



Avoid

Avoid (AV) option aims to avoid the construction of new public and private assets within areas identified to be affected by coastal hazards. The project lifetime of a new asset should be a key consideration in deciding the suitability of locating new assets in coastal hazard areas. For example, the construction of new public assets, such as picnic facilities and public toilets, should be avoided where these assets are likely to be impacted by coastal hazards within the lifetime of the asset.

Similarly, the construction of new private assets which are likely to be affected by coastal hazards over their projected lifetimes should not be permitted. The option of avoid can be applied to manage coastal erosion and inundation hazard risks.



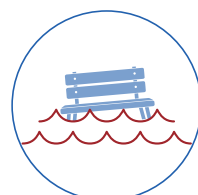
Planned or Managed Retreat

Planned or Managed Retreat (PMR) aims to relocate or remove assets which are located in hazard areas, in an orderly manner, where hazard risks are likely to be unacceptable over relevant planning timeframes.

Planned or Managed Retreat is mostly applicable to developed areas, where there is less potential to adapt to coastal hazards through development planning controls, such as coastal setbacks in undeveloped areas. The strategy of retreat is based on social, environmental and economic sustainability, and ties into the SPP 2.6 objectives and adaptation hierarchy. It allows for continuing public access to beaches, beach amenity, and the provision of a coastal foreshore reserve.

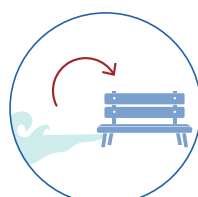
The CHRMAP Guidelines (WAPC, 2019) suggest a range of mechanisms for achieving managed retreat in developed areas, including special control areas, planning policies or compulsory or voluntary acquisition provisions outlined in WA legislation.

Planned or Managed Retreat is an option that can be applied to manage coastal erosion and inundation hazards; however, this option can require a significant investment of public resources to fund acquisitions or retreat plans. Therefore, land managers, landholders and the broader community should be aware of the risks in any decisions they make about managing, developing, or purchasing land in coastal areas. For some places, Managed Retreat may mean significant change, as suitable land within proximity may also be subject to coastal hazards.



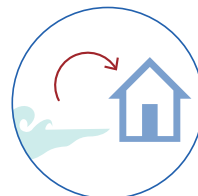
PMR1 – Leaving assets unprotected

For low values assets, accept loss following event. Only implement repairs to maintain public safety. Allow for retreat that allows natural recession of the shoreline over the long term.



PMR2 – Demolition/removal/relocation of asset from inside hazard area.

Relevant for assets where it is impractical both technically and financially to design the asset to withstand the impact of the coastal hazards instead of relocating it.



Includes assets such as park benches and signs, and then more substantial assets such as car parks, parkland, houses and businesses.

Example adjacent.



PMR3 – Prevention of further development/prohibit expansion of existing use rights

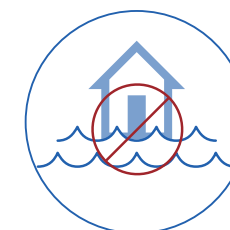
This risk treatment option allows all assets to maintain current development and usage rights, without expanding those development rights, until the risk from coastal hazards becomes intolerable. This would be outlined in the local planning scheme as shown to the right.



