Section 1 – A cared for coastal landscape:
Introducing the Shoalhaven Coastal Zone Management Plan

In this section:
Purpose and scope of the CZMP
The Shoalhaven coastal zone
CZMP framework, adaptive management and broad funding options

1.1 Background

The coastal landscape of Shoalhaven City Council is a treasured natural, social and economic asset for the community. The coastal zone extends 165 km along the NSW south coast, from Shoalhaven Heads to North Durras. It includes 35 open coast beaches, bays and headlands, the Shoalhaven River estuary, 14 coastal lakes and numerous small coastal creeks. Figure 1.1 shows the extent of the Shoalhaven coastal zone. The open coast and coastal waterways are set within catchments that extend to the coastal escarpment of the Great Dividing Range. A string of small coastal communities is situated to capture beautiful coastal views and access to the coast, at the mouths of coastal lakes, on coastal dunes and adjacent headlands, around the white beaches of Jervis Bay and around old river crossings. The community enjoys and benefits from the natural values of a healthy coastal zone every day. Shoalhaven City Council (SCC) manages 320 beach access ways, patrolled beaches and three surf clubs, many picnic areas, natural reserves, roads and water and sewerage infrastructure along the open coast. These assets and services support the community’s enjoyment of the coast. Figure 1.2 shows the different landscape elements – beaches, dunes, lakes, estuaries and catchments fitting together in the coastal landscape and how management of the coastal zone draws on knowledge about coastal systems and the values of local communities.

Integrated and sustainable management of the coastal zone is a high priority for Council. Healthy coastal systems that are enjoyed by local residents and visitors are an objective for all sections of Council and support multiple other Council objectives for the community. Coastal zone management is linked to Council’s key strategies for its communities. A Coastal Zone Management Plan (CZMP) that is adopted by Council and certified by the Minister for the Environment will provide a legal framework for future land use decisions along the open coast. Council services and programs which are informed by plans for the coastal zone include:

- land use planning through the Local Environment Plan (LEP) and Development Control Plan (DCP);
- asset management;
- water and sewerage reticulation services;
- biodiversity protection and invasive species control;
- recreation planning and community development;
- tourism and economic development.

Council’s objectives and work in the coastal zone are influenced by and interact with a broader suite of state and regional legislation, policies, programs and plans. Council works with a range of government and community partners to prepare and implement plans that have consistent objectives for the values of the coastal zone landscape. Figure 1.3 shows how the Coastal Zone Management Plan for the Shoalhaven Coastline (CZMP) fits within the broader Council and regional planning and management framework for the coastal zone.

Council is the lead organisation for several plans which focus on managing risks associated with communities living within dynamic coastal zone landscapes. These plans include:

- The Coastal Zone Management Plan for the Shoalhaven Coastline - how Council manages coastal hazards and risks (this plan).
- Entrance management strategies for coastal lakes - when and why Council will open a lake entrance.
- Flood risk management plans for coastal lakes and rivers - how Council works with communities to avoid or reduce flood risks.
The Shoalhaven coastline is long, with many separate lakes, estuaries, floodplains and open coast embayments. A suite of scientific studies, hazard assessments, management plans and monitoring programs for individual waterways guides progress towards healthy coastal systems that support prosperous, engaged communities. Many studies and plans have been completed and are being implemented now. Others are in preparation. Others are approaching a review which will assess how well they are meeting their objectives. This ongoing review and update process means Council and communities can adapt plans to the best available knowledge of natural processes and community needs.

Figure 1.1 – Shoalhaven Coastal Zone (note, this figure also shows the hazard areas ref. Section 2.3)
Coastal landscapes continually change responding to the dominant natural forces of wind, waves, rainfall and tides. Our understanding of how these beach and estuary systems operate within natural dynamics is improving. Our management needs to recognise how we can adapt and minimise community risk and environmental impact. Coastal Zone Management in NSW now integrates estuary and open coast management planning directions. The CZMPS for the open coast complements and, over time, will be fully integrated with plans for coastal lakes and estuaries.

### Estuaries
The NSW south-east coast region has three main Estuary Types:
- Wave dominated barrier estuaries
- Wave dominated Deltas

Estuary flood plains are areas that are inundated by both catchment runoff and by oceanic waters (tides and wave overtopping of dunes). Many homes and services are currently located in flood risk areas around estuaries. Flood risks are partly managed by entrance management strategies for coastal lakes.

### Estuary Health Monitoring
Healthy estuarine systems provide multiple services to the environment and to coastal communities.

The Monitoring Evaluation and Reporting (MER) strategy was developed to form a consistent program of ‘indicators’ for a state-wide assessment of ecological condition of estuary systems.

Core indicators include:
- Chlorophyll a (measuring microalgal abundance), turbidity and standard water quality parameters (including salinity, temperature, pH, dissolved oxygen)
- DO level is critical to aquatic life with low values causing fish kills
- Nutrient such as Nitrogen and Phosphorus track catchment inputs from erosion or land use
- Habitat mapping measures seagrass, mangroves and salt marsh communities

The MER strategy collects monitoring information from representative sites in estuaries and coastal lakes. The physical and ecological monitoring results are combined into an estuary health score for the system, like a school report. Scores range from D (needs a lot of improvement) to A (a healthy system functioning well).

### Community Values of the Coast
- Knowledge of coastal processes and systems
- Certainty about planning requirements
- Safe pedestrian access to beaches, headlands and rock platforms
- Safe boating access
- Safe vehicle access at selected locations
- Healthy coastal vegetation communities
- Views across coastal waterways
- Stable coastal landforms
- Facilities for families to enjoy the coast – as residents, long term holiday makers or occasional visitors
- Residential areas near beaches and coastal waterways

How are these values and satisfaction with Council’s coastal zone management recorded?
- Engagement with area groups and Council’s Coast, Estuary and Floodplain Risk Committee
- Community surveys
- Joint Council and community projects such as Landcare

### Beaches and Headlands
Shoalhaven has long sandy barrier beaches, rocky pocket beaches. Wave height varies (0.5 m to 1.6 m+) with beach orientation and protection by offshore reefs. Many of the open coast beaches have one or two offshore bars and are rip dominated. The height and extent of coastal dunes is also linked to embayment orientation, wave approach and exposure to strong south easterly winds, as well as the very long term geomorphic evolution of the coast. For instance the well sorted, white sands forming beaches in Jervis Bay are very old wind-blown sand deposits, sorted during periods of lower sea level. http://www.oscoasts.org.au/conceptual_mods/beaches/wdb.jsp

### Coastal Risk Management
The Shoalhaven’s coastal urban areas have been, and will continue to be, exposed to the impacts of coastal hazards. These hazards include: beach erosion; shoreline recession; coastal entrance instability; sand drift; coastal inundation; storm water erosion; slope instability; and climate change.

The CZMPS focuses on managing risks associated with these hazards.

Managing other coastal values
The CZMPS is also about protecting the resilience and functions of coastal ecosystems on a changing coastline.

Monitoring and reporting on coastal health
Council monitors the condition of beach access ways. There is no formal monitoring program for the health of coastal dunes along the Shoalhaven coast at this time.

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Figure 1.2 – Knowledge of science and values – working together in the management of the Shoalhaven coastal zone
Figure 1.3 – Planning framework for the coastal zone

1.2 About this Plan

The Coastal Zone Management Plan for the Shoalhaven City Council coastline (CZMP$) focuses on how Council will manage issues along the open coast in partnership with local communities and government stakeholders. The landforms of the open coast are beaches, dunes, headlands and lake or creek entrances. The Plan is prepared specifically in accordance with:

- the requirements of Part 4A of the Coastal Protection Act 1979, the objectives of the NSW Coastal Policy 1997 and the NSW Sea Level Rise Policy Statement (2009);
- requirements of the NSW Guidelines for the preparation of Coastal Zone Management Plans (2010);
- requirements of Council under the Local Government Act 1994 (such as a Community Strategic Plan) and the liability provisions of Section 733 of the Act.
1.2.1 Purpose and Scope

The CZMPS is mainly designed to manage coastal risks. Coastal risks derive from the interaction of coastal processes and the values and assets of the coastal landscape. Coastal processes such as waves, currents, tides and strong winds create hazards such as storm bite erosion of beaches and dunes, medium to long term recession of the beach and dune system, and slope instability on cliffs and bluffs. Figure 1.4 shows the steps in preparing a coastal zone management plan.

A coastal erosion risk zone is an area which is impacted by coastal hazards now, or is projected to be impacted by coastal hazards in the foreseeable future. When assessing coastal risks, a plan must consider the impacts of projected climate change and sea level rise for the period to 2100. Higher risks occur when an impact is more likely and when the land which will be impacted has assets of high value located on it.

In addition to risks driven by the impact of coastal processes on built assets, the CZMPS provides strategic direction about important natural values and community uses:

- pressures on the ecological health of beaches, coastal dunes and headlands
- appropriate locations and facilities to support and encourage community use of the coast.

Science, community values and sound decision making processes all contribute to a plan for a safe and healthy coastline, where risks are managed effectively.

