

Managing coastal hazards and the coastal impacts of climate change

This General Practice Note provides guidance on:

- ▶ managing coastal hazards in the context of climate change
- ▶ coastal vulnerability assessments
- ▶ the decision making process for assessing coastal hazard risk
- ▶ planning for development in vulnerable coastal areas.

Background

Significant development has already occurred in coastal areas. Population growth and the demand for coastal living are ongoing pressures. The potential impacts of climate change on existing coastal hazards are also likely to increase.

The *Victorian Coastal Strategy 2008* identifies that during this century our coastline is likely to be impacted by climate change. Impacts such as sea level rise and an increase in frequency and severity of storm events are projected which are likely to lead to greater coastal inundation and erosion that may cause damage and loss to property, infrastructure and the environment.

Managing risk exposure relative to such coastal hazards and understanding how climate change will impact on these coastal hazards is an important component of informed decision making.

What are coastal hazards?

There are many coastal hazards that need to be considered as part of any planning process, for example, wildfire, various forms of flooding, acid sulfate soils, landslip and landslide. For the purposes of this practice note, coastal hazards mean inundation (both coastal and river) and erosion.

Coastal inundation

Coastal inundation is the flooding of land by ocean waters or river catchments. The frequency, extent and magnitude of coastal and river inundation is likely to be altered by climate change over time and through the combined interactions with sea level rise, tide ranges, storm surges and other coastal processes.

Coastal erosion

Erosion is a naturally occurring process which is impacted on by a number of climatic factors. Erosion can be classified as either long term or short term.

Long term erosion refers to a trend of erosion extending over several years and can be caused by a reduction in the annual offshore deposition of sand or in the rate of longshore deposition of sand.

Short term erosion refers to erosion that can occur over a short period of time as a result of extreme weather events. Short term erosion caused by sudden and extreme weather can result in significant eroding of the beach profile. During a short term erosion event the sand is transported offshore. After the storm passes the normal coastal process brings the sand back onshore and restores the beach naturally over many months or years.



How will climate change affect coastal hazards?

With the exception of long term sea level rise, climate change is not likely to introduce new types of coastal hazards. However, climate change is likely to increase the frequency, intensity and extent of existing coastal hazards.

This means that for some parts of the Victorian coast, climate change impacts are likely to exacerbate coastal erosion processes and inundation, potentially further increasing the impacts of these coastal hazards on existing and future coastal communities and development.

While some climate change impacts such as sea level rise are gradual and occur over a long timeframe, extreme weather events can occur at any time and can significantly reshape the coastline.

Land use planning decisions have long-term implications due to the relatively long life span and permanency of use and development proposals such as residential growth areas, buildings, roads and utilities.

What is sea level rise and what is the benchmark for planning purposes?

Sea level rise means an increase in the mean level of the ocean. Even if atmospheric concentrations of greenhouse gases were stabilised at today's levels, ongoing sea-level rise would continue from past greenhouse gas emissions and consequent warming.

Sea level rise

Key contributions to sea level rise include the melting of ice stored in glaciers and the polar ice sheets, increasing the amount of water in the ocean. Warming contributes to thermal expansion of oceans contributing to the raising of sea levels.

The Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) November 2007 concludes that:

- ▶ global average sea level has increased at an average rate of 1.8 millimetres per year between 1961 and 2003 but between 1993 and 2003 at 3.1 millimetres per year; and
- ▶ annual average ice extent has shrunk by 2.7 per cent per decade since 1978.

The *Victorian Coastal Strategy 2008*, identifies sea level rise as a significant coastal issue that requires specific attention. Based on current scientific projections by the IPCC, the Strategy identifies the need to:

Plan for sea-level rise of not less than 0.8 metres by 2100, and allow for the combined effects of tides, storm surges, coastal processes and local conditions such as topography and geology when assessing risks and impacts associated with climate change.

The upper limit of sea level rise of 0.8 metres by 2100 is derived from the Fourth Assessment Report of the IPCC (November 2007). This includes a provision of 0.2 metres to take into account the projected extent of ice sheet melt to that time.

For further information about Victorian Government policy on planning for sea level rise please refer to the *Coastal Advisory Note: How to consider sea level rise along the Victorian Coast* (Department of Sustainability and Environment, 2008).

What are coastal hazard vulnerability assessments?