PMR4 – Voluntary acquisition

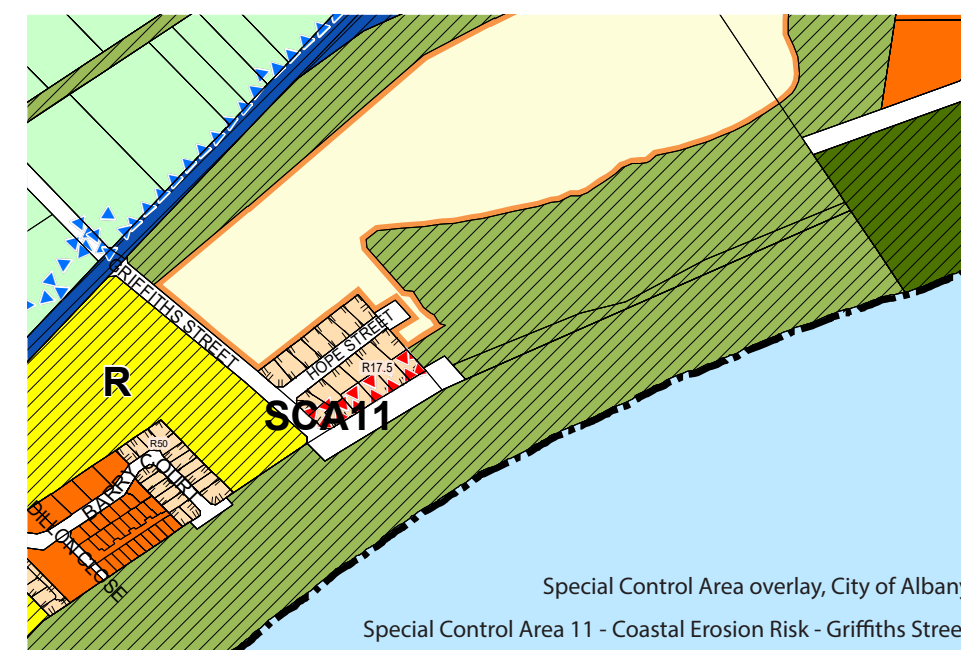
For private property assets, this risk treatment option would propose the acquisition of affected properties, on a voluntary basis.

Acquired properties could still be available on a lease basis, as short term holiday accommodation or as longer term rental depending on emergency management planning, but would be removed when the risk becomes substantial, or when its presences impacts the coast's natural processes.



AV – Avoid locating assets in areas that will be vulnerable to coastal hazards

Assets will not be vulnerable to risk arising from coastal hazards.



Special Control Area overlay, City of Albany
Special Control Area 11 - Coastal Erosion Risk - Griffiths Street



Accommodate

Accommodate (AC) options aim to utilise design and management strategies that render the risks from identified coastal hazards as acceptable. Design and management strategies include minimum finished floor levels to minimise inundation risks. In this way, the Accommodate option allows landholders to continue to use land until hazard risks become unacceptable.

Accommodate design and management strategies can be facilitated through modifications to local planning frameworks. These planning frameworks need to provide clear direction for planning authorities when assessing applications for new development and for affected landholders.

Planning frameworks might include the introduction or modification of the following instruments:

- Special control areas, to ensure planning discretion over new development (Albany and Broome example schemes)
- Clear development assessment criteria, to ensure that new development gives due regard to coastal processes (planning policy)
- Time- or event-limited planning permits, to allow the continued use of land until hazards become unacceptable. Event-limited planning consents have been upheld through the State Administrative Tribunal.

Accommodate is an option that can be applied to help minimise the effect of coastal inundation hazards, however is more challenging for erosion hazards, where the shoreline is allowed to recede, directly impacting the physical or natural asset.

An additional consideration to the Accommodate option, particularly in regard to managing coastal erosion, is that the current WA legislative framework means that permanently inundated private land does not become Crown land.

Therefore, where the shoreline is allowed to recede beyond private property boundaries, issues of public access and trespass may arise. This should be a consideration when assessing the appropriateness of the Accommodate option.



AC1 – Design assets to withstand impacts

Where avoiding or relocating an asset is not an option, design of assets to withstand the impact of inundation. Can be done over long time periods if inundation is not currently a high level of vulnerability, to enable normal asset replacement timeframes to be reached.

For houses that are already low to the ground, consider dam gates for doorways (there are many off-the-shelf products).

Is a risk of being considered a 'solution'. If footings are inundated, it is also likely that below ground services will be impacted, and at-grade surfaces like roads may require increasing maintenance regimes. It is possible that other stakeholders may retreat and leave asset owners unserved, due to the costs involved.



Accommodate - and plan for emergency (cyclone shelter, Cocos (Keeling) Island)



Accommodate (lift floor levels), Queensland



Accommodate (lift floor levels), Denham



Protect

Protect (PR) option aims to stabilise the position of the shoreline using hard or soft coastal protection measures such as seawalls, groynes, offshore breakwaters, geotextile sand-containers, sand nourishment and levee banks. Protection is an option that can be applied to manage both coastal erosion and inundation hazards.

The adaptation hierarchy considers the construction of new protection measures as the least preferred option of all potential options listed in the hierarchy. Protection measures, particularly hard measures such as rock groynes and seawalls, interfere with local coastal processes and can have detrimental effects on local ecological systems.