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**Figure 1.4 – Steps towards understanding and managing coastal risks and mitigation measures**
1.2.2  Shoalhaven’s Future Coast

Council’s vision for the coast describes a coastal landscape where communities and Council work together to maintain a healthy, safe and productive coastal landscape.

Council’s Vision for the Coast

**A cared-for coastal landscape**

Shoalhaven City Council and the communities along the city’s coastline will care for coastal landscapes in ways that protect the beauty and productivity of the sea, the shoreline, healthy coastal waterways and coastal ecosystems, so that future generations continue to be refreshed and inspired by their experience of the coast.

To achieve this vision, Council has set objectives and targets to continue to improve:

- Coastal hazard identification and risk management;
- Protection of the natural environment and coastal biodiversity;
- Scenic outlooks, community access and appropriate recreational facilities;
- Efficiency and effectiveness of coastal zone management; and
- Social and economic wellbeing of coastal communities.

1.2.3  Coastal Management Principles and Objectives

SCC has adopted the ten coastal zone management principles set out in the NSW Guidelines for Preparing Coastal Zone Management Plans (DECCW, 2010). The principles are set out in Table 1.1, together with Council’s objectives for the CZMPs.

### Table 1.1 – Applying Coastal Zone Management Principles

<table>
<thead>
<tr>
<th>Coastal Zone Management Principles (DECCW, 2010)</th>
<th>CZMPS Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider the objects of the <em>Coastal Protection Act 1979</em> and the goals, objectives and principles of the NSW Coastal Policy 1997 and the NSW Sea Level Policy Statement 2009.</td>
<td>Maintain natural systems and processes to maintain or improve the health and diversity of natural systems. Give effect to all relevant NSW legislation and policy, as applied in the Shoalhaven context.</td>
</tr>
<tr>
<td>Optimise the links between plans relating to the management of the coastal zone.</td>
<td>Manage all coastal systems in an integrated manner that recognises the links between catchment, lake, estuary and open coast processes. Align the CZMPS with Council’s estuary and catchment plans, with the planning system and with Council’s Community Strategic Plan.</td>
</tr>
<tr>
<td>Involve the community in decision making and make coastal information publicly available.</td>
<td>Keep the Shoalhaven community informed about the health of coastal systems and changes to coastal processes and landforms, in response to natural process and management responses.</td>
</tr>
<tr>
<td>Base decisions on the best available information and reasonable practice; acknowledge the interrelationships between catchment, estuarine and coastal processes; adopt a continuous improvement approach.</td>
<td>Manage the coastal zone adaptively, with a clear process for modifying management approaches as new knowledge becomes available.</td>
</tr>
<tr>
<td>The priority of public expenditure is public benefit. Public expenditure should cost effectively achieve the best practical long term outcomes.</td>
<td>Invest in effective and efficient strategies to achieve positive natural, social, cultural and economic outcomes within Council’s responsibilities.</td>
</tr>
</tbody>
</table>
Coastal Zone Management Principles (DECCW, 2010) | CZMPS Objectives
---|---
Adopt a risk management approach to managing risks to public safety and assets; adopt a risk management hierarchy involving avoiding risks where feasible and mitigation where risks cannot be reasonably avoided; adopt interim actions to manage high risks while long term options are implemented. | Plan land use and undertake land management to take natural systems and processes into account, so that risks from coastal hazards are minimised. This includes hazards associated with currently active processes and changes due to climate change and sea level rise over longer time frames.

Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions. | As above.

Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems. | Maintain natural systems and processes to maintain or improve the health and diversity of natural systems.

Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy. | Support the social and economic well being of local communities. SCC is a city of villages, each with strong attachment to a local section of coast.

Support recreational activities consistent with the goals of the NSW Coastal Policy. | As above.

## 1.3 Council’s Strategic Approach to Coastal Zone Management

The CZMPS has four main focus areas (Figure 1.5). These focus areas are contained within an adaptive management framework. Adaptive management is a process for managing uncertainty, incomplete data and changing coastal systems, to improve and refine management responses over time.

**Figure 1.5 – Framework for adaptive management of coastal risks and four focus areas**

The Plan reduces known serious risks in five ways, as shown in Table 1.2. More details are in Section 5.

### Table 1.2 – Risk Management Options

<table>
<thead>
<tr>
<th>Risk management</th>
<th>Option</th>
<th>Avoid, Accommodate or Accept? (Approach may change as triggers are met)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid Risk</td>
<td>Planning controls and asset replacement plans for existing and future development, including homes and infrastructure</td>
<td>Long term managed retreat to avoid risk or retreat from risk</td>
</tr>
<tr>
<td>Change the likelihood</td>
<td>Beach and dune nourishment, revegetation and biodiversity programs; coastal protection works</td>
<td>Accommodate change by building community capacity or by targeted land management, beach nourishment, building design or protection works</td>
</tr>
<tr>
<td>Change the consequence</td>
<td>Community awareness, building and infrastructure design; access management</td>
<td></td>
</tr>
<tr>
<td>Share the risk</td>
<td>Insurance measures and funding options for affected landowners</td>
<td>Accept risk and manage costs – who pays and how</td>
</tr>
<tr>
<td>Informed risk retention</td>
<td>Emergency action in the short term</td>
<td>Accept risk and respond when events occur</td>
</tr>
</tbody>
</table>
An aware and involved community has a clear understanding of coastal issues and can see how its values have been incorporated into Council’s strategies for managing the coastline. Effective coastal zone management depends on active community involvement. Council will work with residents to:

- build broad community knowledge of coastal processes and risks; and
- create opportunities for local communities to be involved in protecting important values, providing facilities for appropriate coastal use and enjoyment and monitoring and reporting coastal change.

Details about how Council will inform and collaborate with local communities during implementation of the CZMP are in Section 4.1.

A natural coastal landscape with high biodiversity is an important feature of the Shoalhaven coastal zone. These healthy coastal ecosystems support valuable social and economic services for the community, such as coastal holidays and tourism.

The CZMP supports continuing council and community effort to protect and enhance ecological communities on beaches, coastal dunes and headlands, reinforcing the resilience of the coastal landscape to changes in the intensity of coastal processes. Key actions include managing access ways, preparing planting guides and reserve vegetation plans with local communities, to take into account ecological processes, safety, views and access. Council will continue to work with conservation partners to protect nesting sites for migratory shore birds such as the Little Tern, and to manage whale strandings when necessary. More detail is in Section 4.1.

Council will work with the NSW government, local communities and university researchers to build knowledge of coastal processes and to monitor changes to the coastal zone over the coming decade. Shoalhaven coastal zone monitoring has four main purposes:

1. Tracking implementation of the Plan by Council and its partners.
2. How beach and dune profiles respond to management actions and to storm patterns and changes in sea level.
3. Ecological health and condition for estuaries, coastal lakes and frontal dunes in response to management actions and to droughts, very wet periods and changing sea level.
4. The condition of access facilities and community satisfaction with the coastal amenity.

Results from monitoring programs will be shared with management partners and with local communities. More details are in Section 4.1.

1.3.1 How does Adaptive Management Work?

An adaptive management cycle has four steps (Figure 1.6). Managers track progress against expectations and evaluate effective responses that met community and environmental objectives.

Council will continue to monitor the condition of the coast and shoreline responses to major storm or extreme water level events, so that Council and local communities have the best available knowledge to evaluate, review and adapt management actions. Council will also continue to work with NSW and Australian government to facilitate a coordinated approach to difficult coastal change issues.
1.4 Timeframes for Action

The CZMPS is intended to be implemented over a ten year period. Actions are proposed for urgent/short term implementation (less than 2 years, providing funds are available), for medium term implementation (Year 2 to Year 5) and longer term implementation to be commenced after Year 5, but before 10 years.

A review of implementation progress will occur after Year 5 (linked to Council’s State of the Environment Reporting). A full review of the effectiveness of the plan will occur after ten years. Strategic priorities and triggers for adaptive change to land use would be reviewed and updated at that time.

Coastal hazard and risk studies will be reviewed when new projections are issued by the Intergovernmental Panel on Climate Change (IPCC) and/or the NSW Government Sea Level Rise Policy Statement is reviewed.

Details about the priority of proposed actions on the coast are in Section 6.

1.4.1 Who will deliver action on the coast?

The strategies and actions set out in the Plan are primarily the responsibility of Shoalhaven City Council. Many sections of Council will cooperate to achieve the objectives of the Plan. Council will work closely with the local communities along the coast to implement the plan.

Council will also work closely with the Office of Environment and Heritage (OEH), DPI Catchments and Lands and Land and Property Information (LPI), Southern Rivers Catchment Management Authority, Department of Planning and Infrastructure (DP&I) and other agency stakeholders to ensure a consistent approach to:

- coastal risks;
- the decisions about coastal access;
- the protection of important coastal ecosystem functions.

The CZMPS does not duplicate existing management actions in plans made by these partners. It does make strategic recommendations to be considered by coastal management partners, to help deliver a coordinated, integrated, informed and adaptive management approach for the coast.
As much as possible, the CZMPS aligns with plans of management for Crown Reserves, Council Reserves, National Parks and Marine Parks. It is consistent with coastal ecosystem resilience initiatives which are part of the Catchment Action Plan (CAP) prepared by the Southern Rivers Catchment Management Authority (SRCMA). The CZMPS has directly informed the Shoalhaven LEP and DCP 118 (draft), ensuring that coastal erosion risks are considered in Shoalhaven land use planning strategies for the future.

