Factsheet | Coastal Hazard Adaptation

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. These are naturally occurring processes that contribute to create the unique landforms of each coastal region, however, also have the potential to adversely impact infrastructure, public safety, and natural assets. As changes to our climate occur, these impacts are expected to become more severe. Gladstone Regional Council and the wider community can work together to adapt to change.

A resilient coast has social, economic and environmental systems in place to cope with or 'bounce back' following a hazardous event or disturbance. Resilience also means the ability to respond or reorganise in ways that maintain the essential function, identity and values of a region, while also being able to adapt and transform.

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

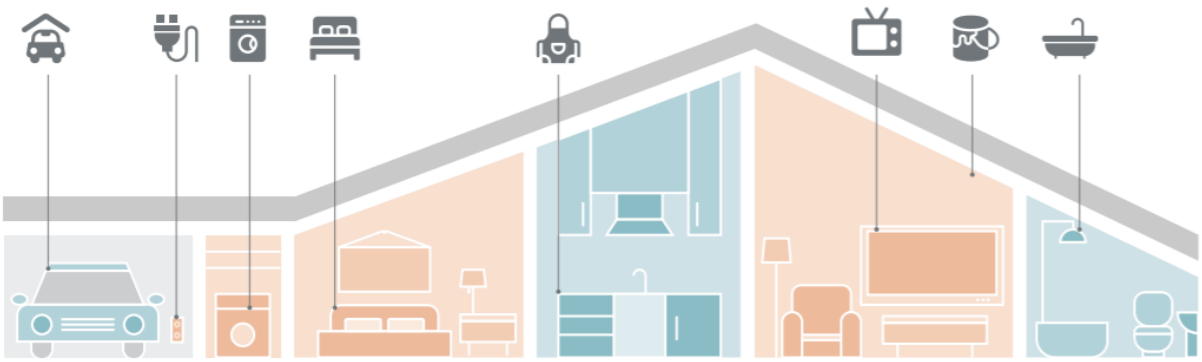
Updates to land use planning may include:

- Identifying appropriate areas for new development (residential, industrial, tourism), and new critical infrastructure (e.g. roads, hospitals)
- Tailoring specific uses for inundation and erosion prone areas (e.g. recreational uses, open space and parklands, conservation zones)
- Planning for urban, industry, tourism and ecosystem changes
- Updating emergency response planning, including early warnings for impacted areas.

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.



3. Coastal engineering

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

Dune protection and maintenance

Dune protection and maintenance involves limiting disturbance to dunes and protecting/enhancing dune vegetation to increase the stability of the dunes.

Where present, the dune system is the beach's natural defence to coastal hazards. 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.

Vegetation plans can be tailored to each site, and with consideration of other needs (e.g. views, access).

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, quarries 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 values of the beach and coastline.

Structures to assist with sand retention

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 long-shore sand transport. Groynes will accumulate sand to the side where sand moves towards the groyne. Groynes are typically made of rock, wood, or 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).

Mangroves have an important role in providing natural dissipation of wave energy. The significance of mangrove communities in providing coastal hazard protection is becoming increasingly recognised. Mangroves are well established along many parts of the Gladstone coastline and have an important role in protecting the shoreline from erosion.

Last line of defence structures

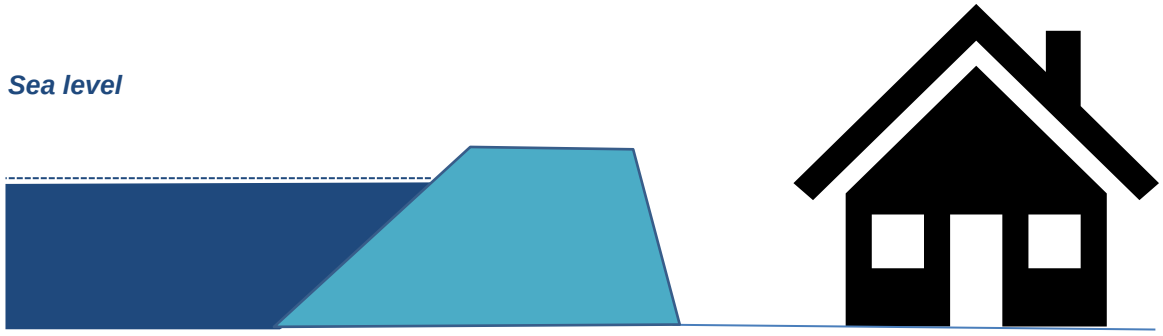
Seawalls provide a physical barrier between the ocean and adjacent coastal land, and protect the coastal assets behind the wall from erosion. Seawalls are typically made of rock, concrete, synthetic blocks or geo-fabric bags, and can be designed as buried revetments or exposed walls.

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). The presence of a seawall can often result in a complete loss of the high tide sandy beach. The appropriateness of seawalls is considered on a site by site basis.

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

Storm 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

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
- Monitoring changes in coastal hazard risk and effectiveness of adaptation.

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
- www.gladstone.qld.gov.au

Fact sheets in this series

- Our Coastal Landscape
- Commonly Used Terms
- Coastal Hazards

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.