

Adaptation options analysis

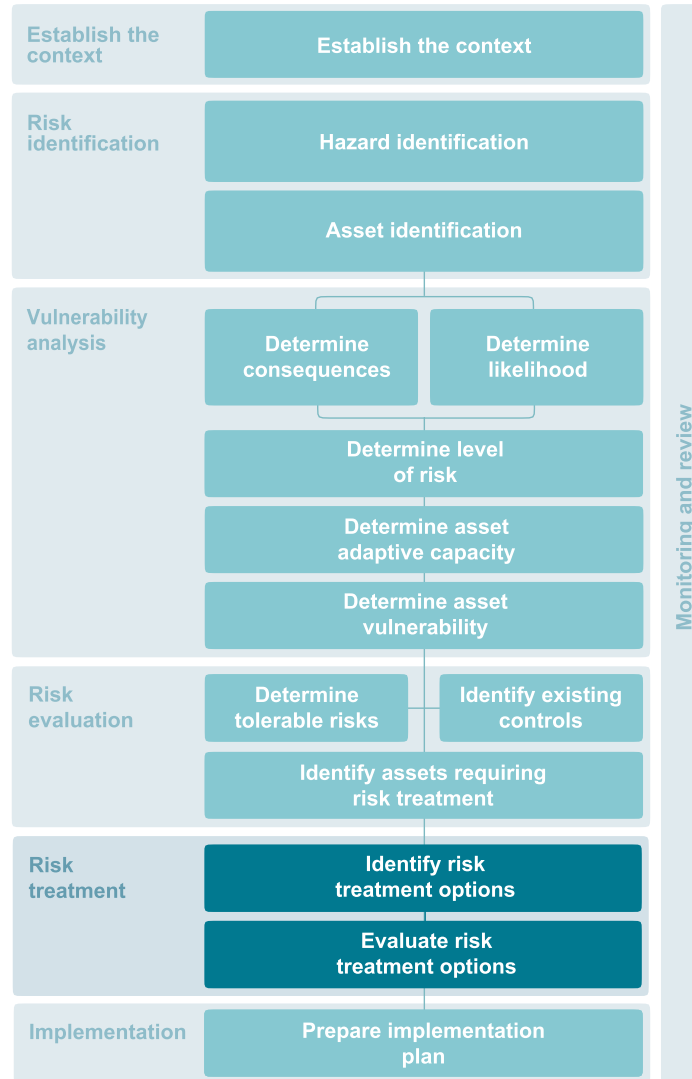
This factsheet aims to guide coastal adaptation options analysis on the Western Australian coastline.

What is adaptation options analysis?

Coastal adaptation is *an adjustment in natural or human systems in response to actual or expected stimuli or their effects, which moderates harm or exploits beneficial opportunities. Adaptation is the means for maximising the gains and minimising the losses associated with coastal hazards over the planning timeframe.* In the WA context, this means it is the response to the impacts of coastal hazards, typically erosion or inundation.

Adaptation options analysis aims to identify and analyse various strategies or actions to mitigate the impacts of coastal hazards. Through various methods, adaptation options analysis is used to select and then develop a preferred adaptation option, which may be a pathway, strategy or specific action.

Adaptation options analysis is often completed as part of the Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) process. However, it can also be conducted after a CHRMAP has been completed. Often this is done in more detail, assessing a reduced number of options but following the same process as adaptation options analysis during CHRMAP.



CHRMAP process

Adaptation options analysis in the CHRMAP process

Adaptation options analysis forms part of the risk treatment component of the CHRMAP process. This process is outlined in the State Coastal Planning Policy Guidelines, which require adaptation options to be analysed for their:

- potential benefits
- effectiveness in reducing losses
- cost of implementation and ongoing maintenance
- impact of the adaptation option on other objectives, including the introduction of new risks or issues.

This process is further detailed below.