1.5 Who pays for Coastal Zone Management?

SCC has the primary role in land use planning (through clauses in its LEP and DCP) and in carrying out on ground works to reduce serious coastal risks to community assets and infrastructure. Council owns and/or manages coastal land on behalf of the Crown and local communities. Council works in partnership with community organisations to manage coastal vegetation, protect sensitive coastal ecosystems and provide safe and attractive beach access facilities for residents and visitors. So Council has responsibility for developing funding strategies for coastal zone management.

Council has prepared budget estimates for all proposed actions. The estimates are linked to Council’s internal budget planning cycles, but Council has limited resources, thus, also needs to draw on funds available from other sources to implement the CZMPS.

1.5.1 Funding Options

There are several strategies open to Council to provide human and financial resources for implementation of the Plan. Council is already addressing many issues through existing staff responsibilities. Council is considering additional options, including:

- Fostering its partnerships with land holders and community based organisations along the coast and with key NSW agencies such as OEH, SRCMA, Marine Parks Authority, Crown Lands and LPI, to promote research and on ground works programs relevant to SCC’s coastal issues and priorities. Community involvement is critical to dune vegetation rehabilitation, and to monitoring the condition of coastal natural resources. Partnerships or sponsorships with private sector businesses are also possible for some coastal management works, both in terms of ecological resilience and asset management.

- Reviewing and reallocating priorities in Council’s overall Business Plan so that greater resources are allocated to coastal zone management.

- Modifying job descriptions for Council officers in line with new priorities, to clarify where officer time is to be invested.

- Focusing on a sound, risk-averse planning framework (LEP and DCP) so that new development is directed out of coastal risk areas.

- Applying for funding through special coastal grant schemes (such as Caring for our Country Coastal Program, OEH programs and Commonwealth emergency response programs). To ensure timely and coordinated delivery of the priority actions in the Plan, Council has identified grant programs which would support implementation of some actions and is actively submitting project applications to these programs. Internal and grant fund requirements are identified in the implementation tables of the CZMPS.

Council supports the NSW Government policy that private landholders should contribute to the cost of constructing and maintaining coastal protection works that benefit them. Council also proposes that, in the longer term, all SCC landholders could contribute in some way to the costs of managing community infrastructure in coastal hazard zones, so that services (both ecosystem services and infrastructure services) that are widely enjoyed are able to be maintained. With these principles in mind, Council is considering the following additional options to generate funds for implementing coastal risk management actions (options involving new levies will require detailed community consultation):

- Require that all private landholders who are directly impacted by coastal process hazards pay for any coastal protection works (on private land) from which they benefit, including maintenance of protection works.

- Implement a special levy on affected coastal landholders, to cover the costs of maintaining beach amenity, where public access and recreational amenity are indirectly impacted by approved private coastal protection works. This charge was authorised by 2010 amendments to the Coastal Protection Act 1979 (now being further amended).
• Implement a Shire-wide levy (similar to the existing storm water levy, or environment levies that other councils have implemented) to provide additional capital funds for works to relocate or protect community assets and infrastructure that are impacted by coastal recession. These assets include surf clubs, park facilities, beach access ways, sewerage systems, roads and pathways. Works to relocate or protect community assets (such as surf clubs and sewerage infrastructure) in the 2050 and 2100 coastal hazard zones are the biggest financial commitment for Council from the Plan.

1.6 The Top Ten Management Actions

The options appraisal process and actions tables are detailed in Sections 3, 4 and 5. A summary of actions that are considered to be priorities is included in Table 1.3. This table highlights ten packages of actions that Council proposes to commence within the first two years of implementing the Plan. These packages of actions will help to prepare Council and its communities for adaptive management of coastal zone issues. They relate to:

• ensuring there are resources for managing the implementation process;
• building the resilience of beach and dune landforms and coastal ecosystems;
• clarifying the likely asset life and foundation capacity of built assets in immediate (or short term) coastal hazard zones; and
• working with local communities to build understanding of coastal processes and coastal zone management interactions and to prepare for change.

These ten packages of actions are not ranked in terms of importance or order of implementation, but wherever possible, Council would focus on this list when planning its short term works budget or applying for urgent grant funds, so that resources are available for action as soon as possible.

Table 1.3 – Top Ten Management Responses

<table>
<thead>
<tr>
<th>Action Package</th>
<th>Responsibility</th>
<th>Indicative Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintain a full time coastal zone coordinator position to coordinate design investigations, develop the implementation strategy (including long term funding options) and build Council’s capacity to respond.</td>
<td>SCC</td>
<td>$100,000 per annum</td>
</tr>
<tr>
<td>2. Development Controls: Finalise DCP118 and apply controls to new development – this includes updating notation on section 149 certificates as new information becomes available, requirements for detailed studies of foundation capacity</td>
<td>SCC</td>
<td>Within existing staff responsibilities</td>
</tr>
<tr>
<td>3. Ongoing Coastal Erosion Monitoring Program: Established in 2009 – 2010, the program includes land and hydro survey for all beach erosion hazard compartments advised by the SMEC (2009) Beach Survey methodology document (see Appendix 7). This baseline survey data allows storm erosion impact to be calculated by repeat land survey in affected beach areas with storm erosion quantities calculated and calibrated against MHL storm records. The Hydro survey component is essential to refine the accuracy of coastal erosion remediation design studies confirming beach slope and closure depth and improve coastal process modeling.</td>
<td>SCC, with support from OEH and DPI (Lands)</td>
<td>Allow $30,000 from SCC over 2 years, plus OEH contribution</td>
</tr>
<tr>
<td>4. Surf Club Site Management Plan: Audit site constraints and foundation capacity for Shoalhaven Heads SLSC, Warrain Beach SLSC, Mollymook SLSC. Clarify trigger points for changed management.</td>
<td>SCC</td>
<td>Allow $150,000</td>
</tr>
<tr>
<td>5. Public Asset Adaptation Plan: Based on existing asset risk studies continue to investigate how key public assets at risk may be adapted and managed under the scenario forecasts (develop sub plans Water, Sewer, Storm water). Examples include including sewerage infrastructure at Mollymook, Collingwood Beach and Curramong, roads, community buildings at Callala Beach and design capacity of existing sea walls protecting public assets at Shoalhaven Heads and Mollymook. Clarify trigger points for changed management.</td>
<td>SCC</td>
<td>Within existing staff responsibilities</td>
</tr>
</tbody>
</table>
### Action Package

<table>
<thead>
<tr>
<th>Description</th>
<th>Responsibility</th>
<th>Indicative Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6. Coastal Erosion Concept Designs:</strong> Develop protection concept designs for all locations where significant beach erosion threatens private and public assets. Priority will be given to Authorised Locations and will include City-wide Emergency Response, and short term response (such as beach scraping/sand replenishment to build foredune height and volume), approval processes, trigger responses for protection measures. Council will negotiate consistent application of Authorised Location (or its replacement under the new coastal reforms) status to Shoalhaven beaches.</td>
<td>SCC, partnering with Marine Parks Authority where works are required along the Jervis Bay Marine Park foreshore. Involve OEH</td>
<td>Allow $100,000 for designs and approval processes, plus Council officer time for negotiation with OEH and MPA</td>
</tr>
<tr>
<td><strong>7. Coastal Erosion Remediation Implementation Plan:</strong> Develop site specific trigger based actions identified in approved remediation plans e.g. for Currajong (SMEC, 2011) and Collala Bay (SMEC, 2008) see Appendix 7, Callala Beach, Collingwood Beach, Mollymook beach (design works presently under contract). For example, at Currajong, construct a trial groyne (5 year lifespan) and nourish the beach with 60 m$^3$/m of sand, principally sourced from dredging marine sand from local creek entrances.</td>
<td>SCC</td>
<td>Allow up to $450,000</td>
</tr>
<tr>
<td><strong>8. Dune Management Plan:</strong> Develop detailed management strategies for typical beach types / dune systems / estuary entrance barriers (e.g. in Plans of Management). Generally, maintain dune fencing, invasive species management and replanting programs, with priority at Shoalhaven Heads, Currajong, central beaches and southern beaches.</td>
<td>SCC, partner with Bushcare, SRCMA</td>
<td>Allow $90,000</td>
</tr>
<tr>
<td><strong>9. Coastal Access Strategy:</strong> Develop a post storm Coastal Access Strategy based on the existing Asset Management Plan and Emergency Action Plan, to guide post storm access reconstruction for each beach compartment.</td>
<td>SCC</td>
<td>Allow $100,000 for key access way remediation</td>
</tr>
<tr>
<td><strong>10. Community Education and Engagement Plan:</strong> Prepare community information in various formats, for web delivery, hard copy and face to face, with priority to immediate coastal risk areas, vegetation policies for frontal dunes and policy/guidelines for community buildings in foreshore reserves.</td>
<td>SCC</td>
<td>Within existing staff responsibilities</td>
</tr>
</tbody>
</table>

**Indicative cost in first two years (including continuing existing coastal coordinator position)** $1,120,000
Section 2 – Coastal Hazards, Risks and Issues

In this section
- Coastal processes
- Coastal change and sea level rise
- Coastal hazards and risks
- Community values, issues and attitudes to coastal risks
- Other coastal zone management issues

Detailed studies of coastal processes, hazards and risks build up an understanding of the issues requiring a priority response for the sustainable management of the Shoalhaven coast. The following sections provide more information about the coastal science and technical studies that are undertaken to build that understanding.

