast by Captain Cook documented stunning views of Pumicestone Passage and the Glasshouse Mountains. Andrew Petrie later explored the Sunshine Coast region and found the mouth of the Maroochy River bar to be too hazardous for shipping and instead established a wharf at Mooloolaba. Timber and logging industries were established and soon included agriculture and grazing on the rich soils, along with the discovery of gold. The first permanent European settlements commenced construction to support these early industries.

### Surf, sun and sea

Seaside cottages start to appear around Potts Point (now Alexandra Headland) with many owned by locals from the hinterland regions. The increase in beachgoers saw the first Surf Life Saving Clubs being established, creating strong community connections. These early buildings were vulnerable to high winds and flooding resulting in many having to slowly move inland to avoid the impacts of erosion and inundation.

### Rapid population

After the 1980s, the Sunshine Coast experienced rapid population growth. As of 2016 it had become one of the fastest-growing regions in Australia. The population growth rate remains consistent, and strong with approximately 7,240 people adding to the population each year. This increased population and associated urban footprint places increasing pressure on the natural environment.

### Tourism - a new industry

The construction of the Alexandra Hostel in 1923 is thought to be one of the first integrated resort complexes on the Sunshine Coast. Its popularity soon saw a boom in hotel-style accommodation and resorts. The Surfair Central Tower and Beach Hotel (now Ramada Hotel) was built in 1971 as part of a 'City of SunCoast' vision, it changed the face of tourism development in the region. Today the tourism and hospitality industry was valued at more than $1.256 Billion (2017/18).

### Transporting communities

As the number of local settlements and towns increased, and the use of rail, motorised vehicles and aircraft became more affordable, so did the demand for infrastructure to support a growing economy. The first major transport infrastructure came in the form of a rail line in the 1880s between Gympie and Yandina and eventually through to Brisbane. River transport was popular between Nambour and the seaside town of Maroochdoore in the early 1900s. Then came the motor car and the start of a road network joining previously isolated settlements and enabling visitors from as far away as Brisbane to visit with the opening of the (old) Bruce Highway in the 1930s. The Maroochydore Airport formed the last major piece of the transport puzzle with the original local airstrip being constructed in 1958 which became a commercial airport in 1961 and continues to increase in size to cope with demand.

### Protecting the coast

The Beach Protection Act was gazetted in 1968 and was supported by the Beach Protection Authority. The Act was later integrated into the Coastal Protection and Management Act 1995. The Beach Protection Authority was eventually dissolved in 2003 with roles and responsibilities spread across a number of different state agencies. The Moreton Bay Marine Park was gazetted in 1992 and in 1993 was also recognised as a Wetland of International Significance under the Ramsar Convention. Today, the Sunshine Coast has more national parks and protected areas than any other region in Queensland.

### Planning for population growth

In the late 1800s, the Sunshine Coast comprised municipal Divisional Boards including Caboolture, Widgee and Maroochy. Shire Councils were introduced in the early 1900s. In 2008 the Councils of Sunshine Coast, Noosa, Maroochy and Caloundra amalgamated to form the Sunshine Coast Regional Council, but in 2013 Noosa Shire Council voted to de-amalgamate. Today, the Sunshine Coast Planning Scheme 2014 regulates the way land, building and structures are used and developed on the Sunshine Coast.

### Community stewardship

The large number of community-based environmental and coastal-based groups, including BushCare, Turtle Care and Coast Care, demonstrate the value and importance of the natural resources to the local community. They play important roles in advocating for natural resource protection and sustainable use, and provide hands-on management of many local ecosystems and species.

**POPULATION** 3000 | 52,200 | 174,000 | 350,720


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# WHAT DOES A RESILIENT COAST LOOK LIKE?

## ENVIRONMENT

- Maintain our unique coastal lifestyle & identity
- Future generations with access to the lifestyle enjoyed by those before them
- Natural amenity
- A balance of secluded, tranquil spaces & active, energised places
- 'Sea change' opportunity retained

## COMMUNITY
(and organisations)

- Maintenance of surf breaks
- Sustainable fisheries
- Appropriate water-based / land-based activities
- Safe all weather & tide access to estuaries & ocean
- Connected sandy beaches
- Appropriate water and land-based activities

## PLANNING
(and built form)

- Multi-purpose open space (for ecological protection & recreation)
- Effective transport networks that are efficient, networked & provide for diverse forms of travel
- Regulation & compliance that reflects agreed policy & strategy
- People- and eco-based economy
- Safe spaces for evacuation in coastal areas (including mass evacuation)
- Smart systems to support communities during disasters
- Appropriate built urban / landscape design & typology
- Critical infrastructure & transport corridors maintained

## PLACE

- Healthy estuaries & coastal ecosystems
- Safe turtle nesting habitats
- Coastal ecosystems values as carbon sinks
- Stable (non-polluting) landscapes
- Room for marine & coastal ecosystems to move and transition
- Protection of fish passage
- Protection of foreshores & coastal vegetation
- Sustainable energy use
- Clean and debris-free beaches & open spaces
- Ecological corridors & coastal buffers
- Healthy and resilient beaches & dunes
- Healthy estuaries & coastal ecosystems

## RECREATION

- Protection of our cultural heritage
- Educated and informed community
- Collaboration and strategic alignment between stakeholders
- Adaptive community with a culture in transition
- Shared stewardship
- Younger generations leading the way
- Shared responsibility
- Engaged communities and business
- A sense of connected, supported coastal communities
- Safe, connected and supported communities


Sunshine Coast COUNCIL

Factsheet 1 | March 2019

# FAQs – *Our Resilient Coast. Our Future.*



## What is '*Our Resilient Coast. Our Future.*'?

*'Our Resilient Coast. Our Future.' is the* name of the long-term strategy Council is developing to help us better understand current and future impacts of coastal hazards to make our coastline more resilient.

Coastal hazards may include erosion, temporary inundation of coastal land due to tides and storms (known as storm tide inundation), or permanent inundation of coastal land due to sea-level rise.

## Why are we developing this strategy now?

Sunshine Coast Council has been awarded funding from the State Government and Local Government Association of Queensland (LGAQ) to undertake detailed assessments to assist with this long-term planning.

By undertaking this work it will help us to be better prepared for the future, and to reduce the impact of coastal hazards on our communities, environment, cultural values and built assets.

## What's involved in developing the strategy?

Our strategy will be a plan for the future. Its development will involve multiple phases of work over the next 18-24 months. We'll use the best available science and understanding to examine coastal hazard risk and adaptation options.

Each phase of the process seeks to integrate scientific and engineering studies, economics, and community and stakeholder inputs and values.

More than 40 coastal councils in Queensland are progressing their own coastal adaptation strategy, and similar work is ongoing across Australia and internationally.

## What's the focus of the strategy?

Our coastline is dynamic, it's always changing over time. In completing our strategic plan, we'll better understand:

- **Coastal values:** What you value most about living on the Sunshine Coast. How you use, value and connect to our coastlines.
- **Coastal hazard risk:** Current and future risk of erosion and storm tide or permanent inundation, and how this may impact on the coastal values.
- **Adaptation options:** The range of options to avoid, mitigate and manage coastal hazard risk that are appropriate and relevant for different locations along the coastline.

Throughout this process, it's important that we listen to the community, understand key issues, gain knowledge on key values and the history of the coastline, and consider innovative approaches.

Image credit: Michael Wren

QCoast2100 COUNCILS LEADING COASTAL ADAPTATION

Image credit: John Anderson

Community views are a vital part of developing the strategic plan. Please participate in our consultation, either online or in person. To do this, subscribe on our website and we'll send you updates.

