



Office of
Environment
& Heritage



Guidelines for Preparing Coastal Zone Management Plans

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Jones Beach, Kiama Downs (Danny Wiecek/OEH);

Coastal erosion at Old Bar in December 2009 (S. Holtznagel/OEH);

Seawall saltmarsh at Pearl Bay, Mosman (D. Wiecek/OEH);

Mangroves at Crookhaven River (OEH)

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Abbreviations

AHD	Australian height datum
ARI	average recurrence interval
CMA	Catchment Management Authority
CZMP	coastal zone management plan
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DoP	Department of Planning NSW
ICOLLs	intermittently closed and open lakes and lagoons
MER	monitoring, evaluation and reporting
OEH	Office of Environment and Heritage
SERM Act	<i>State Emergency and Rescue Management Act 1989</i>

1. Introduction

1.1 Purpose and structure of these guidelines

These guidelines are intended to provide guidance to local councils, their consultants and coastal communities on the preparation of a Coastal Zone Management Plan (CZMP). They have been adopted by the Minister for the Environment as guidelines under section 55D of the *Coastal Protection Act 1979*, and coastal councils are to prepare draft plans in accordance with these guidelines. They specify the minimum requirements that are to be met when preparing a draft CZMP (Figure 1), in addition to the requirements in the Act. The additional requirements in these guidelines relate to:

- preparation of the CZMP (Section 2.1)
- coastal risk management (Section 3.1)
- coastal ecosystems (Section 4.1), and
- community uses of the coastal zone (Section 5.1).

These guidelines provide a framework for preparing a CZMP, including matters that should be considered in CZMP preparation. Supporting information on a wide range of relevant topics will be provided as a series of web-based guide notes on www.environment.nsw.gov.au, and these will be updated as required. The technical detail of how to address particular issues in a CZMP is provided in these guide notes, which should be considered when preparing a draft plan.

These guidelines supersede the December 2010 version of the guidelines published by the former Department of Environment, Climate Change and Water.

1.2 Purpose and scope of a coastal zone management plan

The primary purpose of a CZMP is to describe proposed actions to be implemented by a council, other public authorities and potentially by the private sector to address priority management issues in the coastal zone over a defined implementation period. These issues include:

- managing risks to public safety and built assets
- pressures on coastal ecosystems, and
- community uses of the coastal zone.

CZMPs should support the goals and objectives of the NSW Coastal Policy 1997 and assist in implementing integrated coastal zone management.

The draft CZMP should be developed in accordance with Part 4A of the *Coastal Protection Act 1979* and the minimum requirements in these guidelines. Draft CZMPs being prepared prior to the release of these guidelines should meet the minimum requirements to the extent that can be reasonably achieved. A CZMP may address management issues in the coastal zone beyond these minimum requirements.

CZMPs should inform or assist with implementing other related council or public authority planning processes, management programs and strategies. Clear links should be made between CZMPs and these plans and programs. For example, CZMPs may include recommended strategic directions or actions to be considered in these plans and programs. Management actions in CZMPs should not duplicate management recommendations relating to:

- areas protected under the *National Parks and Wildlife Act 1974*, marine parks under the *Marine Parks Act 1997*, and intertidal protected areas and aquatic reserves under the *Fisheries Management Act 1994*. There are statutory requirements relating to plans of management for most of these areas

- key fish habitats mapped under the *Fisheries Management Act 1994* (actions in CZMPs may assist in managing threats to these habitats)
- commercial and recreational fishing regulation under the *Fisheries Management Act 1994*
- regulation of contaminated sites and point sources of pollution under the *Protection of the Environment Operations Act 1997*
- environmental flows to estuaries and other matters dealt with by water sharing plans prepared under the *Water Management Act 2000*
- plans of management for Crown land under the *Crown Lands Act 1989*, unless the land is managed by council
- actions included in the NSW Oyster industry sustainable aquaculture strategy
- Catchment Action Plans (actions in CZMPs may inform and assist in meeting targets in these Plans)
- Regional Strategies (actions in CZMPs may inform and assist in implementing actions in these Strategies)
- NSW Diffuse Source Water Pollution Strategy (actions in CZMPs may assist implementing this strategy)
- Safe Boating Plans and other plans under the Better Boating Program of NSW Maritime.

1.3 Certification of a plan

Councils are to submit draft CZMPs to the Minister administering the *Coastal Protection Act 1979* for certification under the Act. When a draft CZMP is submitted, the Minister will make an assessment of whether to certify the CZMP by considering whether it meets the requirements of the *Coastal Protection Act 1979* and the minimum requirements in these guidelines. The Minister may refer the draft CZMP to the NSW Coastal Panel for review (Figure 1).

To be eligible for certification, the CZMP title will need to include the text 'coastal zone management plan' and refer to the geographic area covered by the CZMP (e.g. a section of coastline, an estuary or the entire coastal zone in a council area).

A council submitting a draft CZMP to the Minister for certification is to also provide to the Minister copies of written correspondence from public authorities supporting any actions contained in the draft CZMP which they are responsible for or that affect their land or assets.