2.1 Processes acting at different time scales

The coastal landscape is dynamic. It is continually changing in response to natural forces of wind, waves, tides, currents, rainfall and runoff. These forces change daily. They also change periodically with natural cycles, all of which interact. Examples include:

- Monthly tidal cycles from high water springs to neap tides.
- Seasonal variations in storm patterns, which affect wave energy, wave direction and rainfall.
- Southern oscillation index cycles of about 7 to 10 years, which affect droughts, floods, beach orientation and lake entrance processes.
- Century or longer scale variations in climate.

The interaction between processes operating at different time scales means there is a lot of uncertainty about exactly what conditions will prevail at specific times in the future. Council’s coastal zone management proposals are designed to deal with this uncertainty and to help local communities adapt to change.

Scientific and community understanding of how beaches, dunes, lakes and estuaries respond to coastal processes, climate drivers and land management is improving. Natural system responses include changes to landforms (such as beach and dune erosion, creek entrance migration and dune instability) and changes to ecological health (such as water clarity, salinity, chlorophyll a and dissolved oxygen which affect algal blooms, sea grass distribution and fish populations).

2.1.1 Long term trends in climate and Sea Level Rise

Figures 2.1 and 2.2 indicate the recent and predicted sea level rise for the NSW coast and the processes through which sea level rise and other aspects of climate change translate into landscape impacts, to which coastal communities will need to adapt. CSIRO’s State of the Climate Report (2012) concludes that sea level rose at a global-averaged rate of about 3 mm per year between 1993 and 2011, and 1.7 mm per year during the 20th century as a whole. Measured rates of sea level rise on the NSW south coast are close to the global rate, but sea level is rising more quickly across the northern shores of Australia.

Medium to long term climate change also affects rainfall intensity and seasonality, ocean warming and the frequency and types of major storm events. For instance, on the south coast, DECCW (2008) regional modelling predicts 50% more summer rainfall by 2050, but no significant change to annual rainfall.

Changes to the frequency of different types of storms are also predicted but details are poorly understood. On the south coast, changes to patterns of East Coast Lows and the southern extent of tropical cyclones are both possible. East Coast Lows in particular drive major step changes in coastal morphology. OEH and a team of coastal scientists and engineers are currently researching mechanisms driving East Coast Lows to enable more
accurate and reliable predictions of future storm patterns. The landforms we see now along the Shoalhaven coast are the result of relatively stable sea level and climatic conditions over the last 6000 years. Over this period, sea level fluctuations on the east coast have been restricted to about two metres. This is the same order of magnitude as sea level changes that are currently projected for the next century. Coastal erosion and accretion occurred in response to these sea level changes in the past, affecting dune stability, estuary ecology and rock platform ecological communities.

![Graph of global average mean sea level](image1.jpg)

*Figure 2.1 – Global average mean sea level (CSIRO, 2012)*

![Map of Australia showing sea-level rise](image2.jpg)

*Figure 2.2 – The rate of sea-level rise around Australia measured by coastal tide gauges (circles) and satellite observations (contours) from January 1993 to December 2011 (CSIRO, 2012)*
2.2 Studies of coastal hazards and risks

In 2009, Council commissioned SMEC to update coastal hazard studies for nine Shoalhaven beaches, incorporating the sea level rise policy settings of the NSW Government (DECCW, 2009), i.e. 40cm sea level rise above 1990 levels by 2050 and 90cm rise above 1990 levels by 2100. Coastal erosion, recession and oceanic inundation hazard assessments have been completed for:

- Collers Beach
- Mollymook Beach
- Narrawallee Beach
- Collingwood Beach
- Callala Beach
- Curramong Beach
- Warrain Beach
- Culburra Beach
- Shoalhaven Heads.

Maps showing the results of hazard analyses for these beaches are in Section 5.2, with other information about the character of these local communities and issues of concern to local residents.

The full hazard study report is included in Appendix 2. It provides information about the coastal processes that operate along the Shoalhaven coastline; how coastal processes interact with coastal landforms and the natural and built landscape to create hazards (such as coastal erosion and recession); and how risks are identified and evaluated using hazard information. A summary of the background information is also in the 2009 draft of the CZMP, which is on the project web site. The process descriptions and hazard analysis are not repeated here. The following section provides an overview of the findings of the detailed risk assessment (BMT WBM 2012), which Council commissioned to better understand how coastal hazards would affect its future management choices.

For planning purposes the NSW Planning Guideline: Adapting to Sea Level Rise (DoP, 2010) and the NSW Coastal Risk Management Guide: Incorporating Sea Level Rise into Risk Assessments (DECCW, 2010b) define a coastal risk area by the most landward hazard impact boundary for each time frame, i.e. the landward boundary of the Zone of Reduced Foundation Capacity. Figure 2.3 illustrates schema relating to these terms.

![Figure 2.3 – Terms used in assessing coastal hazards (Neillson et. al., 1992)](image)

The coastal hazard zones are predicted using the best available information and analysis techniques. Specifically, the zones have been calculated based on:

- Known erosion impacts of the largest storm to ever have been recorded at each beach – for most of the beaches, this storm occurred in 1974 or 1978. Impacts of such a storm vary at each beach and have been added to long term predicted changes in beach behaviour.
- Known long term changes (loss or gain of sand, changes in the location of the dunes) that have been occurring at each beach since the 1940s, as a result of local coastal processes. These changes have been...
measured by looking at changes in beach volumes and profiles over long term records. The trends for these changes are assumed to continue into the future and are forecast for 2025, 2050 and 2100.

- Long term future changes in beach behaviour that are forecast to occur as a result of sea level rise due to climate change – these have been forecast for 2025, 2050 and 2100, based on the best available information at the regional scale.

The immediate, 2025, 2050 and 2100 coastal hazard zones are reasonably conservative (generally worst case based on known historical evidence); however more landward impacts are also possible, for instance, if a very rare extreme storm occurred or if sea level rises faster than the current projections. The medium to long term hazard zones will be reviewed as better information about sea level rise becomes available. The various coastal hazard zones to which Council refers in its planning guidance are described in Table 2.1.

<table>
<thead>
<tr>
<th>Immediate hazard zone</th>
<th>2025 hazard zone</th>
<th>2050 hazard zone</th>
<th>2100 hazard zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate ZSA (Zone of Slope Adjustment) – this area is bounded by the estimated limit of frontal dune collapse following a storm equivalent to the largest storm ever recorded on that beach. Frontal dune erosion in such a storm would occur seaward of the landward limit of this area and the boundary line indicates how far back the dune collapse would reach following such a storm. Erosion within this area could occur at any time.</td>
<td>2025 ZSA – By 2025, some sea level rise is expected to have occurred as a result of climate change and this is predicted to lead to some landward movement of the frontal dune over time. At some of the beaches, there are local coastal processes which are known to have caused a landward movement of the frontal dune over time (e.g. at Currarong). This area is bounded by the estimated location of frontal dune collapse following a storm equivalent to the largest storm ever recorded, should that storm occur in 2025. It takes into account estimated beach changes that are expected to occur between now and 2025.</td>
<td>2050 ZSA – By 2050, further sea level rise (0.4 m) is expected to have occurred as a result of climate change and this is predicted to lead to further landward movement of the frontal dune over time. At some of the beaches, there are local coastal processes which are known to have caused a landward movement of the frontal dune over time (e.g. at Currarong). This area is bounded by the estimated location of frontal dune collapse following a storm equivalent to the largest storm ever recorded, should that storm occur in 2050. It takes into account estimated beach changes that are expected to occur between now and 2050.</td>
<td>2100 ZSA – By 2100, further sea level rise (0.9 m) is expected to have occurred as a result of climate change and this is predicted to lead to further landward movement of the frontal dune over time. At some of the beaches, there are local coastal processes which are known to have caused a landward movement of the frontal dune over time (e.g. at Currarong). This area is bounded by the estimated location of frontal dune collapse following a storm equivalent to the largest storm ever recorded, should that storm occur in 2100. It takes into account estimated beach changes that are expected to occur between now and 2100.</td>
</tr>
</tbody>
</table>

| Immediate ZRFC (Zone of Reduced Foundation Capacity) – In this area, the frontal dune would have a reduced capacity to carry building foundations and buildings within this zone could be damaged, if a storm equivalent to the biggest storm ever recorded on the beach were to occur tomorrow. | 2025 ZRFC – In this area, buildings may suffer damage as a result of reduced capacity of the soil to carry building foundations, should a storm equivalent to the largest storm that has ever been recorded occur in 2025. It takes into account estimated beach changes that are expected to occur between now and 2025. | 2050 ZRFC – In this area, buildings may suffer damage as a result of reduced capacity of the soil to carry building foundations, should a storm equivalent to the largest storm that has ever been recorded occur in 2050. It takes into account estimated beach changes that are expected to occur between now and 2050. | 2100 ZRFC – In this area, buildings may suffer damage as a result of reduced capacity of the soil to carry building foundations, should a storm equivalent to the largest storm that has ever been recorded occur in 2100. It takes into account estimated beach changes that are expected to occur between now and 2100. |

This highlights locations where the hazard studies identify important assets, infrastructure and community values that will be impacted by coastal processes over the next century. N.B. locations affected by coastal hazards are shown in Figure 1.1.