## What will the strategy provide?

The development of the strategy leads to the creation of a long-term plan (up to 2100) that Council and other agencies and asset owners can use to manage the coast over time.

Once approved, the strategy will:

- Ensure there is a **shared understanding** of coastal hazards, risks, and the preferred approaches to adaptation along our coast.
- Enable **proactive planning** for both the short-term (e.g. next 5-10 years) and long-term (e.g. 50 years) protection of coastal values, including natural and built assets.
- Help **reduce risk exposure** and avoid financial (and other) costs to council and the community.

The strategy also provides a platform for conversations about how we manage our coastline together.

## How will the strategy be used?

The strategy will provide a range of short- and long-term actions to avoid, mitigate and manage the impacts of coastal hazards.

The strategy outputs will inform:

- Statutory planning (future land use zoning)
- Development controls in areas that may be impacted by coastal hazards in the future
- Infrastructure and asset planning and management, including public and community facilities
- Emergency and disaster response
- Environmental and cultural management and protection
- Financial forecasting and budgets.

## What does it mean for me – and how can I get involved?

Our coast is integral to our region's identity. It's important that our strategy, as well as adaptation responses, are aligned with community expectations and coastal values.

The process to develop the strategy may take up to 24 months. This allows sufficient time to undertake complex technical studies. Importantly, it also gives us time to hold a range of conversations with the community. We appreciate the local community has extensive knowledge on key values and history of the coastline. This will be an important input for the strategy process. We encourage everyone to get involved.

We will also engage with key agencies and organisations, each with a role to play in the future management of the coast and/or assets in close proximity to the coast.

The strategy provides many different and exciting opportunities for the community and stakeholders to be involved. If you have a keen interest in our coast and its future, we want to work with you.

To keep up-to-date with *Our Resilient Coast. Our Future.* and the development of the strategy, you can:

- **Subscribe** to receive regular updates and notifications of public meetings. Go to haveyoursay.sunshinecoast.qld.gov.au/our-resilient-coast, enter your email and click on the 'Subscribe' button
- **Ask** the team questions about coastal hazards and the strategy by emailing ourresilientcoast@sunshinecoast.qld.gov.au
- **Contribute** by sharing your thoughts and helping us shape the strategy. Please join us at our community events and keep an eye on the project website or subscribe for details on upcoming meetings.


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Factsheet 2 | March 2019

# Terminology

**This fact sheet provides a description of some of the more commonly used terms relevant to coastal hazard adaptation.**

## The coastal setting

Coastal geomorphology - The physical shape, processes and patterns associated with the coast, including landforms, soils, and geology.

Landform - The natural shape of the Earth's surface. Landforms range in size from small features such as dunes and estuaries found at a local scale, to large features such as mountain ranges and coastal plains that may exist at regional scales.

Shoreline - A designated line representing the landward limit of the sea. Methods used to define shorelines include fixed vertical levels or identifying the physical interface of water and land (e.g. with aerial photography).

Beach - The portion of the coastal zone periodically subjected to wave action. The seaward limit of a beach is typically defined as the spring low tide line, while the landward limit, as the vegetation line.

Tides - The regular rise and fall of the water surface resulting from gravitational attraction of the moon and sun and other astronomical bodies acting upon the rotating earth.

Relative sea level - Sea level as measured by an official tide gauge with respect to the land upon which it is situated.

Climate change - A change in the state of the climate that persists for an extended period, typically decades or longer.

Sea-level rise - An increase in the mean level of the ocean.

## Coastal hazards

Coastal hazards – Natural coastal processes that may negatively impact on the natural environment and human use of the coastal zone. Hazards include coastal erosion, storm tide inundation, and inundation due to sea-level rise.

Storm surge - Elevated sea level at the coast caused by the combined influence of low pressure and high winds associated with a severe storm such as a tropical cyclone or East Coast Low.

Storm tide - The total elevated sea height at the coast combining storm surge and the predicted tide height.

Storm tide inundation - When ocean water levels and waves are high enough to cause localised flooding of normally dry land.

Coastal erosion - Erosion occurs when winds, waves and coastal currents act to shift sediments away from an area of the shore.

Short term erosion (storm bite) - Erosion that occurs periodically on a short-term basis, often during a storm. The shoreline and beach then gradually regain sediment (rebuild).

Long term erosion (recession or retreat) - Erosion resulting in a continuing landward movement (loss) of the shoreline or a net landward movement of the shoreline within a specified time.

Accreting coast - Coasts that experience a deposition of sand instead of erosion. Accretion occurs during the calmer seasons. Beach accretion is generally much slower than beach erosion.

## Resilience and adaptation

Coastal vulnerability - The threat to coastal landforms, social, economic and environmental systems, associated infrastructure or land use that may be caused by a sustained shift in environmental conditions.

Risk assessment - A systematic process of evaluating the potential risks that may be associated with an event or activity.

Resilience - The capacity of social, economic and environmental systems to cope with or 'bounce back' following a hazardous event or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity to adapt and transform.

Adaptation - The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or exploit beneficial opportunities. In some natural systems, human intervention may help a system adjust to the expected climate and its effects.

Adaptive capacity - The ability of systems, institutions, humans, plants and animals to adjust to potential damage, to take advantage of opportunities or to respond to consequences.

Adaptation pathway - A series or sequence of management actions (over time) directed to achieving long-term adaptation objectives.

Coastal adaptation - Future modification of actions and behaviour through construction of infrastructure or change in land use practices that prevents or reduces adverse impacts associated with coastal hazards.

## Reference

Terminology has been tailored for the Sunshine Coast *Our Resilient Coast. Our Future.* program and is consistent with the National CoastAdapt information manuals: https://coastadapt.com.au/information-manuals.