Protection measures can also exacerbate erosion impacts downdrift of the structure, 'shifting the problem' along the coastline. Subsequently, careful consideration and planning needs to be adopted for staging of protection structures, to understand and mitigate likely flow-on impacts (increase coastal erosion risk) of proposed structures.

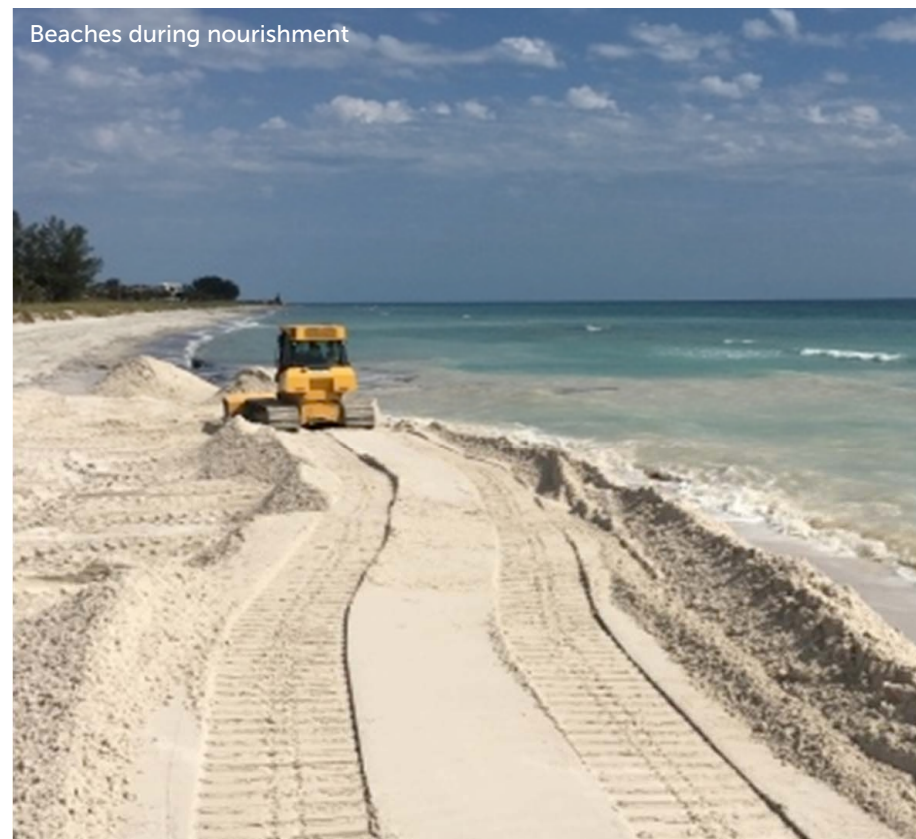
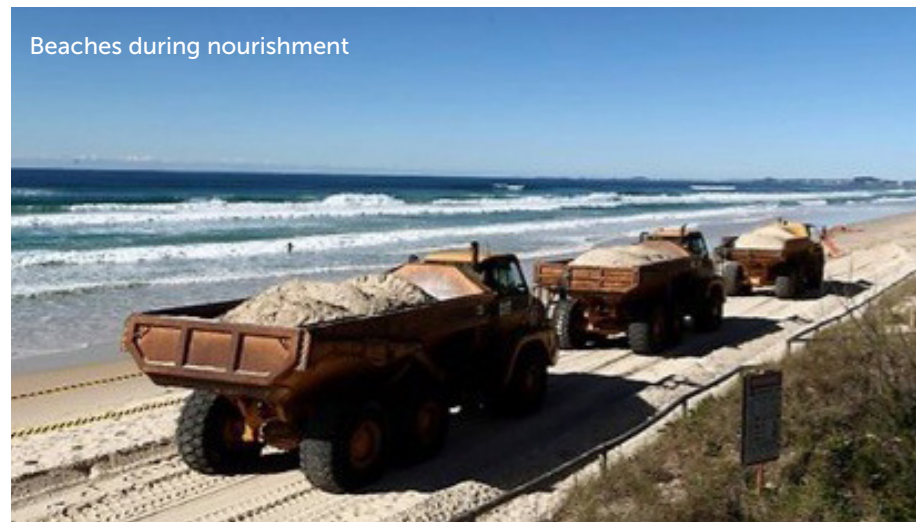
Protection measures can also inflate property values in hazard areas, create expectations that the measures will be maintained into the future, and may limit the capacity of future decision makers to change strategies as situations change.