Our understanding of the coastal impacts of climate change is evolving and as time progresses our knowledge and understanding will continue to improve. Understanding coastal hazard vulnerability will help avoid increased risk exposure as part of future coastal development.

Planning and responsible authorities should determine if a coastal hazard vulnerability assessment is required to assist in making informed decisions about use and development proposals or to inform long term settlement and strategic planning activities.

If coastal hazard vulnerability assessments are required, consideration should include factors such as sea level rise, storm tide and surge, coastal processes, river inundation and local topography and geology.

Coastal hazard vulnerability assessments can be undertaken at a scale appropriate to inform a particular proposal or development need. In some areas this work may have already been undertaken.



The Future Coasts Program

Future Coasts is a major program of the Victorian Government to assess the physical vulnerability of Victoria's coast to climate change, and develop strategies to help communities and industry respond and adapt. The Future Coasts program is being led by the Department of Sustainability and Environment. Further information on this important project can be obtained at: www.climatechange.vic.gov.au/futurecoasts

Coastal vulnerability assessments can be undertaken by a suitably qualified coastal engineer or coastal processes specialist to assist with understanding erosion rates and developing appropriate setbacks or protection works.

In some instances, where local geology may be unknown or unstable, or where inundation from rivers and streams may also be an issue, advice can also be sought from a qualified hydrological or geotechnical expert.

What is the process for assessing coastal hazard risks?

The *Victorian Coastal Strategy 2008* sets out the policy and strategic direction for responding to coastal hazard risks in the context of climate change. This is reflected in the State Planning Policy Framework through Clause 15.08 'Coastal areas'.

The general steps in the process for assessing and responding to proposals in coastal areas are outlined in Figure 1.

Planning decision making for the impacts of climate change on coastal hazards should be guided by a process of investigation and number of general principles. These include:

Risk Avoidance: New use and development should be sited and designed in a way that does not unnecessarily expose future communities and assets to coastal hazard risks over its intended lifespan.

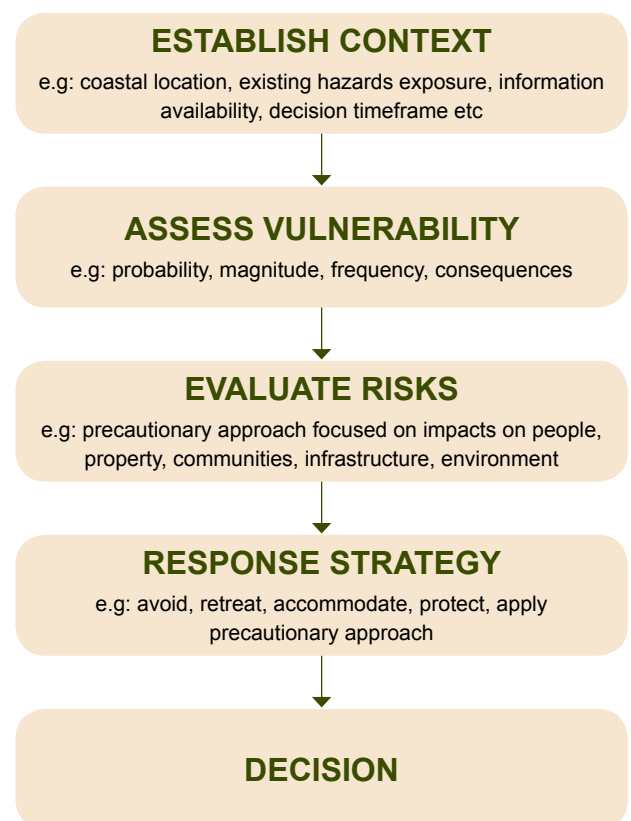
For coastal erosion, avoidance means ensuring that new use and development is not affected by the retreat of a coastline over the intended design lifespan.

For inundation, avoidance means ensuring that new use and development is not placed in harms way and is located beyond, or above an area prone to temporary inundation.

Integrated coastal planning: Requires the assessment of the future impacts of coastal hazard risk exposure on the economic, environmental and social wellbeing of people and communities in coastal areas.

Precautionary approach: The precautionary approach is an accepted principle in coastal decision making. It requires decision makers to act having regard to the best available science, knowledge and understanding of the consequences of decisions and in the context of increasing uncertainty, to make decisions that minimise adverse impacts on current and future generations and the environment.