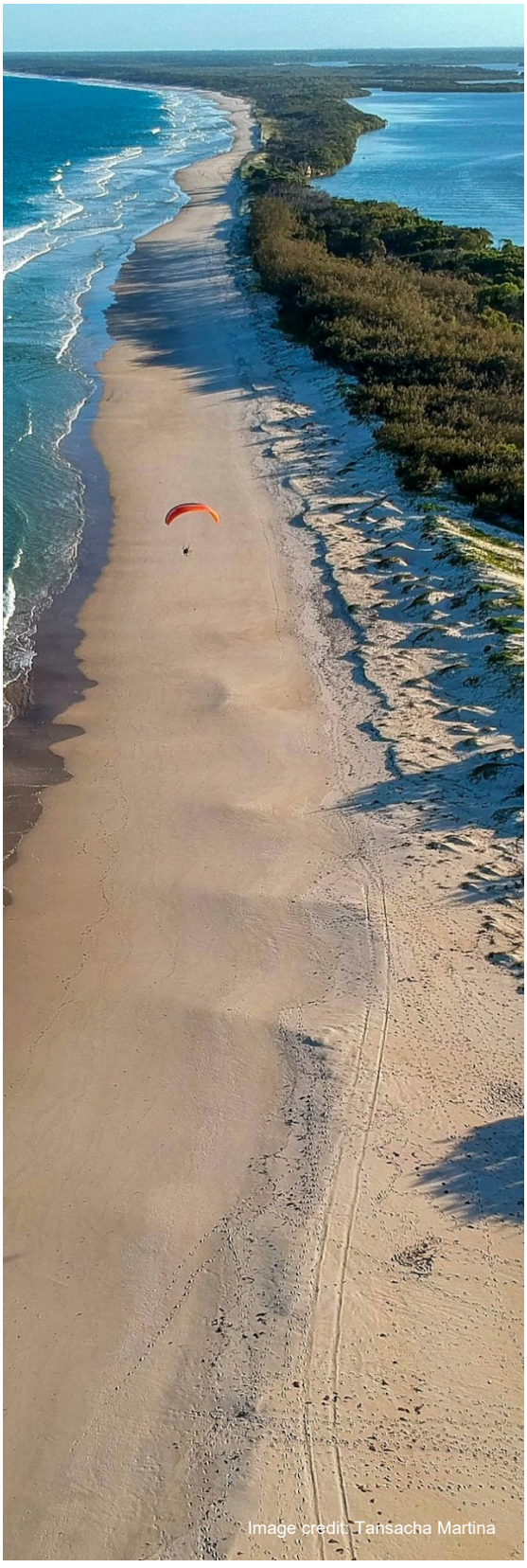

Image credit: Tansacha Martina

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Factsheet 3 | January 2020

# The coastal zone

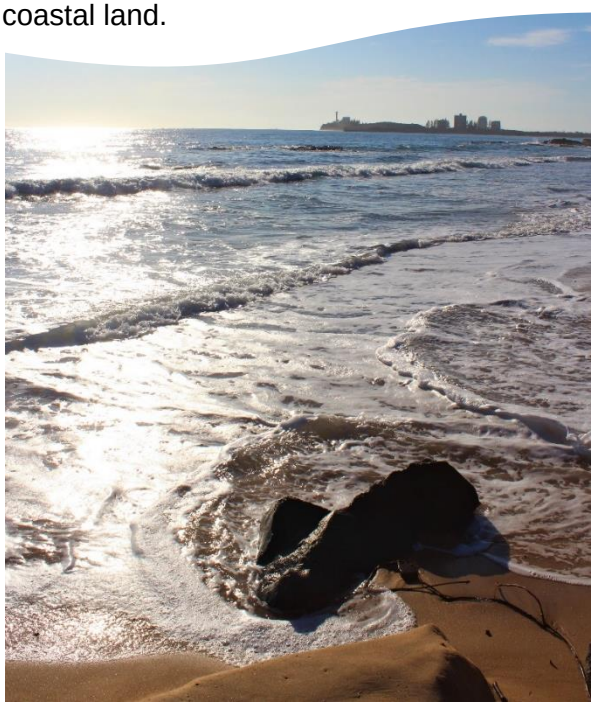
## Our coastal landscape

Coastlines are the dynamic interface between land and sea. The Sunshine Coast Local Government Area includes:

- Over 60 km of open sandy shoreline
- Over 70 km of lower estuary foreshores
- Rocky headlands
- Areas of low-lying coastal floodplains.

Our coastal zone supports a diversity of social, cultural, economic and environmental values. Our beaches, estuaries, and wetlands are highly valued by local communities and visitors.

The coastal landscape experiences constant, and often rapid change. Wind and wave action continually work to move sediment and shape the shoreline and adjacent coastal land.



## What drives change in the coastal zone?

Key drivers of landscape change in the coastal zone include:

**Tides:** The periodic rise and fall (or flood and ebb) of the daily tide moves sediment both on and off-shore and shapes the form of the beach and near-shore environment.

The Sunshine Coast experiences semi-diurnal tides, meaning there are two high tides and two low tides each day.

The difference between the lowest and highest tides experienced under normal conditions is called the tidal range. The tidal range is around 2.17m at Mooloolaba, but extreme weather events can cause considerably higher tides.

**Wind and waves:** Waves are generated by wind blowing across the water. Wind, combined with the morphology (shape) of the sea floor, drives the size, frequency, duration and energy of waves. Wave energy has the potential to move sediment both off-shore, on-shore, and along the coastline.

Data on tides, wind, waves and climate patterns are collected by buoys, gauges and weather stations situated along our coastline.

The Mooloolaba wave monitoring buoy was installed in 2000 and recorded its maximum wave height of 12.1 m in March 2004. A wave monitoring buoy was also installed at Caloundra in 2013.

https://www.qld.gov.au/environment/coasts-waterways/beach/monitoring/waves-sites

Image credit: Michael Wren

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## What drives change in the coastal zone? (continued)

**Weather and climate patterns:** Local climatic conditions (e.g. dominant wind patterns) as well as extreme events like East Coast Lows will influence how the coastal landscape develops and changes over time. Extreme weather events can drive major coastline changes in a short period of time, including erosion (loss) of sand. Sandy beaches and dunes typically rebuild gradually between extreme events. Long-term changes in climate also influence sea level and coastal processes.

**Sediment supply:** Sediment is delivered to coastlines from catchments, rivers, dunes and off-shore environments. When historical sediment supplies reduce or cease, coastlines may be prone to erosion. When sediment supply is abundant, coastlines will tend to build seaward. The main source of sand to the Sunshine Coast is from northern New South Wales via long-shore drift.

**Land use and population:** The number of people living, working and visiting coastal zones is also a key driver of landscape change. Particularly as population increases, the development of urban areas, infrastructure and farmland, can restrict and/or accelerate change.

The population of the Sunshine Coast LGA is predicted to increase from around 300,000 to around 500,000 people by 2041.

## How do we plan for change?

Understanding the key drivers of change in the coastal zone is important to inform management activities. Sunshine Coast Council undertake a range of studies linked to current and future management of the coast. These include assessments related to:

- Coastal erosion
- Storm tide inundation
- Weather and climate trends
- Water quality, coastal ecology, coastal landforms
- Values and uses of coastal areas.

This information informs the development and update of current shoreline management activities, as well as long-term strategic planning.

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Factsheet 4 | February 2020

# Coastal hazards

## What are coastal hazards?

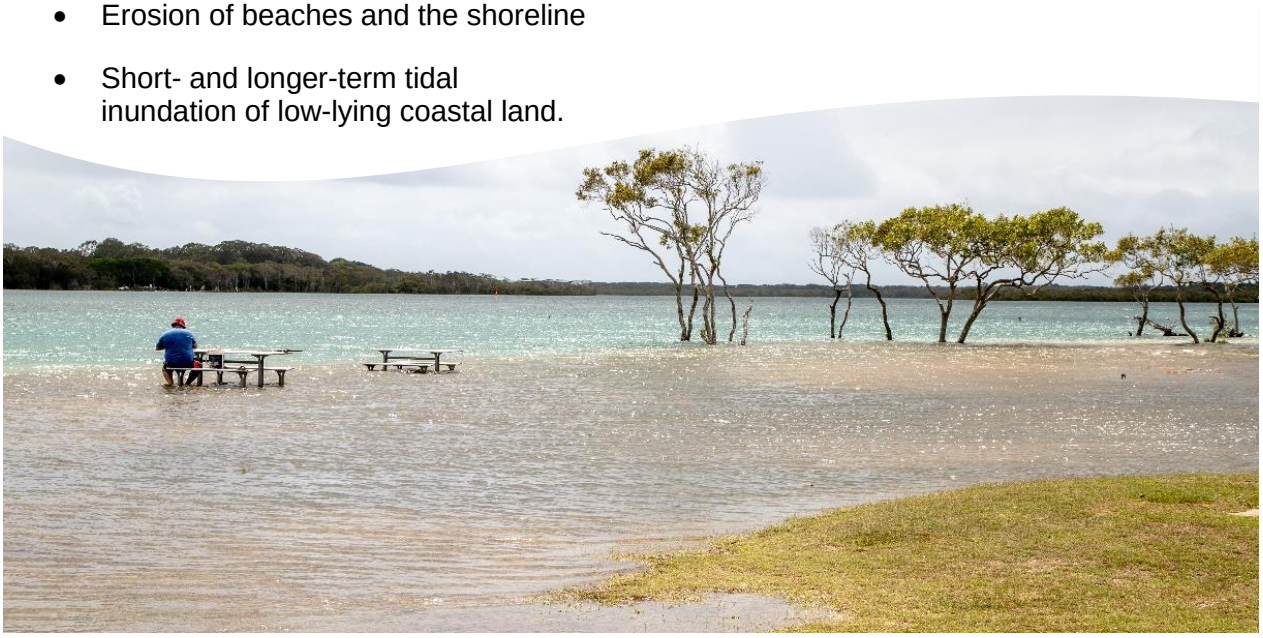
Erosion and inundation are natural processes that shape the coastline. However, they can become hazards when they impact on coastal values and how we use and enjoy the coast.