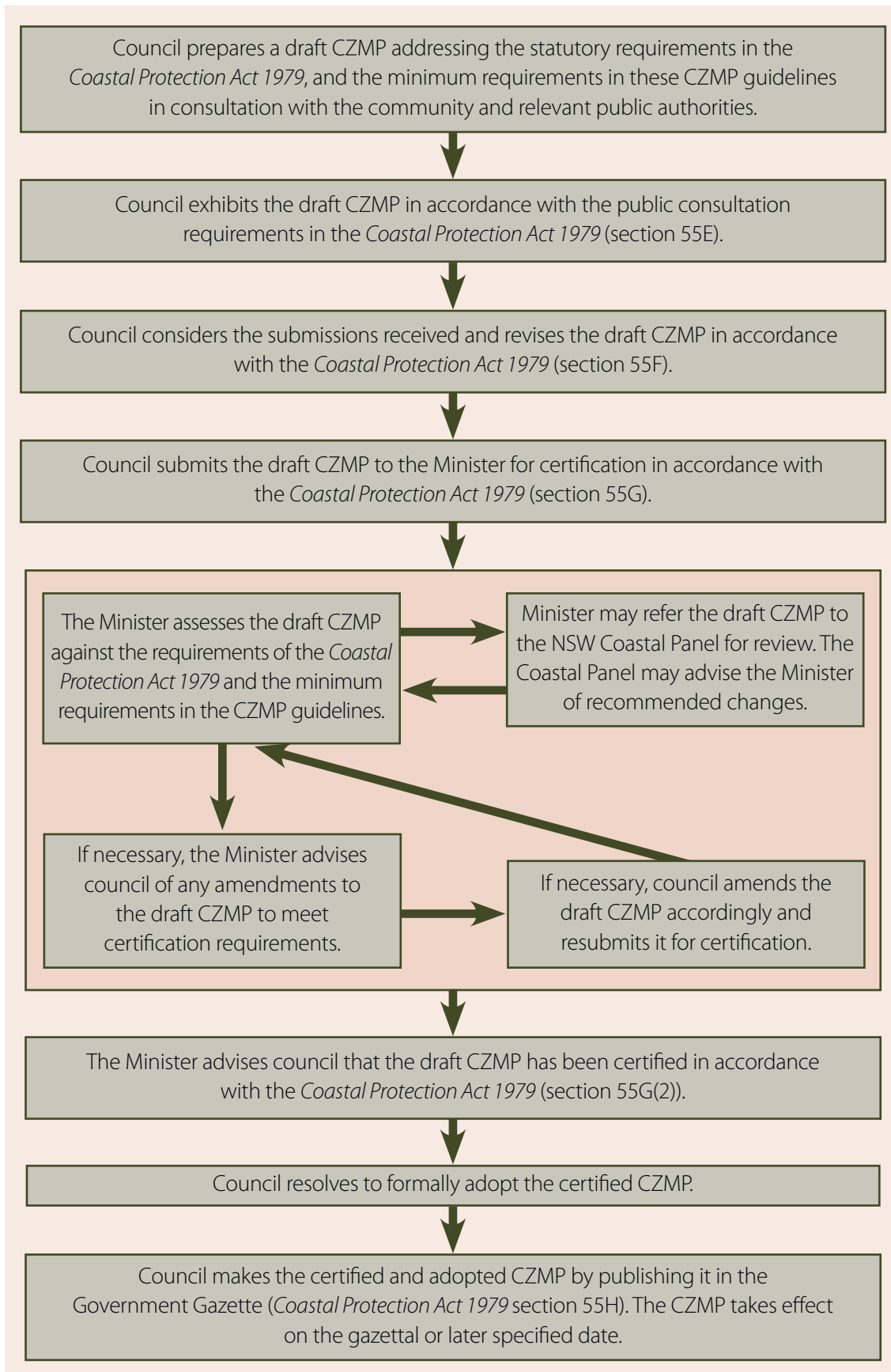


Figure 1: CZMP preparation and certification process

1.4 Relationship to other guidelines

These guidelines replace the:

- *Coastline Management Manual* (NSW Government 1990), and
- *Estuary Management Manual* (NSW Government 1992).

Existing coastline and estuary plans prepared and adopted under the previous manuals should be reviewed over time to ensure consistency with these guidelines where necessary. Those plans can be updated to become draft CZMPs by meeting the requirements under the *Coastal Protection Act 1979* and in these guidelines.

Sections of these guidelines discuss the relationship between flooding and estuary management (Sections 3 and 4). However, the primary guidance for flood risk management is the *Floodplain Development Manual* (NSW Government 2005).

1.5 Coastal Management Principles

Coastal Management Principles have been developed to inform strategic considerations in coastal management, including the preparation of CZMPs (Figure 2). Relevant principles should be considered in evaluating potential coastal management actions and be reflected in draft CZMPs.

In addition, section 733 of the *Local Government Act 1993* provides an exemption from liability for certain management actions by councils and the State Government relating to flooding and coastal management, provided these actions were made in good faith. Under this section, councils and the State Government are considered to have acted in good faith if the actions were undertaken substantially in accordance with the principles contained in the specified manual (this document).

Guidance in this document has been structured to allow logical consideration of the Coastal Management Principles. Figure 2 provides a graphical representation of how the principles relate to the relevant sections of these guidelines.



Clarence River estuary.