The agency or landowner who develops protection measures assumes legal responsibility for their maintenance, and possibly some liability if failure of the protection measures results in damage to person or property.

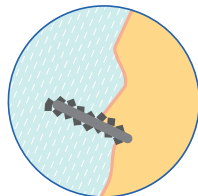


PR1 – Sand nourishment

Placement of sand within the beach profile and/or dunes to activate beach coastal processes and provide a sediment supply. Sand sourced and placed on the beach using trucks. The impact of a sand nourishment campaign may be minimal, but it also risks being done at a time where winds are high and sand is lifted off the beach into nearby land, or just prior to a storm which may lose the sand just placed. This could reduce the impact on the pre-existing beach, which could be a positive should the timing be close.



PR2 – Groyne



Construction of groynes to stop or restrict the movement of sand around the end of the structure, to provide protection to assets behind the beach/foreshore reserve. They are primarily effective where there is longshore sand movement or when partnered with PR1 sand nourishment. Their effectiveness in a sea level rise scenario reduces.



Beach groyne

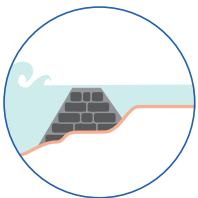


Beach groyne



Beach groynes /
marina combination

PR4 – Artificial reef



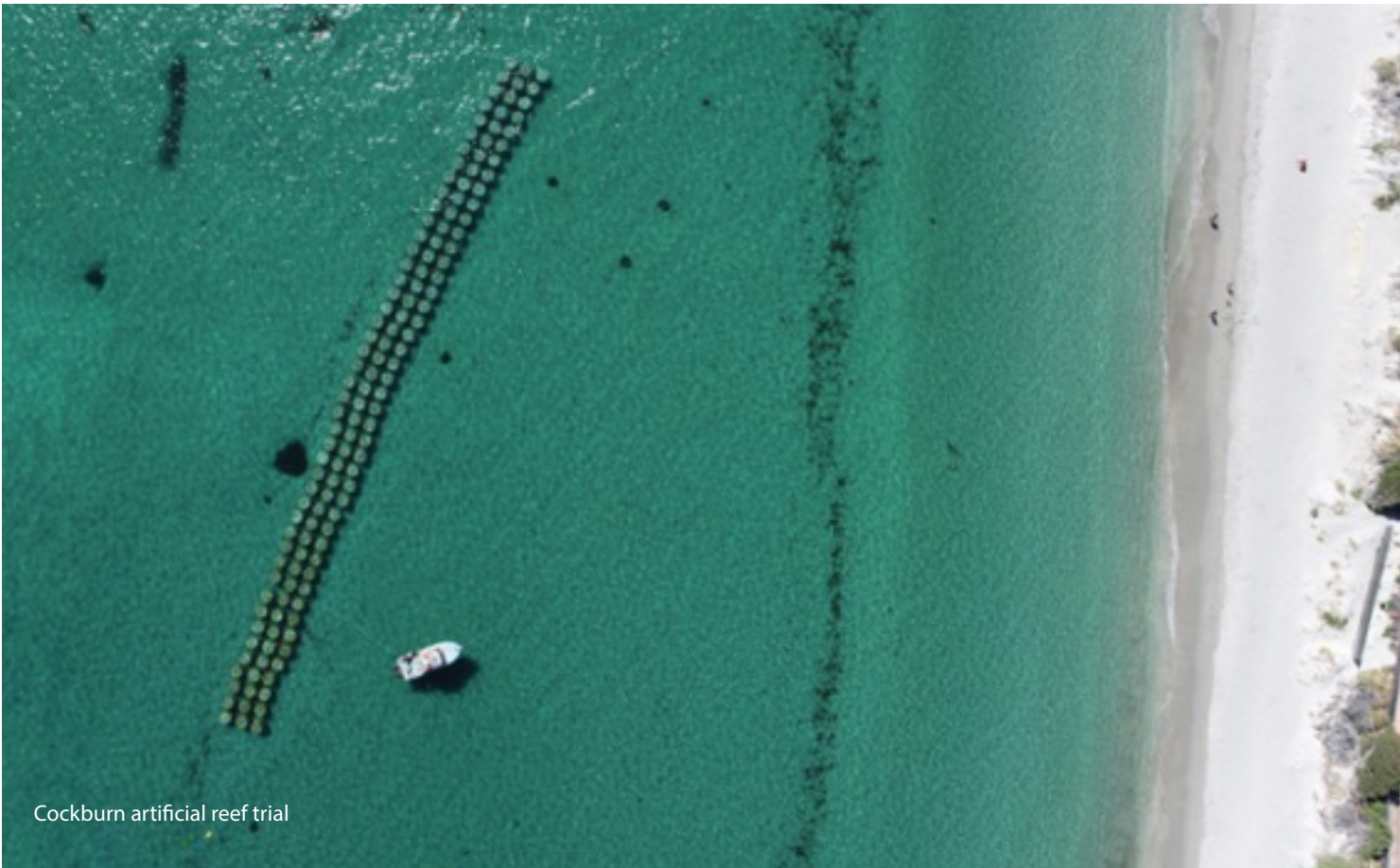
Construction of a submerged artificial reef offshore, to dissipate wave energy impacting the shore by causing waves to break on their seaward side and reducing wave energy on their leeward side.