Coastal hazards include:

- Erosion of beaches and the shoreline
- Short- and longer-term tidal inundation of low-lying coastal land.

Coastal hazards can have adverse impacts on a range of coastal assets including social, cultural, economic and environmental values. In south east Queensland, coastal hazard impacts are typically associated with ex-tropical cyclones and East Coast Lows.

Image credit: Michael Wren



## Storm tide inundation

Storm tide inundation is temporary inundation of low-lying coastal land from locally elevated sea levels, also known as a 'storm tide'.

The storm tide is a combination of the predicted (normal) tide, storm surge, and wave action (Figure 1). Storm surge is driven by the combined influence of low atmospheric pressure and high winds associated with storm events.

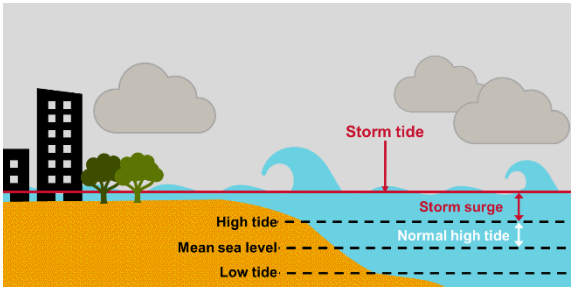



Figure 1. Storm tide inundation

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## Coastal erosion

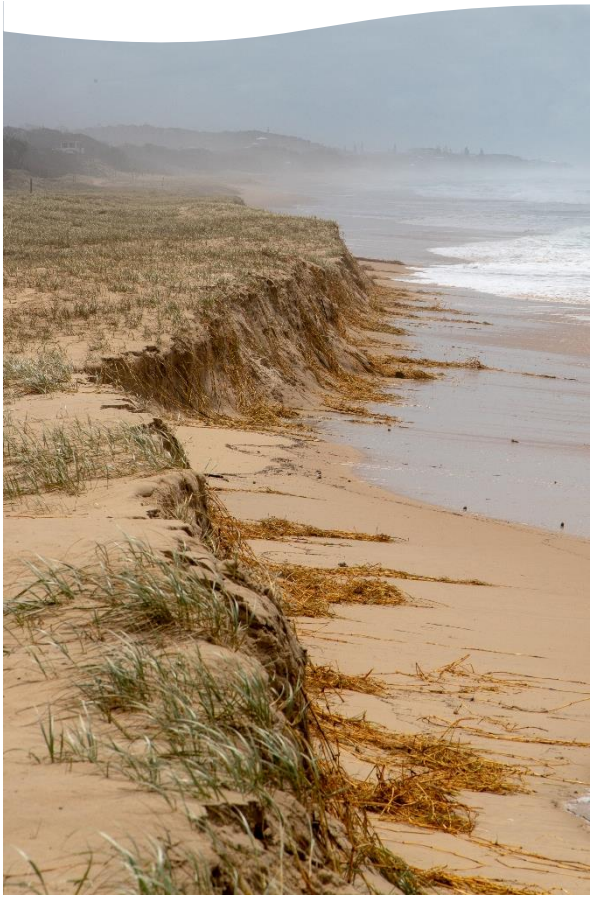
Coastlines naturally erode and accrete over time, driven by variations in sediment supply and climate patterns.

Coastal erosion occurs when winds, waves and coastal currents shift sediment away from the shoreline. This can be a short-term shift, or a longer term erosion trend.

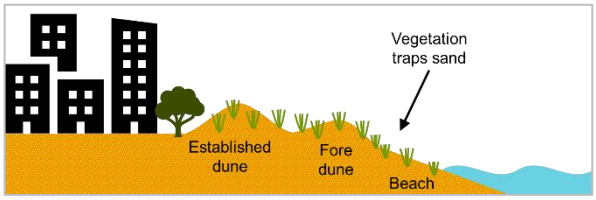
When a beach is stable, all of the sand moved offshore during a storm eventually moves back onto the beach (over timeframes of months to years). In this case the beach erosion (storm bite) is only temporary.

In other cases, due to changing sediment supply or climate conditions, the beach may not have sufficient capacity to rebuild between storm events. In the absence of intervention, long-term erosion (termed recession) may continue.

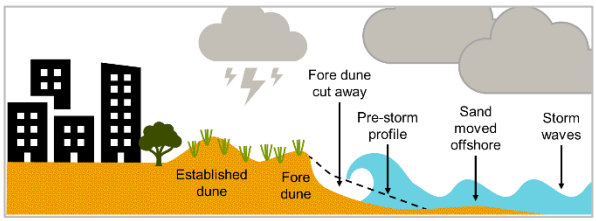
Both short term and long-term erosion processes may impact on coastal assets, depending on how close to the fore dune assets are located.



### Normal beach shape, calm conditions




### Beach erosion during storm




### Beach and dune rebuilding after storm

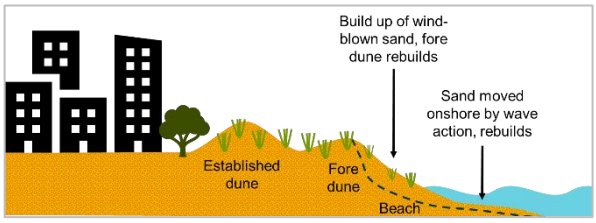



Figure 2. Coastal erosion

## Coastal hazard impacts

Coastal hazards periodically impact the Sunshine Coast and are predicated to have an increased impact in the future (Figure 3, Figure 4).

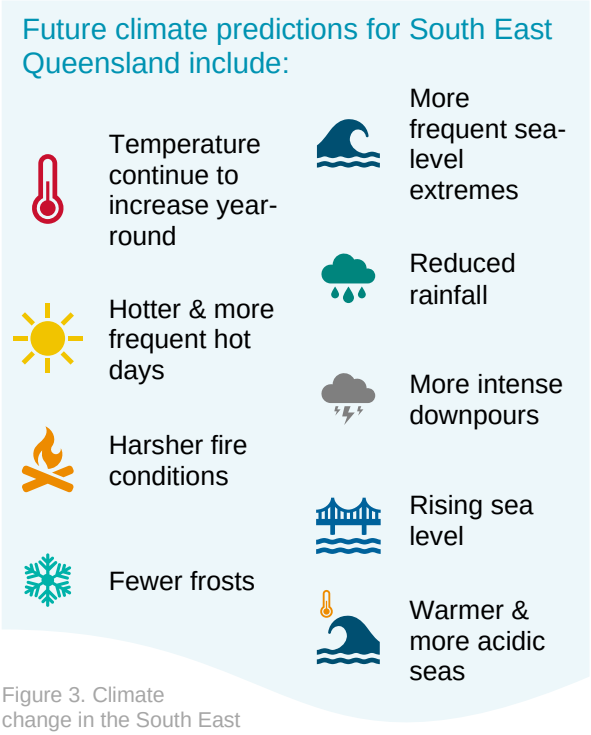



Figure 3. Climate change in the South East Queensland region. DEHP 2016. https://www.qld.gov.au/__data/assets/pdf_file/0023/67631/seq-climate-change-impact-summary.pdf