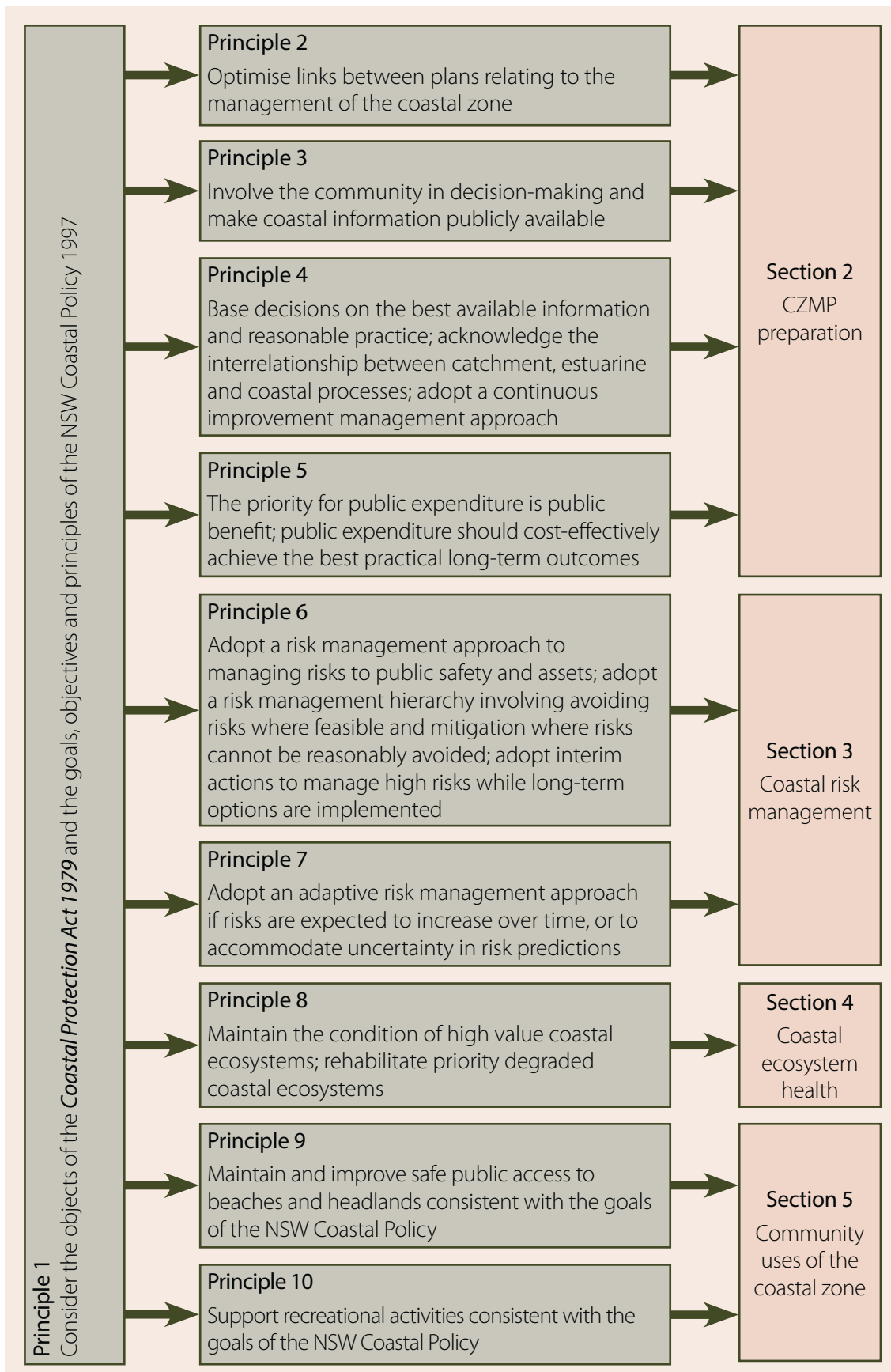


Figure 2: Coastal Management Principles

2. CZMP preparation

2.1 Minimum requirements

Minimum requirements: CZMP planning process content and outcomes

CZMPs are to contain:

- a description of:
 - how the relevant Coastal Management Principles have been considered in preparing the plan
 - the community and stakeholder consultation process, the key issues raised and how they have been considered
 - how the proposed management options were identified, the process followed to evaluate management options, and the outcomes of the process
- proposed management actions over the CZMP's implementation period in a prioritised implementation schedule which contains:
 - proposed funding arrangements for all actions, including any private sector funding
 - actions to be implemented through other statutory plans and processes
 - actions to be carried out by a public authority or relating to land or other assets it owns or manages, where the authority has agreed to these actions (section 55C(2) (b) of the *Coastal Protection Act 1979*).
 - proposed actions to monitor and report to the community on the plan's implementation, and a review timetable.

CZMPs are to be prepared using a process that includes:

- evaluating potential management options by considering social, economic and environmental factors, to identify realistic and affordable actions
- consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper (section 55E of the *Coastal Protection Act 1979*)
- considering all submissions made during the consultation period. The draft plan may be amended as a result of these submissions (section 55F of the *Coastal Protection Act 1979*).

CZMPs are to achieve a reasonable balance between any potentially conflicting uses of the coastal zone.

2.2 Preparing a CZMP

2.2.1 Plan preparation process

The following should be considered before commencing the planning process:

- the geographic area to be covered by the plan and the scope of the plan (i.e. the management issues to be considered)
- relevant time periods for long-term planning, implementation and review of the CZMP
- the management objectives that the plan is to help achieve (these may need to be determined early in the planning process), and
- the proposed community and stakeholder consultation process.

Relevant time periods will include the long-term planning horizon (e.g. 50 to 100 years to set strategic directions for coastal hazard areas), the period for implementing proposed management actions (e.g. 5 to 10 years) and the period for reviewing the CZMP (e.g. towards the end of the implementation period).

A CZMP can be prepared for the entire coastal zone in a council area (i.e. coastline and estuaries), an estuary or number of estuaries, or a stretch of coastline. All CZMPs are to address relevant coastal risks and community uses of the coastal zone. CZMPs for an estuary must also address estuary health. It may be necessary for a CZMP to consider a broader geographic extent than the coastal zone as defined. For example, where catchment management actions are appropriate to address threats to estuary health, the plan's scope can include the catchment, with clear links to the relevant Catchment Action Plan or other relevant initiatives. CZMPs may be prepared together by adjoining councils.

