Adaptation options for coastal environments: planning

Any organisation developing an adaptation plan should explore a range of possible adaptation options. In general, there are five broad adaptation responses to climate change and increased risk of inundation and erosion in the coastal zone:

1. avoidance
2. managed retreat
3. accommodation or limited intervention
4. hold the line
5. loss acceptance.

Within the first four of these response categories there are a variety of potential adaptation options.

In this section, we explore **planning-based options for adaptation**. These are options that use planning legislation and regulations to reduce vulnerability and increase resilience to climate change and sea-level rise. Thus, land that Is projected to become more prone to flooding in future can be scheduled as suitable only for development such as light industry or warehouses, and unsuitable for housing or critical infrastructure.

In general, planning-based options fall under the first three categories above. 'Hold the line' options are generally engineering based (see *Adaptation: engineering options*). 'Loss acceptance' does not immediately require any intervention. However, it should be part of a wider strategy that involves an evidence-based decision that no intervention is required at the present time, and a clear understanding that adaptation action will be required in future. Useful documents if the 'loss acceptance' category is selected are:

- *Taking minimal action*
- *Pathways approach*

Table 1 outlines a series of planning-based options with information that is arranged as follows:

- Column 1: Examples of options, classified according to whether they fall into the category of avoidance, managed retreat or accommodation
- Column 2: Climate stressors that can be addressed by each particular option
- Column 3: Examples of benefits from each option (including direct and indirect benefits)
- Column 4: Examples of risks associated with each option (including the potential for maladaptation).

Three other documents in this series provide information on:

- *Adaptation options: Engineering*
- *Adaptation options: Ecosystem management*
- *Adaptation options: Social, community and education measures*

The purpose is to provide users with quick and high-level information on available adaptation options. The information should not be taken to be exhaustive.

Selected options should match the broader goals of the organisation and its stakeholders. It is important to consider any opportunities that might derive from the selected options and any co-benefits that can be achieved. Environmental outcomes should be explored and taken into account, with options that deliver poor outcomes either discarded or given a low priority.

The infographics *Why should we adapt to sea-level rise?* and *How can we adapt to sea-level rise?* also contain useful information. C-CADS has guidance on developing a suite of adaptation options and how to sequence their implementation (*C-CADS Step 3 Identify options*). Once options have been identified, they should be assessed and those most appropriate for the chosen level of acceptable risk identified. (*CCADS Step 4 Assess options*). Once options are prioritised, more detailed consideration, planning and design of each option may be required.

Table 1: Examples of planning adaptation options including the climate stressor being addressed, and the benefits and risks associated with each option.

Adaptation options:	**Climate stressor being addressed:**	**Benefits:**	**Risks:**
Avoidance: Ensure that new developments of private and public infrastructure and assets are not permitted in areas likely to be affected by climate change, without substantial planning controls being implemented	• Coastal and estuarine flooding and erosion • Bushfire	• Reduces exposure to future risk • If new developments are permitted, and developments are affected by climate change, there are potential legal implications for local and state governments	• Potential for developers and property owners to be negatively affected financially in the short- term • Risk that decisions will be challenged in court by developers and property owners • With better planning and understanding of the impacts, risks from the above will be reduced in future
Avoidance: Planning strategies for large urban centres should place new urban growth in areas with minimum climate change risks	• Inundation, flash flooding, peri-urban bushfires	• Reduces future exposure to identified risks • Reduces legal and financial risks to governments. • Reduces substantial future urban relocation costs	• Low risk
Avoidance: Raise development levels over time by, for example, changing building regulations to ensure that any replacement development is raised and flooding risk is reduced	• Inundation due to sea-level rise and storm surge, increase in rainfall intensity	• Gradual implementation over time provides an opportunity to incorporate changes into repair and maintenance programs, minimising costs	• Increases development costs • Requires a higher degree of coordination between planning and implementing agencies
Avoidance: Adopt more resilient and adaptive building types, e.g. buildings with piled construction can be raised above future flood levels, unlike buildings with 'inflexible' slab on ground	• Inundation due to sea-level rise and storm surge	• If the decision is to maintain existing coastal assets then this option provides more flexibility to manage future coastal inundation and flooding	• Increases development cost

Adaptation options:	Climate stressor being addressed:	Benefits:	Risks:
Retreat: Limit or prohibit rebuilding of damaged structures in defined retreat areas, e.g. a planning scheme may include provisions preventing rebuilding after extreme events	• Sea-level rise, tropical cyclones and windstorm, riverine and estuary flooding and associated beach, estuarine and riverbank erosion	• Reduces exposure to current risk • Provides opportunity for additional recreational space and access to waterfront area for community • Reduces potential for coastal squeeze	• May require options (e.g. funds) to support affected people • Community in these areas will be unhappy if they purchased properties before implementation of the option • Such options may have implications for insurance companies and banks
Retreat: Encourage land owners to relocate structures through tax benefits, voluntary surrender, land-swaps or conservation easement schemes	• Sea-level rise and associated beach and estuarine erosion catchment flooding	• The need for government compensation following extreme events is reduced • Provides opportunity for additional recreation space, access to waterfront area for community • Reduces potential for coastal squeeze	• Equity issues • Government funding may still be required (e.g. for voluntary acquisitions) but costs can be spread
Accommodate: Consolidate urban development by favouring infill and redevelopment of existing urban areas to minimise urban sprawl into highly vulnerable coastal areas	• Sea-level rise, storm surge and riverine and estuarine flooding	• Reduced exposure to present-day extremes • Provides opportunity for additional recreation space, access to waterfront area for community • Reduces potential for coastal squeeze	• If areas that have been consolidated then become affected by climate change, this will impact a greater number and concentration of people. This could potentially lead to greater pressure to defend these communities.
Accommodate: Residential accommodation for vulnerable communities (the aged, people with disabilities and other disadvantaged groups) is provided in locations that minimise their vulnerability to coastal hazards	• Sea-level rise, storm surge and riverine and estuarine flooding	• Better quality of life for these groups	• Low risk

Further reading:

Griffith University Centre for Coastal Management and GHD Pty Ltd, 2012: Coastal Hazard Adaptation Options – A compendium for Queensland Coastal Councils. Report prepared for the Department of Environment and Heritage Protection. Accessed 12 June 2016. [Available online at https://www.townsville.qld.gov.au/__data/assets/pdf_file/0015/7035/Coastal_Hazard_Adaptation_Options.pdf].

This Information Sheet was prepared by staff at NCCARF. Please cite as:

NCCARF, 2016: Adaptation options for coastal environments: planning. CoastAdapt, National Climate Change Adaptation Research Facility, Gold Coast.

NCCARF
National
Climate Change Adaptation
Research Facility

Australian Government
Department of the Environment and Energy