Projected sea level rise and an increase in storm intensity for the south 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 storm activity will escalate the severity of coastal erosion events

Storm tide inundation:

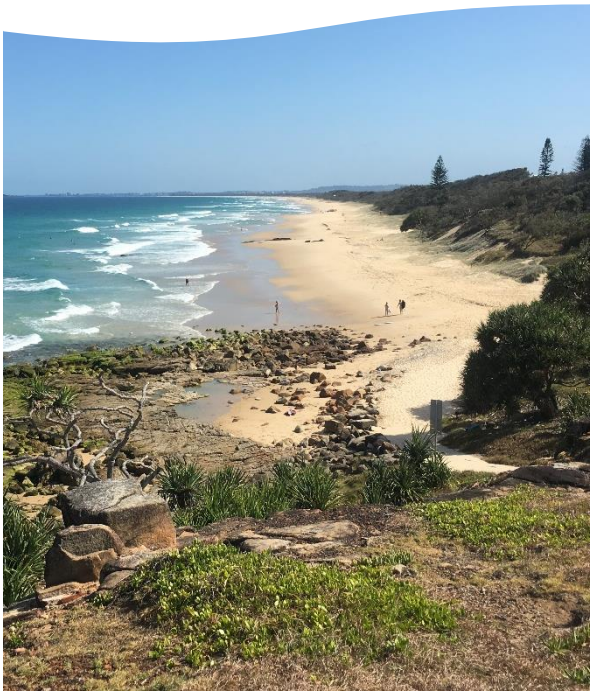
- Sea level rise will increase the apparent severity and frequency of storm tide inundation and will cause inundation to occur further inland
- Increased storm intensity will add to the magnitude of storm tide events and the extent of inundation

Figure 4. Source: Coastal Hazard Technical Guideline (DEHP 2013)

## Planning to adapt

Adverse impacts of coastal hazards can be minimised through strategic planning and adaptation actions. This involves:

- Understanding the physical processes
- Assessing the likely extent of storm tide inundation and erosion, now and in the future, and assets that may be impacted
- Assessing the consequence of impacts for communities and assets
- Considering the range of planning and adaption options and developing an adaptation strategy.



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Factsheet 5 | April 2020

# Coastal adaptation

## How can we adapt to coastal hazards?

There are a range of ways we can adapt to coastal hazards such as erosion and inundation. Adaptation options include:

1. Updates to land use planning
2. Changes and upgrades to infrastructure
3. Coastal engineering options
4. Initiatives to build adaptive capacity across communities

### 1. Updates to land use planning

Updates to land use planning may include:

- Identifying appropriate areas for development (residential, commercial), and new critical infrastructure (e.g. roads, hospitals)
- Identifying appropriate land uses for inundation and erosion prone areas (e.g. sporting fields, open space and parklands, conservation zones)
- Pro-active planning for urban, industry, and ecosystem changes to enable adaptation
- Updating emergency response planning, including monitoring and early warnings (via information and/or technology) for impacted properties

Planning may also include the consideration of innovative economic opportunities that deliver multiple benefits for areas that may be increasingly prone to coastal hazards. For example, joint recreation, biodiversity, carbon sequestration (carbon stored in plants and soils, including blue carbon) and climate resilience benefits.

### 2. Changes and upgrades to infrastructure

Changes to infrastructure may include:

- Relocating critical infrastructure (e.g. essential access and services)
- Upgrading critical infrastructure that cannot readily be relocated
- Increasing floor levels (freeboard) of buildings in flood prone areas
- Building resilient homes
- Updating drainage networks and systems.

The finance industry is increasingly providing new financial products (e.g. mortgages / insurance) that reward resilient design / risk reduction measures in hazard prone areas.

Image credit: Michael Wren

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## 3. Coastal engineering

There are a range of coastal engineering adaptation options including the following.

### *Dune protection and maintenance*

Where present, dune systems are the beach's natural and dynamic defence to coastal hazards. Dune protection and maintenance involves limiting disturbance to dunes and protecting/enhancing dune vegetation to increase the stability of dunes. New dunes can also be created.

The foredunes dissipate wave energy and protect the land behind from impacts of erosion and inundation. Vegetation across the dunes traps windblown sand and enhances the ability of dunes to rebuild after storm activity. Dune vegetation management programs can be developed for different locations and consider a range of environmental and recreational outcomes.

### *Beach nourishment*

Beach nourishment can include scraping of sand from the intertidal zone to accelerate recovery of the upper beach, and/or importing additional sand to increase the overall volume. Imported sand can be sourced from off-shore, near shore banks, estuary shoals or other sources. Beach nourishment is typically combined with dune maintenance, to enhance the level of protection against erosion and inundation.

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

### *Structures to assist with sand retention*

Coastal structures can be installed to assist with retaining sand in a specific area of the shoreline. Usually combined with beach nourishment and dune maintenance, these structures typically take the form of one or many groynes that extend perpendicular to the shoreline to interrupt wave action, capture sand and provide an erosion buffer.

Groynes can be constructed from a range of materials including rock and geo-fabric bags.

### *Structures to assist with off-shore energy dissipation*

Structures can be installed off-shore to create a zone where wave energy will break and dissipate prior to reaching the beach.

These structures include breakwaters and artificial reefs, typically composed of materials such as rock, concrete or geotextile materials.

Living shorelines are a more recent concept of off-shore energy dissipation using a suite of erosion control techniques that combine natural coastal habitats with a natural or engineered means of breaking up a wave energy (e.g. mangrove island, oyster farm reefs/breakwater).Under the water, these structures can also provide joint recreational and cultural benefits.

Mangroves have an important role in providing natural dissipation of wave energy.

The role of Mangrove communities in providing coastal hazard protection is becoming increasingly recognised, alongside other benefits such as carbon sequestration.

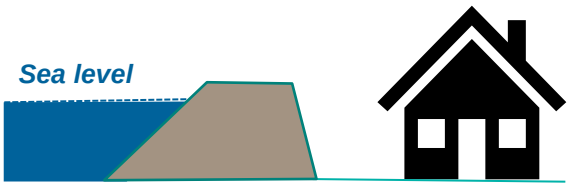
### *Last line of defence structures*

Seawalls provide a physical barrier between the ocean and adjacent coastal land, and protect the coastal assets behind the wall from erosion. Seawalls are typically made of rock, concrete or geo-fabric bags, and can be designed as buried revetments or exposed walls.

A seawall is a hard barrier to wave energy. As a result, waves refract off the seawall and scour sand away from the base (or toe). Depending on the design and location, the presence of a seawall can often result in a loss of the beach. The appropriateness of seawalls is considered on a site by site basis. New designs include working-with-nature principles that assist to minimise the refraction of wave energy.

### *Structures to minimise coastal inundation*

A range of structures can be used to keep floodwaters from entering specific areas.




Dykes and levees are artificially elevated mounds or walls that can be made of earth, rock, concrete, geo-fabric bags or other materials. The presence of dykes and levees can be either part of an emergency planning approach, or more permanent features as part of a drainage network.

Storm surge/tide barriers (barrages or gates) are physical barriers that prevent storm surges travelling inland along rivers, lagoons, inlets or other waterways.