When preparing a CZMP, any relevant past plans should be reviewed. The review should assess the effectiveness of the actions that were implemented and assess why other actions were not implemented. Relevant provisions of applicable environmental planning instruments also may be reviewed. The findings of this review should be used in preparing the new CZMP.

There is no fixed planning process that councils are required to follow in preparing a CZMP and councils are encouraged to adopt approaches that best suit their circumstances. Councils can choose to either prepare a CZMP in its entirety, or break down the preparation of the plan into smaller stages, for example:

- 1 identify the management issues (e.g. coastal hazards, pressures affecting estuary health) and their severity, then
- 2 identify and evaluate potential options, and prepare an implementation schedule.

For CZMPs covering both coastal hazards and estuary issues, the basis for developing appropriate management actions is an understanding of the behaviour of the natural systems. The degree of understanding of natural coastal systems should be compatible with the information needs for making decisions under the CZMP. In many situations, extensive existing information is available and should be collected early in the CZMP preparation process. Only important data gaps need to be filled when preparing a CZMP. The CZMPs implementation schedule may include data collection actions to support future decision-making.

Management actions would normally be implemented after the CZMP has been drafted. However, in some circumstances, interim actions may need to be identified and implemented during the planning process (e.g. interim actions to manage identified beach erosion risks or to implement planning controls for an area subject to imminent development pressure). Table 1 shows the indicative phases that could be adopted in the development of a CZMP.

Table 1. Indicative phasing for coastal zone management plan preparation

Phase	Description	Options for staging preparation of a CZMP	
		CZMP for coastlines	CZMP for estuaries
1	Identify hazards/management issues and their severity	Coastal hazard study	Estuary condition study
2	Identify and evaluate management options	Coastal Zone Management Plan for <insert name>	Coastal Zone Management Plan for <insert name>
3	Propose management actions in implementation schedule	coastline	<insert name> estuary

2.2.2 Consultation

Community participation during the preparation of the CZMP should exceed the minimum requirements in the *Coastal Protection Act 1979* and should include consultation with local Aboriginal communities. Approaches which should be considered include:

- establishing a community advisory committee or reference panel to provide ongoing feedback during the preparation of the CZMP. Where such a committee or panel is established, it is important that key stakeholders including public authorities are involved, the terms of reference are clearly defined and council has responsibility for managing the planning process and the contents of the CZMP
- running community focus groups or workshops, or providing community discussion papers or carrying out surveys on particular issues or at particular stages of the planning process (e.g. when risks are being identified or when potential management options are being considered)
- providing regular updates to the community on the preparation of the CZMP (e.g. through updates on the council's website).

DEC (2006a) provides further guidance on community engagement for environmental planning and decision-making.

2.2.3 Evaluating potential options

The scale of the management options proposed in the CZMP should be consistent with the amount of funding reasonably likely to be available over the CZMP's implementation period.

The aim of the option evaluation process is to identify proposed actions which address priority management issues, are reasonable and achieve optimal long-term outcomes for the expected available funding. The strategy for evaluating options should take into account that:

- a combination of options may achieve the best outcomes – a single option will often not provide a total solution to an issue
- options that achieve multiple objectives should be considered (e.g. environmentally friendly estuary seawalls – SMCMA and DECC 2009), and
- both existing management actions and potential new management actions should be evaluated.

Potential options should first be assessed to identify their feasibility (i.e. whether they are technically and physically possible to safely implement and maintain). Feasible options should then be assessed to identify if they are reasonable. In assessing whether an option is reasonable, the following should be considered:

- the Coastal Management Principles
- the social, environmental and economic impacts of the option, including its benefits and costs, and any impacts on the cultural values of the local area, and
- the views of the community and other stakeholders, including those provided during the exhibition of the draft CZMP. In some circumstances there will be conflicting community and stakeholder perspectives on how to manage an issue. The CZMP should seek to achieve a balanced approach after considering the community and stakeholder views in the context of potential environmental, social and economic costs, impacts and benefits.

2.2.4 The implementation schedule

The implementation schedule should set out the proposed actions for addressing priority management issues in the CZMP's area over the implementation period. The schedule should identify the organisation responsible for implementing each proposed action, and an indicative implementation timetable. The schedule should separately list actions that council intends to fund, actions council would implement should external grant funding be available, other actions for implementation by other public authorities and actions that could be implemented by the private sector (including landowners). Any actions proposed to be implemented using external grant funding should have a reasonable likelihood of being funded (e.g. broadly within the range of past grants for similar projects).

Proposed actions to be carried out by or that affect a public authority's land or assets are to be agreed with the authority before inclusion in the implementation schedule, with this agreement noted in the CZMP. These proposed actions are also to be consistent with any legislation relating to the management of the authority's assets or land. For example, proposed actions affecting Crown land are to be agreed with the Land and Property Management Authority and are to be consistent with the *Crown Lands Act 1989*.

Where it is unlikely that an issue will be fully addressed during the CZMP's implementation period, the CZMP should describe the strategy proposed for addressing the issue. The implementation schedule should then include proposed actions over the implementation period to support this strategic direction.

Many actions in an implementation schedule are likely to be implemented through other statutory plans and processes, and appropriate links should be included in the implementation schedule, for example:

- environmental planning instruments (local environmental plans and development control plans)
- plans of management for community land and Crown land (under the *Local Government Act 1993* and *Crown Lands Act 1989* respectively)
- community strategic plans, resourcing strategies, delivery programs and operational plans under the *Local Government Act 1993*
- Catchment Action Plans prepared by Catchment Management Authorities
- plans prepared under the *State Emergency and Rescue Management Act 1989*
- other non-statutory plans prepared by councils, such as plans relating to environmental management (e.g. biodiversity, water quality).