Details of immediate, 2025, 2050 and 2100 coastal hazard zones for Shoalhaven beaches are presented in Section 5.1, with other information for local communities about issues, risks and proposed management responses.
2.2.1 Risk Analysis

Coastal erosion and recession will affect:

- Land use capability. Approximately 30 private properties at Collingwood Beach, Callala Beach, Culburra Beach and Mollymook Beach are located within immediate coastal hazard areas. More than 70 private properties are wholly or partly within the 2050 coastal hazard areas (ZRFC) and more than 100 private properties are wholly or partly within the 2100 ZRFC. Land that is affected by coastal processes now, or could be affected within the life of a development may not suitable for certain types of development, e.g. homes, shops, schools and hospitals.
- The feasibility and cost of repairing and maintaining the function of community infrastructure such as access ways, roads, car parks, storm water drains and sewerage systems.
- Beach access, amenity and safety. All Shoalhaven surf clubs are within the 2050 ZRFC, but are likely to be impacted by major storms before that time.
- Amenity of foreshore parks and reserves.
- The attractiveness of the coast for visitors (compared to now and to other landscapes).
- Dune vegetation and rock platform ecology.
- Accessibility of rock platforms and smaller beaches for recreational use.

All of these impacts influence the social and economic well being of small communities along the Shoalhaven coastline. In addition, slope instability hazards affect (now and in the future) some homes on coastal bluffs, and the safety of lookout and access paths.

To better understand the significance of coastal erosion, recession and inundation hazards over time, Council commissioned a risk assessment (BMT WBM, 2012). The risk assessment report is included in Appendix 3.

A structured risk assessment uses a standardised matrix of likelihood and consequence to calculate risk. For the Shoalhaven coastline, BMT WBM (2012) used the hazard lines for 2025, 2050 and 2100 to define likelihood. The likelihood scale is shown in Table 2.2. The likelihood descriptors are clarified in the first column.

<table>
<thead>
<tr>
<th>Likelihood Descriptor</th>
<th>Immediate</th>
<th>For 2050</th>
<th>For 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost certain</td>
<td>Immediate ZSA line</td>
<td>2025 ZRFC line</td>
<td>2050 ZRFC line</td>
</tr>
<tr>
<td>Expected to occur, many recorded incidents, strong anecdotal evidence, great opportunity, reason or means to occur. May occur or be exceeded once every 1-5 years.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td>Immediate ZRFC line</td>
<td>2050 ZRFC line</td>
<td>2100 ZRFC line</td>
</tr>
<tr>
<td>Will probably occur, consistent record of incidents and good anecdotal evidence; considerable opportunity, reason or means to occur. May occur or be exceeded once every 20 years.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td>2025 ZRFC line</td>
<td>2100 ZRFC line</td>
<td>Beyond the 2100 ZRFC line</td>
</tr>
<tr>
<td>Might occur, a few recorded incidents in the locality and some anecdotal evidence in the community; some opportunity, reason or means to occur. May occur or be exceeded once every 100 years. Will generally be close to or exceed past records of severity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td>2050 ZRFC line</td>
<td>Landward of the 2100 ZRFC line</td>
<td>Beyond the 2100 ZRFC line</td>
</tr>
<tr>
<td>Is not expected to occur. Isolated recorded incidents in this country with anecdotal evidence in other communities. Little opportunity, reason or means to occur. May occur or be exceeded once every 250 years. Will almost always break previous records of severity.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The consequence scale for risk assessment takes into account financial, governance, environmental, health and safety and beach amenity consequences. Some consequences in the coastal zone can be described quantitatively (i.e. in built assets can be dollar values), but with the currently available information and methodologies, many consequences can only be described qualitatively. The current risk assessment prepared for the Shoalhaven coast relies principally on qualitative consequence scales (dollar values) for built assets.
such as roads, pathways, water mains, sewerage systems (pipes and pump stations), car parks, bridges, surf clubs, community halls and other buildings. Over time, the risk assessment will be revised as new methodologies and data become available for other natural, social and cultural values.

Surf clubs are an example of an asset that has important social values as well as a financial value. Surf Life Saving Australia commissioned a study on the vulnerability of surf clubs (CZM, 2011) to extreme events and to climate change. The study found that surf club buildings are very vulnerable because of their location on frontal dune systems, and the financial and technical capacity of clubs and local councils to respond to erosion impacts is limited. However, storms and sea level rise also increase risks for surf clubs in other ways. Examples include:

- Loss of sand on beaches affects safety and the suitability of club areas for major competitions/events. These changes have potential social and economic impacts on the clubs and on their local communities.
- Loss of club equipment, or increased safety risks when using the equipment.
- Increased emergency response training requirements.
- Development assessment requirements for relocation or for protection works – significant cost and time requirements.
- No coordinated response strategy between clubs, local government areas, regions or states.

### 2.2.2 Results of the Risk Assessment

Table 2.3 summarises the highest risks for 2050 and 2100. The full risk register (BMT WBM, 2012) is included in Appendix 3. Based on asset value, the highest risks are associated with surf club infrastructure and sewerage infrastructure. High risks relate to assets at Collingwood Beach, Callala Beach, Culburra Beach, Mollymook Beach, Warrain Beach and Shoalhaven Heads.

As can be seen from the nature of the assets that are rated as extreme risks in coastal erosion risk areas, these risks have serious implications for Council. Damage or destruction of these assets would disrupt essential community services, create health risks and impact on the social fabric of small communities.

The study by BMT WBM (2012) indicates the following financial implications for SCC from coastal hazard impacts on important community infrastructure.

- Surf clubs (estimated $5 million, 2050 and 2100)
- Wastewater infrastructure (estimated $5.1 million 2100)
- Roads, car parks and bridges (estimated $3.1 million at 2100).

Sound risk management practice requires that Council takes action to reduce the extreme risks, and continuing these extreme risks unmitigated cannot generally be justified. Where there are extreme risks, the General Manager must be informed and urgent risk treatments must also be approved by the General Manager. The implementation of risk controls would be monitored by Council’s risk management committee and progress would be audited annually and regularly reported to Councillors and the community. Management of these risks is a high priority for the CZMP. Proposed management actions to mitigate extreme and high risks are discussed in Sections 4 and 5.

### Table 2.3 – Extreme Risks, 2050 and 2100, Unmitigated and Mitigated (with existing management) (BMT WBM 2012)

<table>
<thead>
<tr>
<th>Risk 2050</th>
<th>Unmitigated risk rating 2050</th>
<th>Mitigated risk rating 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mollymook SLSC</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Pump station at Collingwood Beach</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Warrain Beach SLSC</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Shoalhaven Heads SLSC</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Pump Station, south end Mollymook</td>
<td>Extreme</td>
<td>High</td>
</tr>
<tr>
<td>Pump station north side of bridge, Mollymook</td>
<td>Extreme</td>
<td>High</td>
</tr>
<tr>
<td>Mollymook Golf Club</td>
<td>Extreme</td>
<td>High</td>
</tr>
<tr>
<td>Location</td>
<td>Unmitigated risk rating 2100</td>
<td>Mitigated risk rating 2100</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Mollymook pump station, north side of bridge (as above)</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Mollymook SLSC (as above)</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Collingwood Beach pump station (as above)</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Warrain Beach SLSC (as above)</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Shoalhaven Heads SLSC (entire building)</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Pump station at south end, Mollymook (as above)</td>
<td>Extreme</td>
<td>High</td>
</tr>
<tr>
<td>Bridge on Mitchell Avenue</td>
<td>Extreme</td>
<td>High</td>
</tr>
<tr>
<td>Mollymook Golf Club (as above)</td>
<td>Extreme</td>
<td>High</td>
</tr>
</tbody>
</table>

Figure 2.4 summarises how studies of community use and coastal values, coastal processes, coastal hazards and risks inform the preparation of the CZMP. Coastal management options are developed in response to coastal risks that are based on the interaction of hazards and values (likelihood of impacts and consequences of impacts). Options are evaluated against a range of criteria, including capacity to mitigate extreme risks, community acceptance, council’s capacity to pay and alignment with existing programs. As noted in Section 1, an adaptive approach to management is essential to manage uncertainty in the dynamic coastal environment. Adaptive responses are based on ongoing monitoring and evaluation of actual progress against expectations and targets.
## Figure 2.4 – Evaluation of coastal values, processes, hazards and risks underpins management priorities for the Shoalhaven coast