Figure 1: Decision making process





How can planning seek to avoid development in vulnerable areas?

Planning for the impacts of climate change on coastal hazards need to be considered for:

- ▶ Amendments to planning schemes which seek to rezone land which would have the effect of allowing non-urban land to be used for a new urban use and development. Refer to Ministerial Direction No. 13 *Managing coastal hazards and the coastal impacts of climate change*.
- ▶ Considerations regarding development of individual parcels of land within existing zoning and overlay provisions within planning schemes.

In both the above cases, coastal hazard assessments may be required to understand the risks and identification of strategies to respond to and manage risk.

Rezoning of land for urban purposes

Given the current body of knowledge and information an important principle is the need to avoid the further intensification of development in areas that are likely to be impacted by projected coastal hazards under climate change.

Proposals to rezone land should be accompanied by an informed coastal vulnerability assessment for that part of the coastline. This should be informed using the best available information to understand the impacts of climate change.

Considerations as part of this process may include:

- ▶ The intended use and design lifespan and value of a proposal assessed against the relative risk exposure during that time.
- ▶ The local geographic characteristics of the coastline such as ocean exposure (for example open coast or sheltered exposure) and land type (such as sandy, rocky, engineered).
- ▶ The role of natural coastal processes and the need to provide for allowances for such processes to continue as a cost effective form of coastal defence against climate change.
- ▶ The critical need for coastal protection infrastructure and the type, location and cost of providing and maintaining such infrastructure throughout its intended lifespan.

- ▶ The need to establish and provide for appropriate setbacks to avoid a projected permanent hazard event and/or withstand a temporary event.
- ▶ The ability for a proposal to provide safe, all-weather access during times of emergency.
- ▶ Consideration of appropriate built form responses such as the need for land fill, materials, sub-floor and floor level heights.
- ▶ The cumulative impacts or any flow-on effects of proposed development and any associated protection works to adjacent properties and the coastline.
- ▶ Other identified coastal hazards such as coastal acid sulfate soils, land subsidence, wildfire and other general geotechnical risks.
- ▶ Any other issues relative to the orderly and proper management of use and development within coastal areas such as development within identified settlement boundary, significant landscapes, native vegetation and cultural heritage.
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Strategic investigations should take into consideration the above and other future management issue that may be relevant to ensure risk minimisation and effective long term management of new use and development.



Assessing applications for planning permits

A more complex planning issue is dealing with existing developed areas in particular within or adjacent to low lying areas susceptible to coastal hazards.

The following provides an overview of potential situations and possible considerations:

Minor buildings and works

Situation	Permits for minor building and works, for example non-habitable buildings, dwelling extensions or ancillary farm buildings.
Consideration	Typically no change from current practice. Assessment of impacts may be advisable for high value assets. Siting and design considerations may also need to be factored in.

Existing urban and non-urban areas

Situation	Permits for buildings and works such as replacement of an existing dwelling or construction on a vacant allotment.
Consideration	Assessment of impacts may be advisable for sites immediately adjacent to the coast or near an existing floodplain. Location specific information may be required to inform a localised coastal vulnerability assessment and the development of appropriate land suitability, set back or design responses. The relevant flood plain manager or a suitably qualified coastal engineer or hydrology expert can provide relevant advice as required.

Large scale development/subdivision proposals

Situation	Permits for buildings and works that seek to introduce significant change to built form and intensity within and adjacent to the coast or near existing floodplains.
Consideration	A coastal hazard vulnerability assessment may be required to determine potential exposure and development suitability of the land to evaluate risks. This may include coastal engineering, design or setback responses necessary to demonstrate assessed risks can be effectively and sustainably managed. The relevant flood plain manager or a suitably qualified coastal engineer or hydrology expert can provide relevant advice as required.

Obtaining further information

For guidance on whether a coastal process or coastal hazard vulnerability assessment is required for developments along the Victorian coast, and the key elements of a hazard assessment, advice should be sought from the appropriate flood plain management authority and the Department of Sustainability and Environment.

For more information regarding the *Victorian Coastal Strategy 2008* and the Victorian Government climate change program please visit the following websites:

www.vcc.vic.gov.au

www.climatechange.vic.gov.au

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