3. Coastal risk management

3.1 Minimum requirements for coastal risks

Minimum requirements: coastal risks

A CZMP which addresses coastal risks should include:

- a description of:
 - coastal processes within the plan’s area, to a level of detail sufficient to inform decision-making
 - the nature and extent of risks to public safety and built assets from coastal hazards
 - projected climate change impacts on risks from coastal hazards (section 55C(f) of the *Coastal Protection Act 1979*), based on council’s adopted sea level rise projections or range of projections. Councils should consider adopting projections that are widely accepted by competent scientific opinion.
 - suitable locations where landowners could construct coastal protection works (provided they pay for the maintenance of the works and manage any off-site impacts), subject to the requirements of the *Environmental Planning and Assessment Act 1979*, and
 - property risk and response categories for all properties located in coastal hazard areas
- proposed actions in the implementation schedule to manage current and projected future risks from coastal hazards, including risks in an estuary from coastal hazards. Actions are to focus on managing the highest risks (section 55C(d) and (e) of the *Coastal Protection Act 1979*)
- where the plan proposes the construction of coastal protection works (other than temporary coastal protection works) that are to be funded by the council or a private landowner or both, the proposed arrangements for the adequate maintenance of the works and for managing associated impacts of such works (section 55C(g) of the *Coastal Protection Act 1979*), and
- an emergency action subplan, which is to describe:
 - intended emergency actions to be carried out during periods of beach erosion such as coastal protection works for property or asset protection, other than matters dealt with in any plan made under the *State Emergency and Rescue Management Act 1989* relating to emergency response (sections 55C(b) and (g) of the *Coastal Protection Act 1979*)
 - any site-specific requirements for landowner temporary coastal protection works, and
 - the consultation carried out with the owners of land affected by a subplan.

3.2 Risks from coastal hazards

3.2.1 Identifying risks from coastal hazards

The minimum criteria for assessing the extent of coastal hazards are set out in Table 2.

Table 2. *Minimum assessment criteria for coastal hazards*

Hazard	Minimum assessment criteria
Beach erosion	Storm bite due to a beach erosion event with an average recurrence interval (ARI) of approximately 100 years plus an allowance for reduced building foundation capacity
Shoreline recession	Estimated recession due to sediment budget deficit and projected sea level rise*
Coastal lake or watercourse entrance instability	Qualitative assessment of entrance dynamics based on historical records*
Coastal inundation (including estuaries)	Estimate of wave run-up level and overtopping of dunes resulting from an extreme ocean storm event*
Coastal cliff or slope instability	Slope stability assessment; see Australian Geomechanics Society (2007)*
Tidal inundation (including estuaries)	Estimate of areas inundated from still water levels with a 50 or 100-year ARI*
Erosion within estuaries caused by tidal waters, including the interaction of those waters with catchment floodwaters	Estimate of estuary foreshore erosion due to physical processes and flood events

* assess under current conditions and projected future conditions.

The CZMP should include a map indicating the extent of each hazard present in the study area. For beach erosion and recession, the map should indicate the extent of the predicted beach erosion hazard, with predicted recession hazard areas indicated landward of this erosion hazard area. The plan should also include a table for each hazard indicating the number and type of buildings (e.g. residential, commercial and community) and significant infrastructure within each hazard area. The table should be used to assess the relative risks associated with these hazards, based on likelihood and consequences. It should include any additional relevant information on risks arising from these hazards (e.g. depth of inundation).

3.2.2 Managing risks from coastal hazards

Table 3 provides an overview of the potential actions which should be considered in managing risks from coastal hazards. This list is not exhaustive and any other potential options should also be considered.

The general approach that should be followed in managing risks from coastal hazards is:

- management of high public safety risks takes priority over risks to built assets.
- if risks from a hazard are low, maintain this level of risk through appropriate land-use, development approval and infrastructure planning decisions.
- if the risks from a hazard are high:
 - avoid further development in the area or ensure the development can accommodate the hazard, including any likely increase in the severity of the hazard over time (e.g. due to projected sea level rise)
 - ensure appropriate emergency management arrangements are in place, and
 - consider works to reduce risk levels, focusing on the highest risks.



Wooli Wooli River estuary at Wooli.

Decisions on any coastal or flood protection works should consider any adverse impacts from the works, including increased off-site erosion or flood levels, reduced beach access and environmental impacts.

The potential for works to address more than one hazard should be considered (e.g. coastal protection works may address both erosion and recession, and flood mitigation works may address both coastal and riverine inundation).

If coastal protection works (other than temporary coastal protection works) are proposed, the CZMP is to describe the intended arrangements for the adequate maintenance of the works and for managing any associated impacts of such works.

Table 3. Potential options for managing risks from coastal hazards

Option category	Option	Coastal hazard						
		Beach erosion, recession	Estuary entrance instability	Coastal inundation	Coastal cliffs instability	Tidal inundation	Tide/flood risk	
Avoiding the risk	Building setbacks (planning and development controls)*	✓	✓	✓	✓	✓	✓	✓
	Infrastructure setbacks	✓	✓	✓	✓	✓	✓	✓
	Building design criteria (e.g. footings and floor levels)	✓	✓	✓	✓	✓	✓	✓
	Coastal or flood protection works (short-term or long-term)	✓	✓	✓	✓	✓	✓	✓
	Beach nourishment	✓	✓	✓	✓	✓	✓	✓
Changing the likelihood	Revegetation programs (e.g. dunes)	✓	✓	✓	✓	✓	✓	✓
	Compliance action relating to illegal works on beaches	✓	✓	✓	✓	✓	✓	✓
	Cliff and slope stabilisation works				✓			
	Building and infrastructure relocation or modification	✓	✓	✓	✓	✓	✓	✓
Changing the consequence	Catch walls			✓	✓	✓	✓	
	Access control				✓			
	Public education				✓			✓
Sharing the risk with another party	Insurance				✓			✓
Retaining the risk by informed decision	Emergency management**	✓	✓	✓	✓	✓	✓	✓