### STEP 1: Understand Coastal Processes – consider now, and for years 2025, 2050 and 2100

<table>
<thead>
<tr>
<th>Waves</th>
<th>Currents</th>
<th>Long term sea level changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tides</td>
<td>Storms – strong winds, elevated water levels and storm surge</td>
<td>Land slip and debris flows on cliffs and bluffs</td>
</tr>
</tbody>
</table>

More detail about coastal processes is in Appendix 2 (SMEC 2009)

### STEP 2: Assess Coastal Hazards – consider now and for years 2025, 2050 and 2100

<table>
<thead>
<tr>
<th>Storm bite erosion</th>
<th>Long term recession – sediment deficit</th>
<th>Long term recession – sea level rise.</th>
<th>Creek entrance migration and lake entrance condition</th>
<th>Slope instability</th>
<th>Coastal inundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dramatic changes occur on the coast during major storms. Many communities have experienced the impact of occasional extreme events on the coastline. For</td>
<td>Major storms are separated by long periods of calmer weather allowing beaches and dunes to recover. However, these periods can mask</td>
<td>Projected sea level rise will increase coastal recession hazards. As sea level rises, a proportional retreat of the sandy coastline is predicted. Sea level rise also affects sediment transport between</td>
<td>Meandering creek entrances can add to the erosion of frontal dunes. Changes to entrance conditions, shoaling and scouring as sea level rises may affect lake ecology</td>
<td>The geological structure of the Shoalhaven coastline makes some headlands and bluffs susceptible to rock fall and land slip. A geotechnical hazard assessment (SMEC 2008) has identified two high</td>
<td>Coastal inundation occurs when storm waves overtop the frontal dune system, flooding low lying land and buildings or infrastructure.</td>
</tr>
</tbody>
</table>

Projected sea level rise will increase coastal recession hazards. As sea level rises, a proportional retreat of the sandy coastline is predicted. Sea level rise also affects sediment transport between Meandering creek entrances can add to the erosion of frontal dunes. Changes to entrance conditions, shoaling and scouring as sea level rises may affect lake ecology The geological structure of the Shoalhaven coastline makes some headlands and bluffs susceptible to rock fall and land slip. A geotechnical hazard assessment (SMEC 2008) has identified two high Coastal inundation occurs when storm waves overtop the frontal dune system, flooding low lying land and buildings or infrastructure.
instance, the 1974 and 1978 storms that affected the NSW coastline resulted in well documented severe erosion of the beach and dunes at Shoalhaven Heads, Curarrong, Callala Beach and Collingwood Beach as well as overtopping of the Princes Highway at Ulladulla. Homes along the Shoalhaven coastline are located within the immediate coastal erosion risk area. Community access to beaches, dunes and headlands is disrupted during and after storms and coastal erosion events. Intermittent storm wave impacts on breeding sites for migratory shore birds.

Long term recession trends and beaches and dunes may appear more robust than they really are. Long term erosion and coastal recession occurs when sand is permanently lost from beaches and dunes. A number of Shoalhaven village communities have experienced slow long term loss of beach or frontal dune landforms over a period of decades. Examples are Curarrong and Callala Bay.

Embankments. The impacts of this hazard include:
- Loss or disruption of safe community access to beaches, dunes and headlands, and impacts on surf clubs;
- Impacts on residential property, for instance at Callala Beach, Collingwood Beach, Culburra Beach, Mollymook Beach. A number of properties along the Shoalhaven coast are partly or wholly within the 2050 coastal erosion hazard area;
- Impacts on community assets and infrastructure, such as roads and sewerage systems at Mollymook Beach;
- Ongoing impacts on coastal biodiversity, associated with disruption or dislocation of endangered ecological communities on costal dunes;
- Specific impacts on cultural heritage sites and places.

Beach sediment budgets. Changes to entrance dynamics affect the navigability of lake entrance channels and boating access to the ocean. Increased water levels reduce the area of foreshore reserve available for public recreation—both around lake shores and open ocean.

Risk aspects of this hazard. On cliffs and bluffs, geotechnical instability events also recur especially at a time scale of decades. Examples include landslip (e.g. at Penguin Head, Culburra Beach) and rare rock topple events that cumulatively result in the retreat of the cliff face and accumulation of sandstone boulders and cobbles on intertidal rock platforms at the base of cliffs. Important hazards include:
- Potential block fall and landslip affecting public safety on headlands and rock platforms;
- Impacts of existing rotational slumping on private property at Culburra Beach (Penguin Headland) and a potential large slump at Inyadda Point.

Extreme water level events are predicted to become more common as sea level rises. Natural and community assets that are adapted to or have been planned to be safe and serviceable at particular water levels will be impacted by more frequent high water levels.

Council is also dealing with this issue through Flood Risk Management Plans and Entrance Management Strategies for coastal lakes.
## STEP 3: Assess Coastal Values and Assets

More detail about the scientific, natural, social, cultural and economic values of the coast is in the draft Coastline Management Study and Plan (2009), available from Council.

<table>
<thead>
<tr>
<th>Coastal ecological communities on cliffs, dunes, rock platforms and off shore.</th>
<th>Beach amenity and recreational use, including visual appeal, access and facilities</th>
<th>Beach, bluff and rock platform safety</th>
<th>Homes and holiday homes.</th>
<th>Economic value of tourism, fisheries</th>
<th>Community assets and infrastructure</th>
<th>Cultural values – Aboriginal and historic heritage.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal lakes and estuarine creeks along the Shoalhaven coastline provide diverse, healthy and productive aquatic habitats of high ecological value. Extensive areas of several endangered ecological communities. Roosting, feeding and breeding habitat for migratory shorebirds. The coastline is part of the migration path of several whale species each autumn and spring. Occasionally, whales become stranded on Shoalhaven beaches.</td>
<td>Multiple sandy beaches and headlands with a high level of naturalness and exceptional visual appeal. The coastline is almost entirely in public ownership. Diverse recreational uses including swimming, diving, surfing, boating, water skiing, fishing, coast and bush walking, picnics, art and photography, conservation activities, sightseeing. Local residents and holiday makers utilise open coast, estuary and coastal bushland environments, depending on weather conditions.</td>
<td>High social and cultural value associate with individual, family and community experiences, memories and anticipation of good times spent on safe beaches, headlands, rock platforms and coastal lakes.</td>
<td>A relatively high proportion of absentee landowners, with a long history of holiday occupation. Holiday properties become permanent residences as people retire.</td>
<td>The coastal zone supports activities such as tourism and fisheries that have important economic values for the region. More research is needed in this area that will demonstrate the economic value of the coastal zone to the overall economy of the region.</td>
<td>Such as surf clubs, rock walls, sewerage systems, water supply, power infrastructure.</td>
<td>Rock platforms and headlands listed in the Register of the National Estate or the National Heritage List (primarily for their fossils, other geological features, heritage sites, Aboriginal cultural heritage and landscape character).</td>
</tr>
</tbody>
</table>
STEP 4: Assess Coastal Risks – consider for now, and for years 2025, 2050 and 2100

The likelihood and consequences of coastal hazards impacting on the natural, social, cultural, built and economic values of the coast.

Impacts associated with interactions between coastal values

Consider existing controls

Consequences associated with damage to the structure, environmental impacts (such as raw sewage discharges), health and safety impacts, resource demands etc.

This process helps Council identify the most important and urgent issues requiring management actions.

More detail about the analysis and management of coastal risks is in Appendix 3.

<table>
<thead>
<tr>
<th>Low risk</th>
<th>Medium risk</th>
<th>High risk</th>
<th>Extreme risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples: Occasional minor damage or occasional inundation of access ways, walking paths</td>
<td>Examples: Frequent or severe damage to beach access ways (ramps, steps, lookouts), Wave impacts/erosion on local community halls and sporting venues Occasional shallow inundation of residential property</td>
<td>Examples: Erosion of residential and commercial properties (houses, shops) Erosion/undermining of sea walls Frequent marine inundation of residential properties Frequent or permanent inundation of foreshore reserves Damage/erosion to important cultural sites Loss of important or endangered ecological communities or threatened/protected species</td>
<td>Examples: Erosion/undermining or flooding of surf clubs, sewage reticulation infrastructure (pipes and pump stations), Golf Club at Mollymook, major roads and bridges</td>
</tr>
</tbody>
</table>

STEP 5: Choose and implement coastal risk management strategies

Protect, Accommodate, Retreat, Avoid, Share

Consider priority actions for now and for 2025, 2050 and 2100

Examples include:

- Land use planning (controls on the location of development, the design of development and triggers for lapse of consent)
- Structural protection such as sea walls
- Beach nourishment and dune management
- Vegetation management and habitat protection
- Design and maintenance of access ways
- Asset and infrastructure maintenance and relocation schedules
- Community information, awareness, education and involvement
- Monitoring actual change in relation to triggers for management action
- Research to address knowledge gaps
- Ongoing adaptive improvement of coastal management

STEP 6: Monitoring, review, evaluation and reflection

Is management action achieving its intended outcomes? Is the condition of the coast stable or improving? Is ecological and community resilience maintained? Have triggers for changing management been reached?