Storm surge/tide barriers can generally be opened and closed and are most effectively implemented at narrow tidal inlets. They can vary in size from a flow valve on pipes and culverts to large scale barrages.

Tidal gates provide an opening through which water may flow freely when the tide moves in one direction, but which closes automatically and prevents the water from flowing in the other direction.

Backflow protection involves the use of valves, flap gates or similar to stop backflow through drainage pipes that can occur at high tide.

## 4. Initiatives to build adaptive capacity

Adaptive capacity in this context means the ability of people and communities to adjust to changing circumstances (e.g. coastal hazards), take advantage of opportunities, and/or cope with potential impacts.

Initiatives to build adaptive capacity across our communities include:

- Developing programs and partnerships to support and enhance stewardship of the coastline
- Facilitating knowledge sharing and education on hazards and adaptation
- Supporting the important role of citizen science, and trials for different adaptation initiatives
- Monitoring changes in coastal hazard risk and effectiveness of adaptation

**Adaptation approaches:**

- Will vary from site to site within each region
- Are tailored to the needs of local communities
- Consider the relative impacts of coastal hazards
- Seek to safeguard the values (social, environmental and economic) and character of the landscape


## Working together

Across Queensland, councils and communities are working together to develop a tailored approach to adaptation across different localities.

More information on coastal adaptation can be found at:

- QCoast2100: http://www.qcoast2100.com.au
- Coast Adapt: https://coastadapt.com.au.

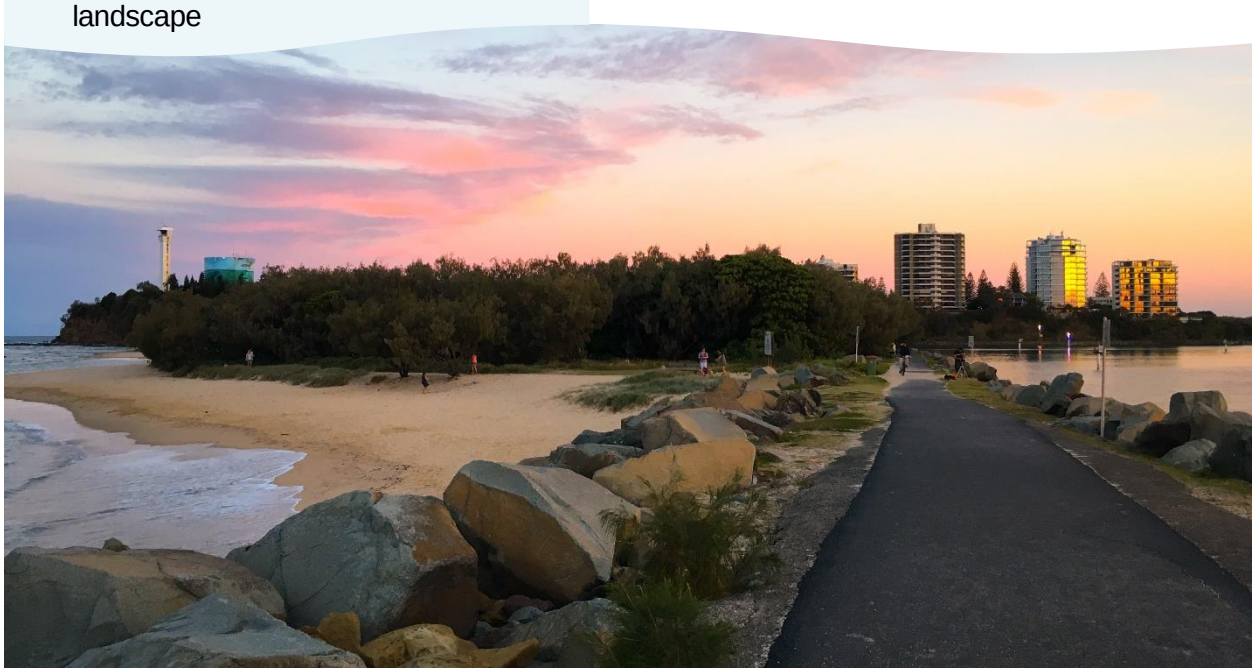


Image credit: Megan Mackie

Our Resilient Coast.
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# Adaptation framework

## A strategic approach and framework

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:

- Developing a locally relevant adaptation framework
- Assigning a strategic adaptation response and pathways (Table 1) to different localities, to guide decision making over multiple planning horizons from present day to 2100
- Assessing the range of adaptation options (Table 2) suitable in different locations to help mitigate the risk of coastal hazards
- Developing a strategy for coastal adaptation with a view to 2100, with prioritised actions over a 10-year timeframe.

**Table 1. Adaptation framework**

| Adaptation response | Monitor, maintain and prepare | Mitigate | Transition |
|---|---|---|---|
| | Monitor the risk of coastal hazards. Monitor until local trigger levels are reached to initiate mitigation. Maintain existing arrangements and prepare for future actions. | Actively mitigate the risk of coastal hazards through a range of adaptation options. Mitigate until local trigger levels are reached to initiate transition. | A strategic decision to transition to an alternative land use in some areas. Mitigation may be part of the transition process. |
| **Adaptation options** | Full range of adaptation options | | |

Image credit: Martin Rich

**Table 2. Adaptation options**

| | |
|---|---|
| **Enhancing adaptive capacity** | Community stewardship |
| | Knowledge sharing |
| | Monitoring |
| **Planning** | Land use planning |
| | Disaster management |
| **Modifying infrastructure** | Increase infrastructure resilience |
| | Relocate infrastructure |
| **Coastal management and engineering** | Dune protection and maintenance |
| | Beach nourishment |
| | Structures to assist with sand retention |
| | Structures to dissipate wave energy |
| | Last line of defence structures |
| | Structures to minimise inundation |

The Coastal Adaptation factsheet provides further information on adaptation options and is available at haveyoursay.sunshinecoast.qld.gov.au/our-resilient-coast or here.

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## Applying the framework

A tailored framework has been developed for the Sunshine Coast Coastal Hazard Adaptation Strategy, to guide decision making on adaptation response and options across the region. This framework has been informed by:

- Consultation with council and stakeholders, including the Community Advisory Group
- The values and objectives for different localities gathered from engagement activities
- The 10-year Shoreline Erosion Management Plan (SEMP) for the Sunshine Coast, prepared in 2014
- An understanding of the risk and cost of coastal hazards for a diversity of asset types, across multiple planning horizons (from the risk assessment)
- A whole-of-coast perspective of the range of values, uses and pressures in the coastal zone.

The broad adaptation responses are described as:

### Monitor, maintain and prepare

At localities where the coastal hazard risk profile is low, the adaptation response is to monitor risk, undertake existing maintenance/asset management activities, and continue active stewardship of the coastal zone. Preparation for potential future adaptation actions will also be undertaken.

If, over time, the risk profile is observed to increase (as indicated by local trigger levels), then the adaptation response may shift to mitigate.

### Mitigate

At localities where coastal hazard risks have been identified, the adaptation response is to actively mitigate the risk through implementing a range of fit for purpose and cost-effective adaptation options. Adaptation options will be tailored to each locality, incorporating site-specific activities, community input, and statutory planning considerations.

If, over time, the risk profile is observed to increase (as indicated by local trigger levels), and mitigation becomes infeasible (due to economic or other factors), then the adaptation response may shift to transition.

### Transition

In some specific areas, if the coastal hazard risk profile is very high, and mitigation becomes infeasible (due to economic or other factors), a strategic decision may be made to transition to an alternative land use. Any such transition would be guided and informed by locality-based adaptation planning.