* e.g. through environmental planning instruments and, potentially, through time- or trigger-dependent consent conditions (see Department of Planning 2010)

** including monitoring and warning

3.2.3 Emergency action subplans

The emergency action subplan should be consistent with and not duplicate or contradict any plans prepared under the *State Emergency and Rescue Management Act 1989* (SERM Act). The relationship between these two planning frameworks is indicated in Table 4. These subplans are to be prepared with direct consultation with landowners affected by the subplan (e.g. landowners eligible to place temporary coastal protection works).

Table 4. *Contents of emergency action subplans and SERM Act plans*

Emergency action subplans	SERM Act plans
Any coastal protection works or other actions to be carried out by council when coastal erosion is imminent or occurring, or in recovering from coastal erosion.	Actions in relation to the prevention of, preparation for, response to and recovery from emergencies, excluding permanent or temporary coastal protection works.
Any additional requirements for landowner placement of temporary coastal protection works beyond those in the <i>Coastal Protection Act 1979</i> (e.g. constraints on access and the location of works)	Actions are consistent with the NSW State Disaster Plan and the State Storm Sub Plan.

3.2.4 Property risk and response categories

CZMPs are to categorise all private property subject to coastal hazards according to the degree of the hazard, and, in the case of hazards due to erosion and recession, the category of council's intended response to managing the risks to the property (see Tables 5 and 6). This information is to be provided in a table in the CZMP. Where a property is located on the boundary between two hazard areas, the most seaward hazard area should be used, unless this area is less than approximately 25% of the block.

Table 5. *Hazard vulnerability categories*

Risk category	Hazard area for property
1	Current hazard area
2	2050 hazard area (i.e. likely to be affected by erosion or recession in the next 40 years)
3	2100 hazard area (i.e. likely to be affected by erosion or recession in the next 40–90 years)

Table 6. *Coastal hazard response category*

Response category	Intended public authority response
A	Coastal protection works are considered technically feasible and cost-effective – funding is being sought for implementation
B	Coastal protection works are considered technically feasible but not cost-effective for public funding – unlikely to be implemented by a public authority
C	Coastal protection works are not considered technically feasible – no intended public authority works

3.3 Other coastal risks

A CZMP may address other risks to public safety or built assets or the environment in the coastal zone if actions are proposed by council or a public authority to reduce these risks over the CZMP's implementation period. These additional coastal risks may include rock fishing, beach safety, sand drift, stormwater outlets onto beaches and tsunami impacts.



P. Watson/OEH

Coastal erosion at Old Bar (2008).

4. Coastal ecosystem health

4.1 Minimum requirements for coastal ecosystems

Minimum requirements: coastal ecosystems

A CZMP which addresses coastal ecosystem management is to include:

- a description of:
 - the health status of estuaries within the plan's area
 - the pressures affecting estuary health status and their relative magnitude
 - projected climate change impacts on estuary health (section 55C(f) of the *Coastal Protection Act 1979*), based on council's adopted sea level rise projections or range of projections.
- proposed actions in the implementation schedule to respond to estuary health pressures (section 55C(e) of the *Coastal Protection Act 1979*)
- an entrance management policy for intermittently closed and open lakes and lagoons (ICOLLs)
- an estuarine monitoring program, consistent with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy.

4.2 Estuary health management

4.2.1 Estuary health status

The assessment of estuary health should be evaluated against applicable estuary health targets, including the NSW Government's Water Quality and River Flow Objectives (DEC 2006b).

An initial assessment of estuary health should be based on existing information. This can include the State of the Catchment reports (DECCW 2010) which describe the condition of and pressures acting on NSW estuaries, and the National Land and Water Resources Audit (2002). This initial assessment can be used to identify priority estuaries within a council's coastal zone for preparing a CZMP.

Where existing information is either limited or insufficient to characterise an important aspect of estuary health, additional data could be collected while preparing the CZMP. If necessary, a targeted monitoring program to collect additional information on estuary health or specific estuary health issues could also be a proposed action in the implementation schedule. An expert panel could also be used to provide sufficient information to identify priority issues.

4.2.2 Estuary health pressures

Existing and potential pressures affecting estuary health should be identified. This includes identifying the relationship between the following, to identify the key pressures on estuary health:

- water quality and estuary sediment quality
- flow conditions (particularly catchment inflows and tidal exchange) and sediment movement
- estuarine biota (including aquatic and terrestrial habitats and species that are estuary dependent).

A CZMP should consider the influence of the pressures on estuary health, particularly those in Table 7. Many of these pressures are due to land-use changes in the catchment (e.g. water quality impacts). The level of investigation should be sufficient to identify the pressures which can be reasonably targeted during the CZMP's implementation period. For estuaries in fair or poor condition, sufficient existing information is often available to identify key pressures (e.g. water quality from catchment sources) to a level sufficient to identify potential management actions. More detailed data may need to be collected to identify other pressures and understand estuary processes to enable feasible management options to be identified (particularly those involving works within an estuary). Further data collection could be a proposed action in the implementation schedule, if required.