Contents

This factsheet covers the following:

- When adaptation options are needed and how they are used.
- How the options are developed.
- How the community is involved.
- What options should be considered and how they are assessed.
- How and when adaptation options are implemented.

Adaptation options analysis process

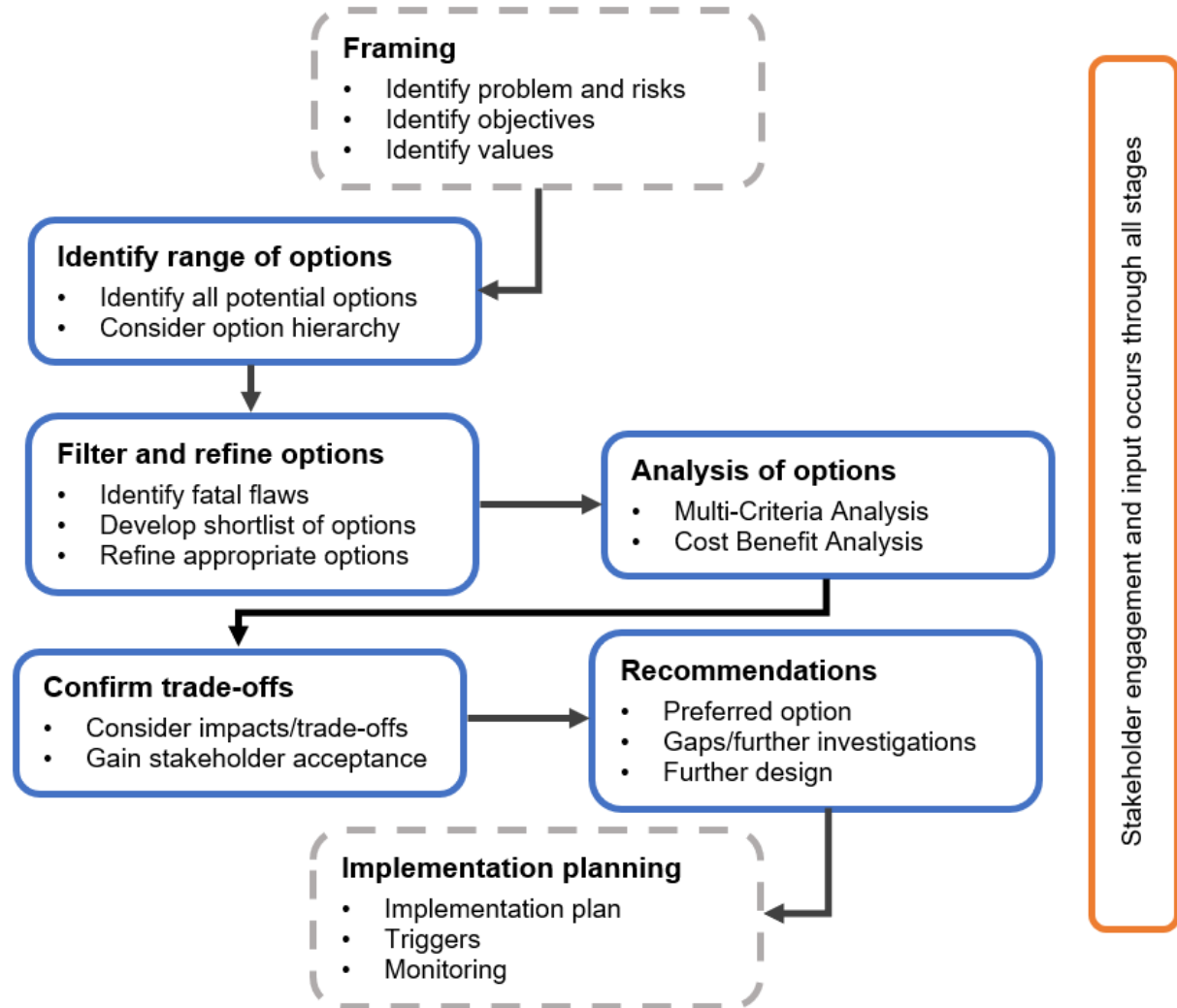
Stage 5 – Risk treatment

Assessment of appropriate risk treatments, or adaptation options, occurs as Stage 5 of the CHRMAP process.