Transition is about changing how we use land in coastal areas in a way that assists to lower the long-term coastal hazard risk. This can often involve a localised planned retreat of assets, or alternative planning approaches.

If transition is identified, it is likely to be a gradual process over time, where mitigating hazards for a period is part of the transition process. However, in some cases a more rapid transition response may be required subject to a threshold trigger, and there is a need to remain agile. A range of adaptation options will be part of the transition process.

## Implementing adaptation actions

Through the adaptation process, Sunshine Coast Council will continue to plan for future challenges by implementing strategies that support our resilience outcomes.


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# Resilient homes

## What does a resilient home look like?

In coastal areas, private dwellings may be exposed to impacts from coastal hazards, including flooding associated with storm tide inundation. Smart choices for features of your home can reduce the impact of flooding. It is worth considering these top tips for a resilient home (next page).

Some of these changes may have higher initial upfront costs but provide a longer-term benefit. Making these changes over time can reduce damage from future flooding, and help you get back to normal quicker after a flood event.

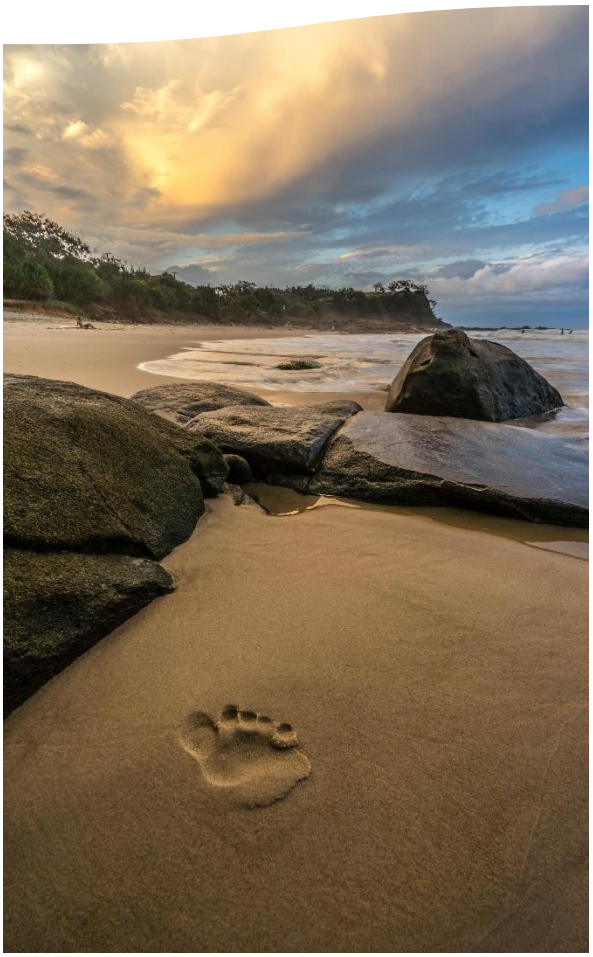

Image credit: Lukas Deroo

Image credit: Bree Anderson

## Flood depth and damage

A relative shallow floodwater depth (10 - 30 cm) can cause substantial damage to the interior of a dwelling (Figure 1). A water depth in the order of 30 cm can often require rewiring, reflooring and replacement of appliances. Investing early in adaptation measures can significantly reduce the damage to your home and the costs associated with clearing up. The top tips for a resilient home are recommended even if your dwelling is only exposed to relatively minor flood events.

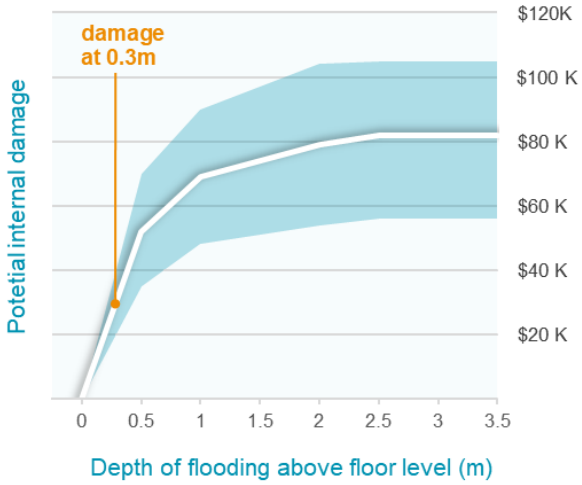


**Figure 1. Indicative internal damage cost compared to depth of flooding in residential buildings. Shaded area represents uncertainty and variation from a number of studies.**

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## Top tips for a resilient home:

### Around the house

Raise electrical power outlets above waist height to reduce damage during a flood and allow power to be restored more quickly

Look at different floor and wall covering options. Tiles and waterproof grout are much easier to clean after a flood than wallpaper or carpet

### Living room

Raise TVs, speakers, WiFi modems and other electricals above waist height or mount on walls if possible to reduce damage during a flood

### Bathroom

If fitting a new bathroom, think about a free-standing bath or shower that is easier to clean around after a flood rather that a fixed bath

**NOTE:** Consult a Registered Professional Engineer Queensland (RPEQ) structural engineer for all structural alterations

### Kitchen and laundry

Raise fridges, freezers, kitchen appliances and cupboards on plinths or stands with removable kickboards to reduce damage and make cleaning up easier

If replacing electrical appliances think about appliances which can be lifted or placed in higher locations such as a front-loading washing machine on a shelf or plinth instead of a top loader on the ground.

### Bedroom

Metal or raised bed frames and other furniture will be easier to clean up than divan or upholstered furniture

### Outside

Place work benches along the inside of garage walls to help reinforce the walls and reduce damage from floodwaters and strong winds

Further ideas for resilient homes can be found here:

- Flood Resilient Homes Program - https://www.citysmart.com.au/floodwise/
- Flood-resilience strategies - https://www.citysmart.com.au/content/uploads/2019/08/FWHS-Flood-resilience-Strategies.pdf
- Resilient Queensland – Resilient homes - https://www.qra.qld.gov.au/resilient-homes


Sunshine Coast COUNCIL

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# Draft Coastal Hazard Adaptation Strategy - overview

***Our Resilient Coast. Our Future – working together to proactively plan for the future management of our coastal areas, to increase the resilience of our region.***

The ***Our Resilient Coast. Our Future*** project team have now completed a draft Coastal Hazard Adaptation Strategy (the Strategy) for the Sunshine Coast.

The Strategy is a risk and change management initiative to better prepare Council and the community to proactively respond to coastal hazards including erosion and inundation. This includes to mitigate and adapt to the social, cultural, economic, and environmental risks associated with current and future coastal hazards.

