

A strategic, transparent and defensible model for managing coastal land

Kerri Woodcock and Derek Ball
Reef Catchments PO Box 815 QLD 4740

INTRODUCTION

The coastal zone is a significant national environmental asset that is fundamentally important to our lifestyle and economy as it provides multiple, critical ecosystem services (Commonwealth of Australia, 2009a; Anon, 2005). The impending impacts of climate change, growing population, multiple-use conflicts, and complex jurisdictional arrangements present ongoing challenges for effective management of coastal areas. A comprehensive coastal management program has been developed at a meso-regional scale to address these challenges along the Mackay coast, central Queensland (Figure 1).

The Mackay coastal zone is characterised by a diverse range of natural features including sandy beaches, rocky headlands, extensive intertidal flats, and substantial areas of estuarine wetlands. The area supports many significant conservation assets including critically endangered littoral vine forest communities, nesting habitat for marine turtles, and internationally significant populations of migratory shorebirds. The coastal zone is vitally important for the region's economy, particularly in terms of commercial fisheries, tourism and residential settlements. The coastal zone in this region also retains considerable cultural significance for Aboriginal people (Barker and Bernard, 2007), and makes major contributions to the lifestyles of communities within the region.

The Mackay Regional Council jurisdiction is one of the fastest growing in Queensland, with an average annual growth rate of 3.3 per cent, compared with 2.6 per cent for the state (The State of Queensland, 2010). The majority of the population in the Mackay region lives on or directly adjacent to the coast, and subsequently the resources in this landscape are highly sought after by competing interests; residential development, tourism, commercial and recreational uses.

The growth of the urban footprint has expanded into environments which until recently were largely in a natural condition, and this brings increasing recreational use which threatens the condition and ecological integrity of coastal ecosystems. Added to this, the Mackay region is one of the most vulnerable sections of the Queensland coast in terms of the impacts of climate change (Commonwealth of Australia, 2009b).



Figure 1: Mackay Regional Council mainland coastline and key residential beaches.

Regional government has a major role to play in the management of public coastal lands. The Mackay Regional Council jurisdiction includes approximately 370 kilometres of mainland coastline. Under the provisions of the *Local Government Act 1994* and *Land Act (1994)* Council is responsible for the public area ('Esplanade') along all beaches, in addition to many other coastal reserves and other open space areas. The *Coastal Protection and Management Act 1995* underpins coastal management in Queensland. However, this and other state, national and

international coastal policy documents provide little detailed direction at a scale relevant to regional council operations. A history of mis-management, or lack of management, of public coastal lands has resulted in encroachment from adjacent private properties into public land, waste dumping, establishment of invasive weeds, physical disturbance of fauna and their habitats, and vegetation clearing.

Mackay Regional Council collects a natural environment levy from ratepayers providing significant but nonetheless finite funding for natural resource management activities. With approximately 760,000 hectares of land under Council jurisdiction, coastal management is but one competing priority; and there are also competing interests within the coastal management arena. In addition, management in the region has been typified by a largely reactive and non-strategic delivery of conservation management interventions. Thus there is a clear case for a more strategic, transparent and defensible model to ensure maximum return on investment from future management interventions.

The “coasts and communities” program has been developed in recognition of the need for a strategic planning and implementation framework that more effectively contributes to the long term sustainability of the coastal zone in the Mackay region. Using an integrated management approach (Harvey and Caton, 2003; Natural Resource Management Ministerial Council, 2006) the program seeks to balance environmental, economic and social objectives, through facilitating data collation, planning, consultation, decision making, implementation and monitoring. Given the geographic scale of the program, and the limited resources available there was a strong need to adopt the principles of systematic conservation planning (Margules and Pressey, 2000) to guide the development of a decision making framework that prioritised coastal management interventions. Support from both coastal communities and decision makers was recognised as essential for long term sustainability and successful implementation. Thus the conservation planning framework used in the first instance was a simplified model, but one that can be further developed as community understanding and appreciation of the concept grows.

The vision of the coasts and communities program is that the natural environment values of the Mackay coast are protected and restored, whilst allowing for appropriate recreational access and use. The key aims are to: Set a vision for the future of the Mackay coast and engage the community in coastal management initiatives; Increase delivery outcomes of available resources by prioritising coastal activities through transparent conservation planning; Provide leverage to attract additional funding and resources to the region to protect coastal resources.

THE COASTS AND COMMUNITIES PROGRAM

The coasts and communities program has been developed for coastal land under Mackay Regional Council jurisdiction. There are four key elements to the program; planning, prioritisation, community engagement, and implementation and monitoring. Feedback loops following the implementation and monitoring of on-ground activities ensure that priorities are continually updated (Figure 2).