Table 7. *Potential pressures affecting estuary health*

Category	Potential pressures and sources
Water and sediment quality	Point sources of pollution (e.g. effluent, contaminated sites)
	Diffuse sources of pollution (e.g. urban stormwater, acid sulfate soils, bank or foreshore erosion, agricultural run-off, sewer overflows, septic tank effluent)
	Discharges from vessels
	Contaminated sediments
Flow conditions and sediment movement	Changes to catchment inflows (e.g. upstream withdrawals/diversions, river regulation, land clearing, urbanisation)
	Changes to tidal exchange, salinity regimes and inundation levels (e.g. altered entrance conditions for ICOLLs, berm status, entrance training works)
	Changes to tidal/flood flows across an estuary (e.g. due to culverts, flood gates or reclamation)
	Sea level rise and upward movement of water tables
Estuarine biota	Changed sediment transport dynamics (e.g. due to dredging)
	Changes to the extent and condition of seagrass, saltmarsh, mangroves, coastal wetlands, littoral rainforest and riparian vegetation
	Recreational and commercial fishing
	Outbreaks of aquatic weeds or pests

The assessment of pressures should identify the most significant pressures (or combination of pressures) currently affecting or likely to affect estuary health.

4.2.3 Responding to estuary health pressures

Table 8 sets out potential actions which should be considered in a CZMP in responding to estuary health pressures. This list is not exhaustive and any other potentially feasible options should also be considered.

The general approach that should be adopted to manage estuary health is:

- if estuary health is good, maintain this condition through appropriate land-use and infrastructure planning decisions
- if estuary health is poor:
 - minimise further impacts on estuary health through appropriate land-use planning and development decisions
 - reduce the pressures on estuary health, and
 - rehabilitate priority habitats, accommodating any altered water quality or flow conditions, if required.

If funding for rehabilitation is limited, consider staged implementation with demonstrable outcomes to illustrate progress and consider restoring prominent sites as a priority.

Where a CZMP addresses more than one estuary, or where CZMPs have been prepared for more than one estuary in a council area, consider estuary condition and vulnerability when deciding on management actions. For example, ICOLLs are typically more vulnerable to water quality impacts than drowned river valley estuaries.



Cudgera Creek estuary, Hastings Point.

Table 8. Potential options for responding to estuary health pressures in a CZMP

Option	Category of pressure		
	Water quality	Flow conditions and sediment movement	Estuarine biota
Implement planning and development controls	✓	✓	✓
Carry out works to address diffuse sources of pollution (e.g. stormwater, acid sulfate soils, bank erosion)	✓		✓
Enforce regulations (e.g. erosion and sediment control, septic tanks, illegal clearing)	✓		✓
Manage point source water pollution* (contaminated sites, spills)	✓		
Improve infrastructure design (e.g. sewer overflows, road crossings)	✓	✓	✓
Improve foreshore management (including public access, stock access and erosion control)	✓		✓
Conduct public education programs	✓		✓
Rehabilitate habitat**	✓		✓
Manage coastal lake entrances	✓	✓	✓
Manage sediment movement within or into the estuary (e.g. dredging, groyne)	✓	✓	✓
Remove or reduce barriers and restrictions to natural movement of water	✓	✓	✓
Protect fish nursery areas			✓
Eradicate or manage aquatic weeds			✓

* where council is the appropriate regulatory authority under the *Protection of the Environment Operations Act 1997* ** e.g. DECC (2008)

4.2.4 Estuary health monitoring

Estuary health monitoring programs proposed in a CZMP should be consistent with the NSW Monitoring, Evaluation and Reporting (MER) Program, which provides a system for monitoring and reporting on estuary condition against the State-wide natural resource targets. Further information on the NSW MER Program (Estuaries Theme), including monitoring protocols, is available from Roper et al 2010, Scanes et al 2009 and Creese et al 2009. A number of CMAs have also produced guidance documents to assist in designing and implementing local and regional estuary health monitoring programs (e.g. Fraser 2008).

4.2.5 ICOLL entrance management policy

Where a CZMP is prepared for an ICOLL, it is to include an entrance management policy. The policy is to identify if a council intends to artificially manage the entrance. If so, the policy is to include triggers for actions to manage the opening of the entrance, which were developed considering the impacts of entrance opening on:

- flood levels and tidal inundation
- estuary health, including inundation of fringing wetlands and water quality, and
- community uses of the estuary.

The policy should achieve a reasonable balance between these considerations, and should also consider the longer term impacts of climate change on entrance management.

4.3 Other coastal ecosystems

A CZMP may address pressures on other coastal ecosystems if actions are proposed by council or a public authority over the CZMP's implementation period to address any management issues relating to these ecosystems. These coastal ecosystems include:

- open coast ecosystems such as dunes, sandy beaches, rock platforms
- other ecosystems within the coastal zone such as freshwater wetlands and littoral rainforest.

5. Community uses of the coastal zone

5.1 Minimum requirements for community uses

Minimum requirements: community uses of the coastal zone

CZMPs are to contain:

- proposed actions in the implementation schedule that protect and preserve beach environments and beach amenity, and ensure continuing and undiminished public access to beaches, headlands and waterways, particularly where public access is threatened or affected by accretion (section 55C(c) of the *Coastal Protection Act 1979*)
- a description of:
 - the current access arrangements to beaches, headlands and waterways in the plan's area, their adequacy and any associated environmental impacts
 - any potential impacts (e.g. erosion, accretion or inundation) on these access arrangements, and
 - the cultural and heritage significance of the plan's area
- proposed actions in the implementation schedule to manage any environmental or safety impacts from current access arrangements, and to protect or promote the culture and heritage environment.

5.2 Access

The CZMP should assess current access arrangements to beaches, estuary foreshores and headlands to assess their adequacy, safety, associated environmental impacts (e.g. erosion), and the current or likely impact of coastal processes on these access arrangements including projected sea level rise impacts. Where access management issues are identified, the plan should include proposed actions to address these issues, with priority based on the severity of the issue.