Artificial reefs do not block waves and during storm events water depths over the reef may be sufficient to allow waves to pass over the reef without breaking, reducing their effectiveness in protecting the beach from erosion.

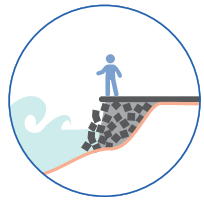
Often suggested to deliver surfing as well as coastal management, but poorly studied in WA. Could enhance marine life, depending on construction.



Albany artificial reef graphic representation



Cockburn artificial reef trial



PR3 – Seawall

Construction of a seawall usually along an entire section of shoreline. Where a beach is to be retained, this risk treatment option should generally be accompanied with PR1 beach nourishment or replenishment. Over time, it is likely that loss of sandy beach will be experienced, first seasonally, then permanently. The scale of the wall can be significant.



Seawall - with example design to stop wave overtopping



Buried Seawall example



Seawall



Seawall and retaining



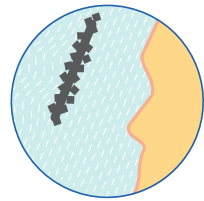
Failed geotextile (sandbag) seawall



Seawall that has resulted in a loss of beach over time, and is now more like a revetment edge. End has been extended several times as erosion has worsened at previous terminus

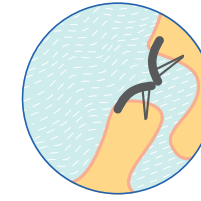
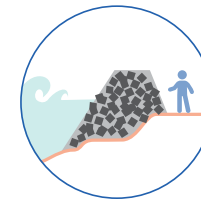
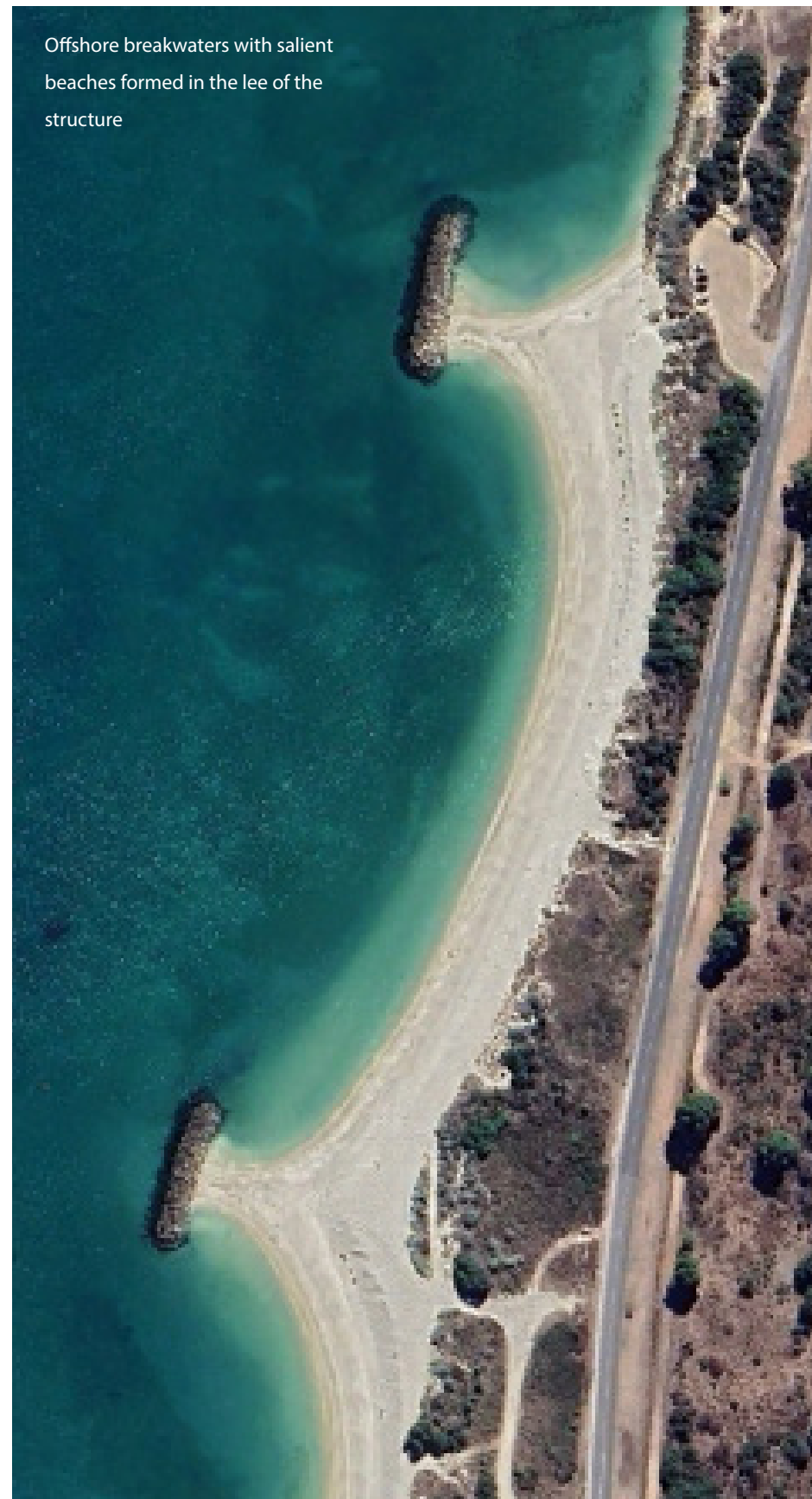


Seawall/Promenade/ Parkland combination



PR5 – Offshore breakwater

Construction of an emergent offshore barrier (often referred to as an offshore breakwater). Offshore breakwaters block wave energy by absorbing wave impact on their seaward side. An offshore breakwater creates a lower wave energy section of beach immediately in its lee, which is characterised by sand accreting in the low energy environment, when designed appropriately. Nearshore structures can also be constructed, a cross between a seawall and breakwater.

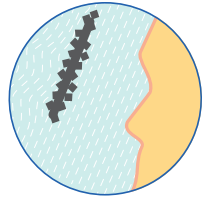


PR6 – Levee/weir/storm surge barrier

Inundation protection to minimise inundation on low-lying land. This could be a levee on the banks of a river, a storm surge barrier at the entrance to an inlet/estuary etc. Details would be specific to the relevant conditions of each Management Unit.



PR1 Protect – Soft options, revegetation, fencing, signage



Development of a long-term program for revegetation and rehabilitation of the dune system. Sand fencing to manage wind-blown erosion and signage for dune conservation also falls under this category. Collaborative with Coast Care groups, environmental organisations and the broader community are a benefit of this option.

It is worth considering more advanced educational signage, as 'dune under repair' signs do not adequately communicate the purpose of dune repair, and can be disregarded.