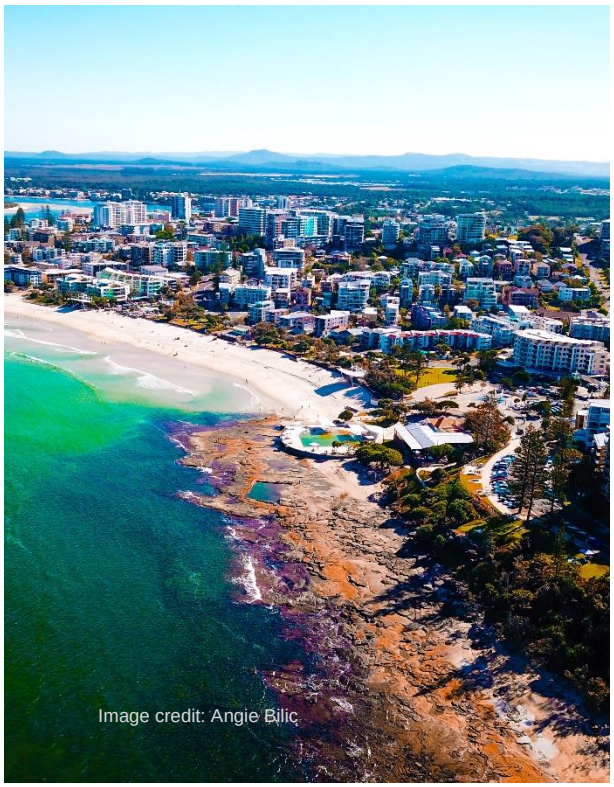
Image credit: Angie Bilic

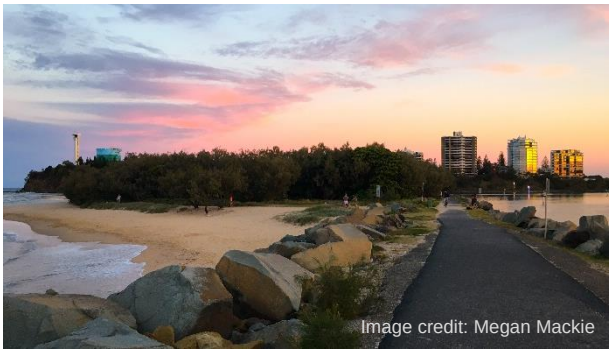
Image credit: Megan Mackie

Image credit: Noel Brady

## This is the start of the adaptation process

Adapting to coastal hazards is a shared responsibility for all stakeholders and the Sunshine Coast community. We look forward to working together as we continue the adaptation journey.

This draft Strategy represents the start of an ongoing process of planned adaptation over time. Adaptation pathways will be continually informed by community input and ideas, new knowledge, and monitoring the effectiveness of actions. We encourage everyone to consider how you can build your own resilience and adapt to future climate change.

The draft Strategy has been a joint project with the Queensland Government and Local Government Association of Queensland (LGAQ) who have provided funding through the QCoast2100 program to Queensland coastal councils to support the process.

QCoast2100 COUNCILS LEADING COASTAL ADAPTATION

Image credit: Tracey Papandrea

## A collaborative Strategy

*Our Resilient Coast. Our Future* has included a substantial engagement program over 2019 - 2020 with our communities and key stakeholders to inform the development of the strategy, through participatory and co-design approaches at different stages of the process.

Community and stakeholder feedback has informed the direction of technical assessments and development of the adaptation options and pathways in the Strategy.

To date:

- Over 5,400 people have engaged via the website
- Over 2,500 people have been involved in face-to-face events and activities
- Over 1,250 people have completed a survey during the project.

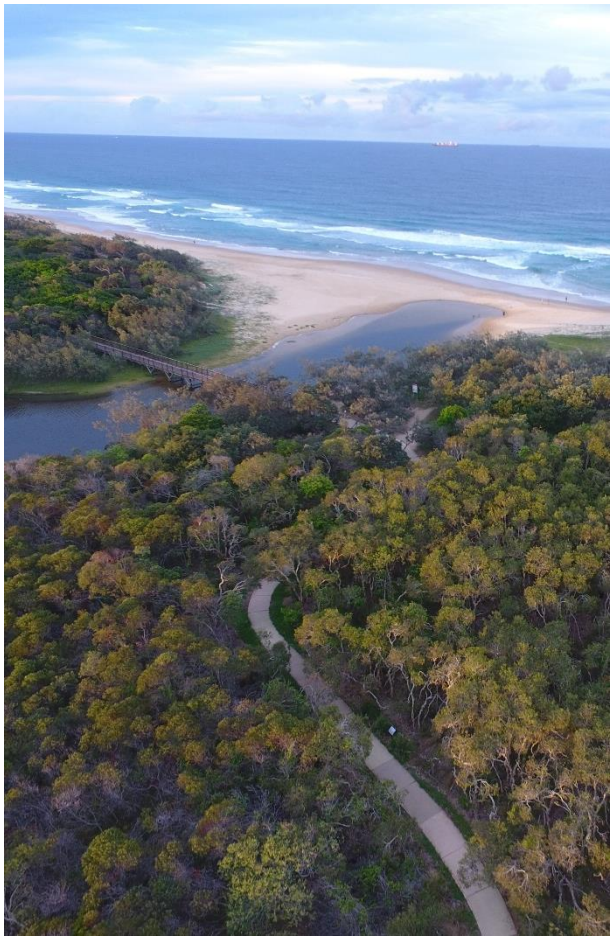

Image credit: Etha Farquharson

## Technical assessments

Work completed to inform the Strategy has included:

- **Mapping:** Updating the existing State mapping of areas that may be exposed to coastal hazards by 2100, including additional planning horizons from present day to 2100
- **Risk assessments:** Undertaking a leading practice and tailored coastal hazard risk assessment
- **Adaptation actions:** Developing and applying a framework for adaptation, and associated adaptation pathways and actions.

The Strategy includes region-wide and location specific actions to manage the current and potential future impacts of coastal erosion, storm tide inundation, and expanding tidal areas due to sea level rise.

## Adaptation actions

The Strategy includes over 50 region-wide adaptation actions across the themes of:

- Enhancing adaptive capacity
- Planning
- Modifying infrastructure
- Coastal management and engineering.

Location specific applications of adaptation actions are set out in pathways from present day to 2100 for each of the 28 coastal localities along the coast.

Image credit: Chris Schwenke


Image credit: Catherine Holland

Example initiatives in the Strategy include:

- Region-wide dune protection and stewardship
- Enhancing social adaptive capacity
- Progressing a region-wide beach nourishment program with pilot site applications
- Advancing partnerships with our Traditional Owners and First Nations people in coastal adaptation
- Enhancing monitoring programs to inform adaptation planning
- Establishing collaborative research partnerships
- Defining ecosystem adaptation needs
- Reviewing surf lifesaving infrastructure location and services across the coast
- Special area adaptation plans to form site specific hazard mitigation and land use transition
- Informing infrastructure upgrades and betterment programs
- Informing coastal engineering actions for the next Shoreline Erosion Management Plan 2.0
- Integrating stormwater, drainage and flood management into adaptation pathway planning
- Updating management principles and actions for intermittently closed estuary systems and rocky headland areas
- Sequencing of location specific adaptation actions from present day to 2100 based on the changing risk profile and objectives for management.

## How can I help adapt?

There are many ways you can contribute to coastal hazard adaptation on the Sunshine Coast.

1. Provide feedback on the draft Strategy – visit the website for options on how to give your feedback
2. Increase your awareness of coastal hazard prone areas - review the State coastal hazard mapping and the updated Coastal Hazard Adaptation Strategy mapping
3. Review the adaptation pathway for your local beach/area and provide feedback on the proposed actions
4. Consider the top tips for a resilient home (visit the website for the fact sheet)
5. Contribute to the stewardship of our coastline by protecting our dunes and coastal vegetation. You can also get involved in citizen science projects or local catchment care group.

Image credit: Lukas Deroo

Becoming a well-adapted and resilient community is a long-term plan that requires ongoing efforts by everyone in our community. We look forward to continuing this journey together with our community to ensure we maintain our impressive coastal lifestyle both now and into the future.

The draft Strategy will be out for public comment over November-December 2020. Please visit the website for a range of options to have your say and contribute to refining the draft Strategy.

Image credit: Rita Aitken

Have your say on the draft Strategy at: [haveyoursay.sunshinecoast.qld.gov.au/our-resilient-coast](haveyoursay.sunshinecoast.qld.gov.au/our-resilient-coast)