



Snapshot

Monitoring the effectiveness of beach nourishment in the City of Mandurah

Summary

Mandurah's sandy beaches are a valuable asset to residents of this local government area of Western Australia. A risk assessment study conducted by Mandurah's council revealed the vulnerability of these beaches to the impacts of climate change, especially those associated with increasing sea levels. The council decided to implement beach nourishment activities in order to preserve the beaches and maintain their amenity. The effectiveness of this single strategy is being monitored on an on-going basis to make sure the adaptation measure meets the economic, environmental and social objectives set by the council. An additional measure could be the construction of protective structures such as sea walls or groynes.

The City of Mandurah, a local government area of Western Australia, is renowned for its sandy beaches and its water-based activity facilities. It is also well known for a strong history of awareness and action on climate change, which led to the development of a coastal zone risk management study in 2009. The study revealed the susceptibility of the area to increased rates of erosion and loss of sand dunes as a result of sea-level rise. Other findings of the study included changes in sediment transport and changes in the availability of freshwater levels (e.g. due to saltwater intrusion and deposit of organic sediments).

Given the particular significance of Mandurah's beaches to the local community, the council adopted a strategy of beach nourishment to protect the beaches from the threats identified. One of the council's strategies is to redistribute the sand (e.g. transport sand accreted up stream, reduce berm heights that block natural down drifts) along the coast wherever possible to maintain beach width. A combination of monitoring processes which include –taking photographs, conducting cross sectional surveys by a coastal survey team (daily to weekly basis) and using LiDAR and hydrographic survey as inputs for numerical models are pursued by the council's personnel.

Keywords

Beach nourishment, monitoring, risk assessment, Mandurah

The monitoring and evaluation needed to inform the Mandurah council beach nourishment program is active and continuous – it is not restricted to a post storm event, or just informed by research consultants. The council has dedicated staff responsible for the monitoring process: these staff aim to increase understanding within the council, rather than the council being solely dependent on external coastal adaptation engineering consultants.

The template in Table 1 has been designed to capture the monitoring and evaluation process conducted for the beach nourishment strategy, an activity that is conducted on an ongoing basis.

A strategy constantly reviewed and revisited

Mandurah's council is aware that the main purpose of the strategy of beach nourishment is to maintain the beach value as a public amenity – it is not aimed at safeguarding properties near the beach. In addition, the on-going cost of this strategy is uncertain and depends on the level of erosion – which is also linked to the level of uncertainties associated with sea-level rise projections and occurrence of extreme storm events. Thus protection structures such as sea walls or groynes have also been considered.

The construction of a rubble mound groyne to complement the beach nourishment strategy could increase the amenity of the area by providing a wider beach width and additional buffer for any existing structures, though the costs associated with it is high.

In view of the high costs associated with such combination strategies, the council has decided at present to continue only with the beach nourishment strategy. In the longer term, this decision will need to be tested against the effectiveness of this adaptation measure to meet the economic, environmental and social objectives set by the Council, as well as the emerging priorities or values of the local community.

Further reading

Both links accessed 9 June 2017:

Mandurah's coastal zone climate change risk assessment: <http://coastaladaptationresources.org/PDF-files/1390-Mandurah-CC-Risk-assessment.PDF>.

A more extensive case study on Mandurah's risk assessment process: <https://www.nccarf.edu.au/localgov/case-study/city-mandurah-coastal-zone-climate-change-risk-assessment-and-adaptation-action-plan>.

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Australian Government

Department of the Environment and Energy

Table 1: Monitoring template for the beach nourishment strategy. Source: City of Mandurah.

Title of project:
Beach nourishment – Council X
Context:
Council X has a sandy shoreline that is subject to erosion. One of the council’s strategies is to put back (redistribute) the eroded sand from further upstream sites where the sand has accreted. Beach nourishment is conducted as part of maintaining the beach value as a public amenity/asset/liability rather than aiming to safeguard the properties behind the beach.
Assumptions made – Longshore transport across the beach continues the same and as projected.
Objective of the M&E project:
The aim of using this template is to assess the effectiveness of beach nourishment against the economic, environmental and social objectives set by the council (as informed by the local community’s priorities). The purpose of this template is mainly to monitor progress of the strategy-beach nourishment towards achieving the council’s objectives. Monitoring is conducted on an ongoing basis. Performance rating is conducted annually in this case.
Coastal monitoring tool, transactional surveys of the coast, bathymetric and LiDAR surveys, hydrographic surveys, a very complex model that determines how the sediment currently moves and is likely to move into the future and storm surge models that help to identify areas at risk to inundation under extreme storm conditions.

Objectives across the TBL	Baseline condition	Indicators	Monitoring requirements, type of data collected and how is the monitoring frequency determined (i.e. T1, T2, ...)	Performance rating (assessment of beach nourishment against the TBL objectives) across the monitoring periods (T1, T2, T3, T4 and T5)	
				T1=year 1	T2=year 2
Economic objective Sub criteria 1: Ensure affordability of the strategy	Economic conditions before the intervention (reduced use of beach & associated income due to receding shoreline) Economic projections before the intervention (required for performance rating against T1, T2,..)	Change in cost/benefit ratio due to the strategy Benefit can be measured using proxy measures such as: Residential property values attributable to beach amenity, expenditure by beach visitors etc., cost/benefit ratio projection due to the intervention	Net benefit of beach nourishment (benefit due to nourishment minus ongoing cost of beach replenishment) is compared against baseline economic conditions Data needs to be collected to quantify the benefits of having a wider beach. The economic returns associated with more local community members, tourists and businesses utilising the spot could be used as a proxy indicator for the economic benefits for that particular year.		
Sub criteria 2: Maintain or improve economy associated with the beach (e.g. tourist activities, local activities)	Current number of businesses linked to the beach area	Change in the number of businesses associated with the beach area	Quantify the economic returns due to business expansions/new businesses linked to the beach		
Environment objective Ensure quality of water is not damaged due to organic sediments Maintain the natural habitat and resources for it	Current water quality Current species diversity	Water quality measurement Change in number of species abundance and concentration	Measure species diversity Measure water quality Ongoing data collection will be required		
Social objective Maintain and enhance recreational amenity	Current social uses of the beach and projected use of the beach in the absence of beach nourishment	Change in number of tourist visits (use of recreational facilities, number of surfers)	Data needs to be recorded regularly (daily basis)		

Performance rating key*: Exceeding or meeting desired outcome/trend Moving towards a desired outcome Limited to no changes towards a desired outcome Not meeting desired trend and showing signs of decline No data available in that particular reporting period

*Use the key to rate the strategy, also mention any assumptions made during assessment.