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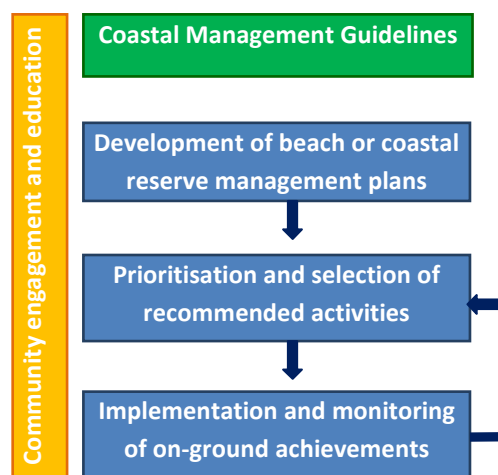


Figure 2: Coasts and communities program model

1. The planning process

Given the historical variability of coastal management intent in the Mackay region, Coastal Management Guidelines were developed first to provide an agreed broad policy framework for future management activities. The guidelines identified six key management priorities; native vegetation protection, management of public access, wildlife protection, maintenance of cultural heritage values, erosion mitigation, and adaptation to climate change. 33 management guidelines outline how these are to be addressed. The Coastal Management Guidelines thus provided a regionally consistent overarching framework which guided all subsequently developed local beach management plans.

Beach management plans were developed for 23 residential beaches. Two large coastal reserves with individual management plans were additionally included. These beach/reserve units were further broken down into 63 management zones, which were delineated based on presence of common issues or management requirements. These beach plans identified and mapped environmental, social, and recreational values and issues using a geographic information system (Figure 3).

In line with the overall vision, beach plans sought to achieve a balance between conservation of the natural environment, and recreational use, and necessarily acknowledged the presence of existing infrastructure and developments. A natural environment objective (class 1 to 4) which was an estimated measure of the potential to achieve conservation outcomes in each zone was set to allow a realistic list of recommended activities to be developed.

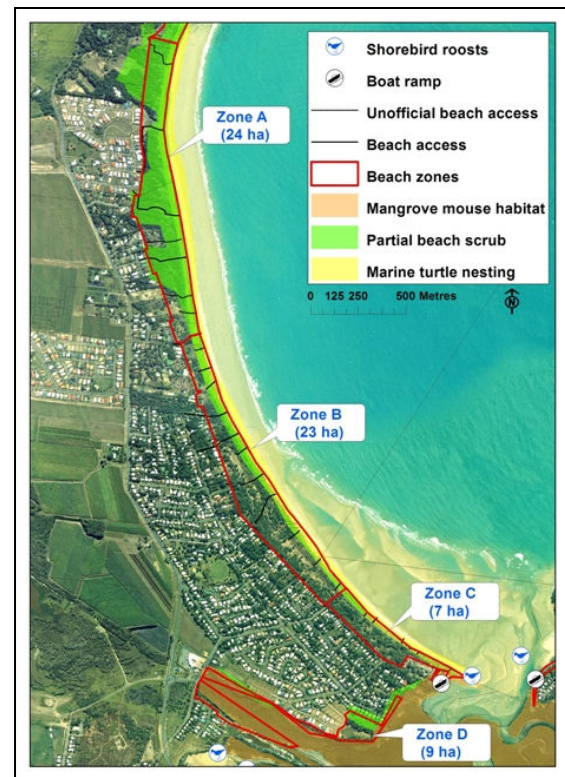


Figure 3: Extract from Bucasia Beach Plan

2: The prioritisation framework

A conservation planning framework was developed to provide a decision support system for the selection of priority management interventions which were expected to achieve optimum coastal management outcomes with finite resources. Given the imperative to communicate simply and thus effectively with community members and decision makers, this framework was developed using simple, relevant and quantitative factors.

Firstly, a natural environment value was calculated for each beach zone, using the formula and data layers listed in Table 1. A panel of community based coastal experts in the region was consulted to ensure the validity of the natural environment values score results.