What’s changed and why? – New science, new community aspirations, new threats, new legislation and policy. Inform the revised plan with best available knowledge about processes, condition and values.

This is the feedback loop that informs ongoing adaptive management to achieve agreed outcomes.
2.3 Understanding community values, concerns and issues

This section outlines how Council has consulted with stakeholders and its community during the preparation of the CZMP. This consultation process has been ongoing over the six years that Council has been studying coastal process, hazards and risks.

2.3.1 Some characteristics of the Shoalhaven coastal community

Some important social and economic characteristics of the Shoalhaven coastal zone, which affect community attachment to the coast and interest in its management, include:

- A coastline that is almost entirely in public ownership and is therefore accessible to all the community as National Park or Crown land or Council reserve.
- The Shoalhaven coastline is two to three hours travel from Sydney and Canberra. It has been a favourite short holiday location for decades and the peak summer population of coastal villages is three to five times their normal population.
- A relatively high proportion of absentee landowners, who use coastal residences in the small villages scattered along the coast for holidays. Many of the small villages along the Shoalhaven coastline have permanent residential occupancy rates of less than 50%.
- Local villages are economically dependent on income from holiday makers using tourist parks, other accommodation, restaurants and coastal recreation activities (such as dolphin cruises and art and craft markets).
- Diverse recreational uses, including swimming, diving, surfing, boating, water skiing, fishing, coast and bush walking, picnics, art and photography, conservation activities, sightseeing (including local produce) and car touring. Holiday makers utilise open coast, estuary and coastal bushland environments, depending on weather conditions.
- High social and cultural value is associated with individual, family and community experiences, memories and anticipation of enjoyment of time spent on beaches, lakes, headlands and rock platforms.
- As owners of holiday homes reach retirement age some choose to make the coastal property their permanent residence. Increasing permanent settlement by retirees also increases the age of the population and provides a group of well educated and aware residents with strong interests in protecting long established values of the coast.
- The Huskisson/Vincentia area on Jervis Bay and the Ulladulla/Mollymook area are the key centres for future growth (DoP South Coast Regional Strategy, 2007). Seventy five percent of the coastal population of Shoalhaven City Council lives in these two areas (SCC Population Profile, 2007).

2.3.2 Community engagement during Plan preparation

The Shoalhaven coastline is highly valued by residents, ratepayers and visitors. During preparation of the CZMP, Council has provided information using a special project website and has sought to listen to the community’s views about important issues and potential management options, through direct feedback opportunities and a series of meetings, workshops and briefings.

Throughout the project the Shoalhaven coastal zone management website has provided background about coastal hazards, coastal legislation and policy, coastal research, coastal management and Council’s progress on a range of projects that affect the future quality of the coastal environment and lifestyle of coastal residents. Copies of all draft reports have been available on the project web site, as well as in hard copy from Council. The web site also includes information about the science of climate change and sea level rise, which are major concerns for coastal property owners. People were also able to submit questions and comments via the website. All comments were forwarded to Council officers for direct response.

Council has conducted multiple rounds of community briefings and workshops to discuss how local communities use and value the coast, community experience and observations of coastal change, objectives for the future of the coast, issues, hazards, risks and potential management responses. Meetings were held at
Nowra (Council Chambers), Callala Bay, Callala Beach, Ulladulla, Huskisson and Mollymook. Separate, but concurrent to the briefings and workshops for the CZMP, Council engaged with coastal residents and stakeholders about potential land use planning measures such as its draft Shoalhaven Local Environmental Plan and draft DCP118, for coastal risk planning areas. Consultation about the coastal planning clauses in the draft LEP provided further opportunities for community feedback on coastal hazards, risks and their management.

Council has an established Coastal Committee made up of representatives of several Natural Resource and Floodplain Management Committees (NRFM). These Committee members include state agency representatives, Councillors and representatives of local community organisations. Regular Committee briefings during the development of the hazard studies (two cycles, to accommodate the 2009 sea level rise benchmarks), risk assessments, previous draft plan, and current update and review of the draft Plan have provided opportunities for stakeholders to discuss issues and provide written feedback.

2.3.2.1 Groups consulted

Multiple community interest groups, including those in Table 2.4, contributed to the development of the CZMPS.

Table 2.4 – Groups consulted about the Shoalhaven Coast

<table>
<thead>
<tr>
<th>Shoalhaven Coastal Community Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Council Community Consultative Bodies, Reference Groups and Reserve Management Committees.</strong> Examples include:</td>
</tr>
<tr>
<td>Callala Bay Progress Association</td>
</tr>
<tr>
<td>Callala Beach Progress Association</td>
</tr>
<tr>
<td>Culburra Beach Progress Association</td>
</tr>
<tr>
<td>Curarrong Progress Association</td>
</tr>
<tr>
<td>Lake Wollumboola Protection Association</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Regional and Local Community Organisations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushcare groups and Dunecare groups</td>
</tr>
<tr>
<td>Other Community and Environment Groups. Examples include Surf Clubs, Fishing Clubs, Sailing Clubs, Environmental groups, bird watching groups and the South Coast Shore Bird Recovery Program</td>
</tr>
<tr>
<td>Aboriginal community groups and organisations, including Wreck Bay community, Local Aboriginal Land Councils.</td>
</tr>
<tr>
<td>Businesses and Chambers of Commerce</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>All interested Residents and Property Owners</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitors to the Shoalhaven</td>
</tr>
</tbody>
</table>

2.3.3 What the community said about the coast

Table 2.5 notes some of the community’s concerns, organised by locality and theme. These issues are an overview of the input from meetings, briefings and submissions to date. The table provides an indication of the areas where community members raised each issue. This input has been used in scoping potential coastal management responses and in evaluating the capacity of responses to meet community needs. Additional matters that are raised in the next round of consultation meetings and during the exhibition process will be reviewed and the Plan will be adjusted as necessary. Through the ongoing adaptive management
process, the community will have further opportunities to participate in evaluation and review of the outcomes of coastal zone management.

Table 2.5 – Community input about the Coastal Zone

<table>
<thead>
<tr>
<th>Issue or concern reported by community representatives</th>
<th>Localities where residents reported this concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal processes and climate change - impacts</td>
<td></td>
</tr>
<tr>
<td>Impact of climate change induced erosion on coastal dunes and beach amenity, as well as on the foreshore reserve properties.</td>
<td>Curraong, Culburra Beach, Collingwood, Callala Bay, Callala Beach, Mollymook</td>
</tr>
<tr>
<td>Impact of climate change-driven processes on the integrity of community infrastructure including roads, pathways, sewerage systems, water supply.</td>
<td>Curraong, Mollymook, Berrara, Ulladulla, Collingwood</td>
</tr>
<tr>
<td>Impact of coastal erosion and recession on private property – damage to existing assets but also the impact of risk controls on the value of assets.</td>
<td>Callala Beach, Collingwood Beach, Culburra, Mollymook</td>
</tr>
<tr>
<td>Impact of geotechnical instability of cliffs and bluffs on private property.</td>
<td>Penguin Head, Bannisters Point</td>
</tr>
<tr>
<td>Impact of geotechnical instability of cliffs and bluffs on safety (paths, viewing spaces on the edge of the bluff).</td>
<td>Nelson, Orion, Barfleur Beaches, Plantation Point, Hyams Beach</td>
</tr>
<tr>
<td>Urban water management - flows and quality</td>
<td></td>
</tr>
<tr>
<td>Management of discharges from storm water drains and small coastal creeks. Discharges are considered to affect water quality (urban runoff and/or septic tank effluent), land surface geotechnical stability and dune erosion.</td>
<td>Wowley Creek, Moona Creek, Mollymook Creek, various headlands, Kioloa Creek</td>
</tr>
<tr>
<td>Access management through coastal reserves</td>
<td></td>
</tr>
<tr>
<td>Decision-making and communication processes relating to the number of tracks, spacing of tracks and maintenance of tracks across dunes, on headlands and along bluffs (linking beaches).</td>
<td>Curraong, Culburra Beach, Shoalhaven Heads, Mollymook, Narrawallee, Cudmirrah, Berrara, Collingwood Beach, Gannet Beach, Cormorant Beach</td>
</tr>
<tr>
<td>Private use of public reserve lands on dunes and bluffs, including garden encroachment, private access ways and blocking other public access (reported as both dune vegetation and equitable access to the coast issue).</td>
<td>Bannisters Point, Mollymook Beach, Collingwood Beach, Callala Beach</td>
</tr>
<tr>
<td>Conflicts on beaches - most often in relation to dog exercise areas.</td>
<td>Shoalhaven Heads Beach, Mollymook Beach, Narrawallee Beach</td>
</tr>
<tr>
<td>Access suitability for diverse user groups - aged, disabled, variety of recreational users, permanent residents and visitors.</td>
<td>Callala, Huskisson/Vincentia area, Mollymook</td>
</tr>
<tr>
<td>Access by people, dogs, and vehicles close to nesting and roosting sites for migratory shorebirds disrupts breeding success (in addition to the effects of storm waves or very high tides).</td>
<td>Example is Warrain Beach</td>
</tr>
<tr>
<td>Vegetation in foreshore reserves</td>
<td></td>
</tr>
<tr>
<td>The highest priority is to maintain the unique natural coastal features including beach, dunes, headlands and intertidal rock reefs. Conservation of endangered communities, threatened species and habitat is important.</td>
<td>All locations</td>
</tr>
<tr>
<td>Management of vegetation on coastal bluffs and cliffs, including weed removal, drainage, species selection and contribution to instability.</td>
<td>Penguin Headland, Racecourse Headland, Bannisters Point</td>
</tr>
<tr>
<td>Vegetation management on coastal dunes, particularly in relation to height and density of rehabilitated vegetation along urban foreshores. Narrow margin of vegetation and dune between the tidal zone, the dunes and residential development. More rehabilitation effort is needed, but there are also concerns about impact on views; intent and function of rehabilitated landscapes.</td>
<td>Collingwood Beach, Mollymook Beach, Narrawallee Beach, Berrara, Cormorant Beach, Gannet Beach</td>
</tr>
<tr>
<td>Community members help look after the coast through active participation by Bushcare and Dunecare Groups. These groups already work closely with Council.</td>
<td>Most beaches</td>
</tr>
<tr>
<td>Management of invasive species on coastal dunes.</td>
<td>All beaches</td>
</tr>
</tbody>
</table>
Management Plans and Reports are currently in various forms and stages of implementation. This can create confusion for local communities about how the various pieces of coastal management fit together.