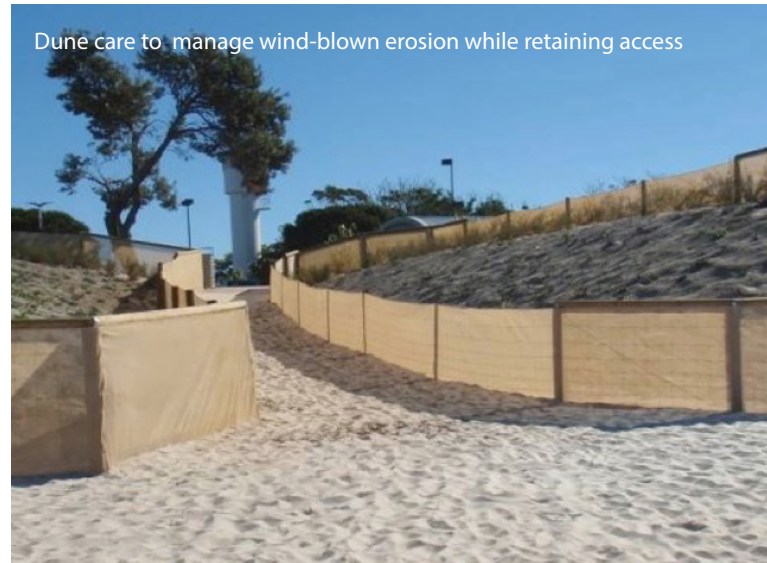
These options will not stop long term erosion, and may be quickly lost in storms, but may slow the rate of erosion and help the community get involved in hazard management.



Dune revegetation



Dune under repair signage



Dune care to manage wind-blown erosion while retaining access



Closing access points



Dune care / vehicle access management (low management)

No Regrets



No regrets (NR) options cover a period of time where assessments are required or are being undertaken to determine a preferred risk treatment option, prior to implementing specific asset risk management measures.

This is particularly pertinent where a more costly or difficult risk treatment option is proposed, or better understanding regarding the level of risk to an asset may be required.

No regrets options are cost effective and support a flexible approach to appropriate long-term management. No regrets approaches allow decision makers to plan for the worst, but only make decisions if required.

NR1 – Monitoring



Involves long-term baseline monitoring and event-based monitoring following storm erosion events.

NR2 – Protection structure audit



Involves undertaking an audit of existing protection structures to determine their current condition, effectiveness and future protection potential.



Example of citizen science coastal monitoring program



Educational signage, helping community to understand why actions are being taken

Example of signage to engage and educate the community





NR3 – Notification on Certificates of Title

Indicates to current and future landowners that an asset is likely to be affected by coastal erosion and/or inundation over the planning timeframe. Helps current and future owners make informed decisions about level of risk they are/may be willing to accept, and that risk management is likely to be required at some stage within the planning timeframe.



NR4 – Emergency evacuation plans

Where existing assets may be affected by inundation and are not already identified in an existing emergency evacuation management plan. Such plans are important in managing the safety of community and stakeholders.



Warnings for community safety



Flood conditions, emergency response planning



Flood conditions, emergency response planning



Localised closure of access points in response to storm events



Signage responding to risk



Planning for after events

10.1 Evacuation Planning for evacuation

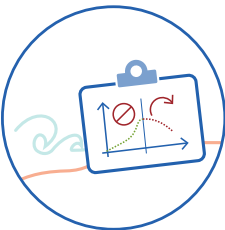
Comprehensive emergency management planning should involve planning for community evacuations. Although the actual act of evacuating a community is the responsibility of the Controlling Agency, the local government with the assistance of its LEMC has clear responsibilities to undertake pre emergency evacuation planning. A comprehensive evacuation plan is of considerable value to all agencies with a role in evacuation and can be very effective in assisting the controlling agency to make timely and informed decisions.

Consideration also needs to be given to receiving evacuees from other local governments.

To assist with emergency evacuation planning SEMC has endorsed the [Western Australian Community Evacuation in Emergencies Guideline](#) which has a section on pre emergency evacuation planning for local governments and LEMCs and dot point items for consideration.

Emergency Management Planning 2024

Emergency Management Plan



Do Nothing

Do Nothing (DN) assumes that all levels of risk are accepted and that no further action will be taken. A Do Nothing option provides the basis for comparison of all other risk treatment options.

A Do Nothing option may also be reflected in reality where the selection of another option (e.g. protect) is not funded. In this case, the selection of an option results in 'nothing happening' despite recommendations in a CHRMAP. This needs to be considered when selecting the most appropriate option to address risk.