The prior stages of the CHRMAP process will have defined the project scope and objectives, determined community and coastal values, identified coastal hazards and assets at risk, and completed a vulnerability and risk assessment on those assets.

The risk evaluation process aims to prioritise the risk management measures where the risks are deemed intolerable. Adaptation options should be developed in response to these risks and may include pathways, strategies or specific options. The options analysis process is consistent for each of these and generally outlined in the flow chart opposite.

Stakeholder engagement and consultation is completed throughout the process and should occur at each step to ensure collaborative input.



Adaptation options for consideration

Site specific conditions

Potential adaptation options should be developed in response to site specific conditions, objectives and constraints, and respond to community values. These are typically defined in earlier stages of the process but should be re-confirmed at the commencement of the options development. It is also important to recognise that community values, project objectives and risks can change over time.

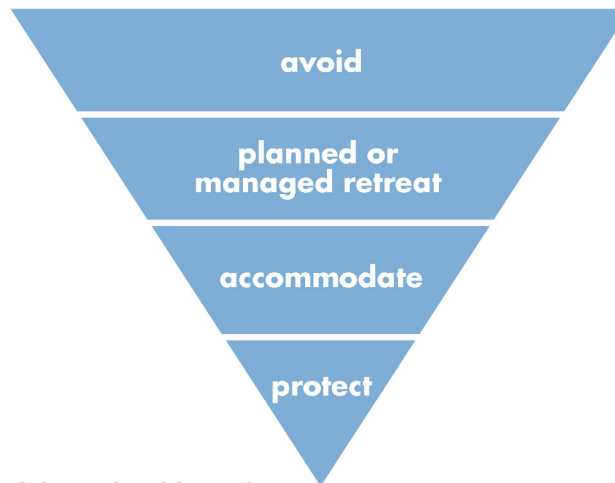
Hierarchy of adaptation options

Coastal adaptation options are considered within a hierarchy which aims to retain flexibility in the decision-making process at all stages. Options which maintain a wide range of potential future risk management pathways are considered more favourably than those that, either directly or indirectly, do not. By allowing a greater range of adaptation measures to be considered by future decision makers, risk management processes can more effectively address uncertainty and long timeframes associated with coastal hazards.

The CHRMAP Guidelines outline four broad categories of potential adaptation options to manage the risks of coastal hazards.

This hierarchy is presented to the right. Flexibility in future decision making diminishes down the hierarchy.

Along with these categories, coastal managers can consider 'no regrets' options, which aim to retain flexibility and improve resilience and may be implemented prior to long term adaptation works. Alternatively, managers may accept losses and 'do nothing,' assuming that risk levels are tolerable. However, this may result in reactive actions to respond to coastal hazards as they occur.