5.3 Amenity

Beach amenity impacts should be considered when assessing potential management actions in a CZMP. Actions that have a significant adverse impact on beach amenity should not normally be included in a plan unless the action addresses a significant management issue and all reasonable actions will be taken to minimise amenity impacts. A CZMP should also include reasonable actions to improve beach amenity.

5.4 Recreational use of the coastal zone

A CZMP may include actions relating to the recreational use of the coastal zone, particularly where this use may result in a conflict with coastal risk or ecosystem health management. Recreational uses which may be addressed include walking, swimming and surfing.

The CZMP should not include actions normally included in Safe Boating Plans prepared by NSW Maritime or NSW Maritime's Better Boating Program. It may recommend strategic directions or actions that could be considered in preparing or revising these plans or in implementing the program.

5.5 Cultural and heritage environment

A CZMP should include appropriate actions to protect and promote the cultural and heritage environment in the coastal zone, including responses to threats from projected sea level rise. Items and places of cultural and spiritual significance within the coastal zone include shell middens, ceremonial grounds, rock art and artefacts. CZMP preparations should take into consideration *Aboriginal People, the Environment and Conservation Principles* (DEC 2008).



S. Holzinger/OEH

Coastal erosion impacts on beach access, Old Bar (2009).

Glossary

Beach	The area of unconsolidated material between the lowest limit of tidal or lake water level and the highest level reached by wave action (i.e. both open coast and estuary foreshores).
Beach berm	That area of shoreline lying between the swash zone and the dune system.
Beach erosion	The offshore movement of sand from the sub-aerial beach during storms.
Beach nourishment	The supply of sediment by mechanical means to supplement sand on an existing beach or to build up an eroded beach.
Coastal hazard	'Coastal hazard' is defined in the <i>Coastal Protection Act 1979</i> (section 4) and means the following: <ul style="list-style-type: none">a) beach erosionb) shoreline recessionc) coastal lake or watercourse entrance instabilityd) coastal inundatione) coastal cliff or slope instabilityf) tidal inundationg) erosion caused by tidal waters, including the interaction of those waters with catchment floodwaters.
Coastal inundation	Coastal inundation is the storm-related flooding of coastal lands by ocean waters due to elevated still water levels (storm surge) and wave run-up.
Coastal zone	Statutory definition – Coastal zone is defined in the <i>Coastal Protection Act 1979</i> (section 4). Bio-physical definition – The coastal zone encompasses the interface between land and sea. It is a zone of interaction between terrestrial and marine systems and processes. Within this zone there is a wide variety of landscapes and habitats, including beaches, headlands, rock platforms, dunes, foreshores, estuaries and marine waters.
Consequence	The outcome of a hazard which affects objectives.
Culture and heritage environment	Culture is a way of understanding our world – the way we live in and remember our world, be it through expressions of song, music, dance, art, poetry or stories. Heritage is the environment, objects and places – both tangible and intangible – that we inherit from the past and pass on to future generations to use, learn from and be inspired by.
Dune management	The general term describing all activities associated with the restoration and maintenance of the role and values of beach dune systems. Dune management activities and techniques include planning, dune reconstruction, revegetation, dune protection, dune maintenance and community involvement.
Temporary coastal protection works	Sand or sandbags placed on a beach to reduce beach erosion impacts in accordance with the <i>Coastal Protection Act 1979</i>

Entrance instability	Refers to the tendency of entrances to estuaries and coastal lakes to migrate along the shore, close up, reopen, form new entrances, etc. in response to wave and current action and freshwater flows.
Escarpment	The landward limit of erosion in the dune system caused by storm waves. At the end of a storm the scarp may be nearly vertical; as it dries out the scarp slumps to a typical slope of 1 vertical:1.5 horizontal. Also known as the 'scarp', 'dune scarp' and 'backbeach erosion'.
Hazard	Occurrence or change in a set of circumstances relating to the physical aspects of coastal processes. To constitute a hazard, the change gives rise to a potential negative impact on life or property located within close proximity to the coastline.
Likelihood	The chance of something happening.
Risk	Effect of uncertainty on objectives, usually characterised by reference to potential hazards and their consequences, or a combination of these. It is also expressed as a combination of consequences of a hazard and the associated likelihood of occurrence.
Sand drift	The movement of sand by wind. In the context of coastlines, 'sand drift' is generally used to describe sand movement resulting from natural or human-induced degradation of dune vegetation, resulting in either nuisance or major drift. Sand drift can damage buildings, roads, railways and adjoining natural features such as littoral rainforest or wetlands. Sand drift can be a major coastline hazard.
Sediment transport	The process whereby sediment is moved onshore and offshore by wave, current and wind action.
Shoreline recession	A net long-term landward movement of the shoreline caused by a net loss in the sediment budget.
Storm surge	The increase in coastal water level caused by the effects of storms. Storm surge consists of two components: the increase in water level caused by the reduction in barometric pressure (barometric set-up) and the increase in water level caused by the action of wind blowing over the sea surface (wind set-up).
Tidal inundation	The inundation of land by tidal action under average meteorological conditions and under any combination of astronomical conditions.
Training walls	Walls constructed at the entrances of estuaries and rivers to improve navigability.
Tsunami	Long-period ocean waves generated by geological and tectonic disturbances below the sea. Incorrectly referred to as 'tidal waves', tsunami travel at speeds of up to 800 kilometres/hour in the open ocean, where they are of low height. However, tsunami can rise to a height of 10 metres or more through the shoaling process as they approach land.
Wave run-up	The vertical distance above mean water level reached by the uprush of water from waves across a beach or up a structure.

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