More care is needed to protect Aboriginal culturally significant sites

General concern over water quality, particularly in high-use areas, including the impacts of fishing, mooring on seagrass beds and high-impact areas.

Vehicles in reserves and on beaches can create safety issues and damage the natural environment

Lack of signage for environmentally sensitive areas

Where concrete/rock walls have been built to protect a foreshore area, they should be properly designed and maintained and allow for safe access.

2.4 Coastal Resilience Issues

The resilience of coastal ecological communities is threatened by existing uses and management as well as future coastal hazards. Other issues arise when the location and design of coastal access facilities does not match community needs or because of conflicts between different user groups, who may value the coast in different ways (Table 2.6).

Information to define these issues comes from ecological condition assessments, from asset condition assessments (particularly for access ways) and from community input about values, recreational uses, concerns and management gaps.

Table 2.6 – Summary of Community Use, Access and Ecological Resilience Issues

- Balancing ecological function with other ecosystem services valued by local communities – protecting and rebuilding dunes and dune vegetation
- Species and landscaping concepts for coastal reserves on dune and headlands
- View maintenance for residents and visitors
- Invasive species in coastal bushland (dunes and headlands), especially near urban areas
- Excess beach access ways – trampling and wind funnelling across coastal dunes, gullying on headlands
- Lack of cycleways and pathways between coastal communities
- Maintaining safe access ways after coastal storms or other damaging events
- Adequacy of disabled access in communities such as Callala Bay, with high elderly population
- Adequacy of recreation, beach amenity and tourism facilities in high profile locations
- Poorly located and designed signage
- Occasional poor water quality in recreational areas and natural places
- Responses to whale strandings and protecting habitat for migratory shorebirds
- The interaction of conservation land tenure with coastal risk management. Several villages around Jervis Bay, which is Marine Park, have high risk existing frontal dune development. Regulations to protect the natural systems on the Marine Park limit options for managing sediment budgets to accommodate the impacts of coastal change on local development.
Choosing the right actions to care for the coast

In this section
Types of actions for managing coastal zone issues
Connecting strategies and actions to objectives for the coast
Criteria for selecting preferred strategies and actions

The logical links between Council’s vision for the future of the Shoalhaven coast, and the proposed actions for managing coastal issues are shown in Figure 3.1. This figure focuses on how information is processed to make decisions, rather than the data that has been used. The data is outlined in Section 2. Figure 3.1 shows how Council’s vision and objectives for coastal zone management set the direction for Council, community and other stakeholders to work together.

The strategic scoping and evaluation of management options processes are used to identify the most effective ways to manage the issues so that a well cared for and healthy coast is achieved. Operational planning, implementation, monitoring and review of progress are used to guide investment, on ground works and ongoing improvement of management effectiveness and relevance. These links, well communicated across Council, communities and partner agencies, will help keep action focused on the most important issues.

Options considered in the CZMP take into account outcomes and recommendations from several detailed studies as well as community feedback.

- Priority actions from the 2009 draft study and plan, as modified by recent studies or plans. These actions include the set up of adaptive management processes and information management within Council.
- Additional actions to respond to significant coastal risk issues (or changed priorities) which have emerged since 2009. These issues may have arisen from changes to State-wide policies, community feedback to Council, or from Council’s routine monitoring of the condition of coastal assets.
- Specific wording of planning controls from Council’s Interim Policy – Areas of Coastal Zone Management and the draft Shoalhaven LEP.
- Actions resulting from detailed studies at specific locations (e.g. SMEC (2011) detailed options study at Currarong, which also includes a detailed options evaluation process, see Appendix 7).
- Actions recommended in the public asset coastal risk management review (BMT WBM 2011).
- Initiatives from the CMA (coastal resilience) or agencies which contribute to the objectives and targets of the CZMP.
- Actions to better integrate the CZMP with existing estuary management plans, flood risk management plans and entrance management strategies.

Five strategic approaches to managing coastal risks are available to Council, individually or in combination (Table 3.1 and Table 3.2). Suitable strategic approaches for mitigating coastal risks affecting existing development are different to those suitable for making decisions about future development. Section 4 details the actions to be undertaken by Council and its partners to manage risks in the coastal zone. Note, the full options appraisal process is available in the previous Shoalhaven Coastal Plan (2009), available on Council’s project website.
Vision: A Cared for Coastal Landscape

Principles and Objectives
Linked to legislation, policy and planning framework.
Agreed with community

Targets
How success will be measured, and timeframes for delivery

Focus
Four key strategies to deliver the objectives:

Scope potential actions consistent with the key strategies
Examples include the following. The 2009 draft CZMP includes the full range of potential actions and details of the evaluation process. Strategic risk management approaches: Avoid, Protect, Accommodate, Retreat, Share Accept
Planning controls
Relocation of assets and infrastructure
Protection works – short term and long term, including dunes and creek entrances
Beach nourishment
Cliff stabilisation
Coastal biodiversity programs – invasive species control, revegetation, conservation zoning
Access management
Siting and quality of beach facilities
Emergency planning
Community information
Compliance monitoring and enforcement
Monitoring, evaluation and reporting
Funding initiatives

Evaluate potential actions to define a program that:
Mitigates critical (extreme or very high) coastal risks
Complies with statutory requirements
Is affordable and cost effective for Council and communities
Is practical and technically feasible
Meets community social and environmental aspirations, including opportunities for involvement
Is supported by partner organisations
Can be monitored
Is adaptive and can respond to new knowledge

Implementation (see Section 6)
Prepare Whole of coast actions (Section 5.1) and integrated “Place Plans” to show how local issues will be addressed (Section 5.2)
Define triggers for changing from one strategy or action to another
Establish monitoring and knowledge management programs, baseline and ongoing. Establish adaptive review process, linked to objectives and targets
Incorporate priority actions into Council’s 3 year and 1 year operational plans with full costing and project specifications
Negotiate with agency partners for coordinated delivery of related strategies and programs
Train relevant staff

Figure 3.1 – Linking vision to action
### Table 3.1 – Risk Management Options for Existing Development

<table>
<thead>
<tr>
<th>PROTECT</th>
<th>ACCOMMODATE</th>
<th>RETREAT</th>
<th>SHARE</th>
<th>ACCEPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural protection such as sea walls, and</td>
<td>Make development more resilient to coastal risks:</td>
<td>Identify and act on triggers for when buildings</td>
<td>Insurance schemes and acquisition/land swap arrangements</td>
<td>Emergency response – planning, preparation and action during erosion events.</td>
</tr>
<tr>
<td>breakwalls. Build up the sand buffer by beach</td>
<td>Lease back arrangements for less intensive or more</td>
<td>moved or abandoned. Time frames for relocation of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nourishment, dune enhancement.</td>
<td>flexible/relocatable uses. Retrofitting and</td>
<td>infrastructure.</td>
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<td></td>
<td>redesigning (e.g. piered foundations or raised</td>
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<td></td>
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<tr>
<td></td>
<td>floor levels)</td>
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</tbody>
</table>

### Table 3.2 – Risk Management Options for New Development

<table>
<thead>
<tr>
<th>AVOID</th>
<th>ACCOMMODATE</th>
<th>ACCEPT</th>
<th>SHARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prohibit specific development types in coastal risk areas. New</td>
<td>Make development more resilient to coastal risks:</td>
<td>Emergency response/evacuation planning (generally only for infill areas, not greenfields sites)</td>
<td>Appropriate insurance arrangements</td>
</tr>
<tr>
<td>critical infrastructure to be located outside high coastal risk areas.</td>
<td>Design requirements for new development such as piered foundations and relocatable structures. Time limited approvals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Require set backs.</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>