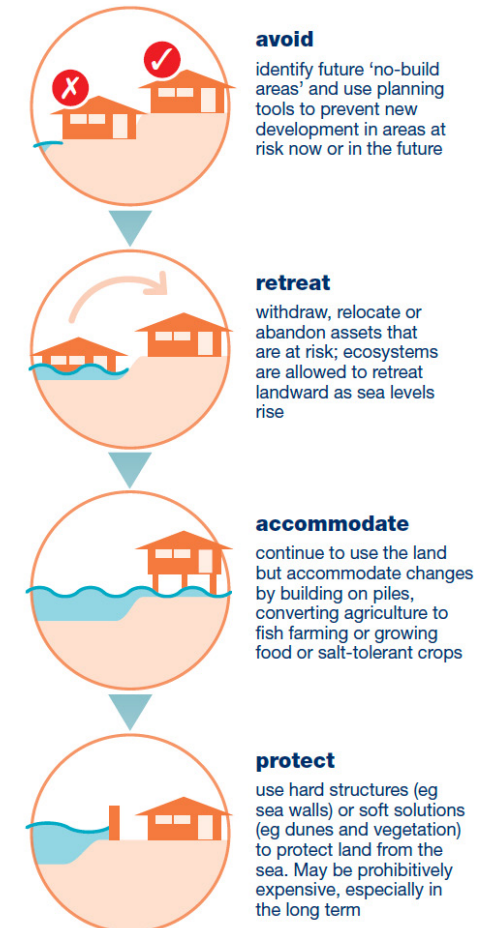


Adaptation hierarchy

A full range of risk treatment options are provided within the CHRMAP Guidelines (refer to Table 15).

Potential adaptation options

All potential adaptation options should be initially identified for consideration before being filtered for fatal flaws, site constraints, objectives and values.



How to compare and assess potential adaptation options

Initial filtering

Once all adaptation options have been identified, an initial filtering is completed through a fatal flaw assessment, assessment against project objectives, community values or success criteria. This helps refine the full range of potential options to a more comprehensive shortlist.

Shortlisted adaptation options can then be refined or further developed and analysed or compared through methods such as a Multi-Criteria Analysis (MCA) or Cost Benefit Analysis (CBA).



Multi-Criteria Analysis

MCA is a framework for assessing and selecting preferred options across a range of criteria. Typically, the MCA will include consideration of the following broad categories of criteria:

- **Technical.** Includes consideration of the effectiveness, adaptability and complexity of any legal or approval requirements.
- **Social.** Includes consideration of provision of recreational opportunities, amenity, aesthetics, accessibility and facilities.
- **Environmental.** Includes consideration of preservation of the beach, dune and marine environment.
- **Economic.** Includes consideration of the capital and maintenance costs.

Each category would typically include sub-criteria which are developed in response to the project objectives, success criteria and community values. These criteria and sub-criteria can both be weighted. The sensitivity of the outcomes to the weighting of criteria should be assessed through the process.



Each option is scored against each sub-criteria, typically on a 1-5 scale or similar, where:

- 1 is least appropriate or highest impact.
- 5 is most appropriate or lowest impact.

The MCA is used to further refine the list of appropriate options, to recommend a single preferred option (highest scoring) or several suitable options for further assessment.

Cost Benefit Analysis

A CBA helps compare and prioritise the appropriate adaptation options. It identifies and assesses both the costs and benefits associated with each option over the planning timeframe.

- **Costs.** Calculated over whole of life and include loss of environmental or social value.
- **Benefits.** Represent reduction in impact, include avoided costs and gains in environmental or social value.

The CBA determines the Net Present Economic Value (NPEV is the sum of discounted benefits less the sum of discounted costs), and Benefit Cost Ratio (BCR is the ratio of present value of benefits to present value of costs).

An option is typically viable if the NPEV is greater than 0 and the BCR is greater than 1.

How and when adaptation options are implemented

Risk management pathways

Following identification of an appropriate adaptation option, which may include a broader strategy or specific action, risk management pathways and triggers for implementation or action can be determined.

A risk management pathway approach identifies a series of decision making points over time and appropriate adaptation options or pathways. This approach prevents the coastal manager or decision maker from being locked into a specific approach,

recognising that risks and values can change over time. This keeps options open until there is more information, funding or support for options.

The risk management pathway includes decision making points which are triggered by a change, either temporal, environmental or social. The triggers are identified in development of the plan.

Triggers

Short, medium and long-term triggers for decision making points should be identified in the implementation plan.

The triggers set the timing and points for decisions to be made and can be informed by monitoring. This avoids the burden and costs of unnecessary actions too early.

Examples of appropriate triggers may be if the buffer to a key asset reduces to a specific value, if a key asset is affected by coastal erosion or inundation, or if key stakeholders no longer support a risk management pathway.

An example of a risk management pathway is presented below.