Table 1: Formula and indicators used to calculate the natural environment value of beach zones

Formula	
Natural Environment Unit Value	= Biogeographic Multiplier (per beach) * $\left(\text{Vegetation Zone Value} + \text{Fauna Zone Value} \right)$

Indicators used:	Contribution to formula:	Source data:
Habitat diversity index	Biogeographic Multiplier (per beach)	Remnant vegetation mapping Version 6, 2009, 1:100,000, DERM.
Percentage remnant vegetation remaining	Biogeographic Multiplier (per beach)	Remnant vegetation mapping Version 6, 2009, 1:100,000, DERM.
Geomorphological diversity index	Biogeographic Multiplier (per beach)	Central Queensland Coast shoreline type, DERM.
Area of endangered and of concern remnant vegetation	Vegetation Zone Value	Remnant vegetation mapping Version 6, 2009, 1:100,000, DERM.
Area of critically endangered beach scrub vegetation	Vegetation Zone Value	Beach scrub mapping 1:12,000, 2009. DERM.
Density of nesting marine turtles	Fauna Zone Value	Mackay and District Turtle Watch Association, 2010.
Prioritised shorebird roosts	Fauna Zone Value	Queensland Wader Study Group, 2011.
Mangrove Mouse (<i>Xeromys myoides</i>) Essential Habitat	Fauna Zone Value	Essential Habitat mapping, 2005, DERM.
Coastal Sheathtail Bat (<i>Taphozous australis</i>) Essential Habitat	Fauna Zone Value	Draft Essential Habitat mapping, 2011, DERM.

*Biogeographic multiplier ($[\text{habitat diversity index} \times \% \text{remnant vegetation in beach unit}] + [\text{geomorphology diversity index} \times 0.25]$) was used to offset zonal differences within beach units and incorporate the value of proximal areas.

Secondly, the cost of recommended activities from each beach plan were calculated using current known costs for on-ground coastal activities, and divided by the natural environment value score, to calculate a return on investment ratio (cost per natural environment unit value).

Finally, in recognition that decisions about management interventions include social and practical considerations; community support, maintenance requirements, and the status of beach plan adoption (as Council policy) were included as additional decision support criteria. Table 2 provides an overview of the final prioritisation framework template.

Table 2: Template of prioritisation criteria provided for each beach zone

Criteria provided for each beach zone:	Range of values in 2011/2012 prioritisation:	Description:
Area	0.5 ha to 185 ha	The area of land in the beach zone (hectares).
Natural environment objective	Class 1, 2, 3, or 4	Identified the natural environment objective sought for the beach zone, from class 1 (large natural areas with self-sustaining coastal vegetation) to class 4 (recreational uses override natural value, no functioning coastal vegetation community).
Natural environment value score	0 to 895	A quantitative and comparable score for current natural environment values in the beach zone. Incorporated measures of the indicators listed in Table 1, which were selected specific to the Mackay region.
Total cost for activities	\$0 to \$223,000	Total cost of on-ground activities recommended for each beach zone from the beach plans.
Cost per natural environment unit value	\$0 to \$87,000	Return on investment performance indicator. Calculated by dividing the total cost for activities by the natural value score.
Beach plan status	Yes or No	Described whether or not the relevant beach plan had been formally endorsed by Council.
On-ground projects initiated	Yes or No	Identified whether there had been projects initiated under past coastal projects which may require maintenance.
Level of community engagement required	High, Medium or Low	Provided a measure of 'willingness' or support in the community for activities proposed.

3: Community engagement and education

Coastal communities have a vested (often inter-generational) interest in the management of public coastal lands. Thus the long term sustainability of coastal resources depends on the understanding, ownership and support for beach plans and on-ground activities that are selected for implementation. An extensive community education, consultation and engagement program was delivered including; an ongoing suite of communication and education products, local beach events throughout the beach planning consultation phase (Figure 4), and ongoing project updates to over 4,000 households. A program of coastal community activities was put in place across the Mackay coastline to provide local residents with the opportunity to get involved in on-ground coastal management initiatives and encourage continued dialogue.



Figure 4: Residents attending local beach event during the community consultation phase of the Seaforth Beach Plan.

ACHIEVEMENTS TO DATE

Beach plans have now been developed and cover approximately 1,200 hectares of public coastal land under Mackay Regional Council jurisdiction. These provide a comprehensive list of recommendations designed to ensure the sustainability of coastal resources, in line with the recently released Queensland Coastal Plan State Policy for Coastal Management (The State of Queensland, 2011). Some beach plans await formal adoption by Mackay Regional Council and this will occur when sufficient community support has been established. This support is required as the Coastal Management Guidelines and beach plans provide a vision for the region and collective ownership is vital.

The result of the prioritisation framework developed was a matrix of 63 beach planning units (zones) and aligned management interventions prioritised by the criteria selected (Table 2). Multiple solutions are commonly available for conservation investment questions being asked, depending on which particular criteria, or suite of criteria, are chosen. The prioritisation framework developed has been used to determine the on-ground project activities for implementation across the Mackay beaches for the 2011/12 financial year. For this program, the natural environment objective (class 1) was ranked highest, followed by return on investment (cost per natural environment unit value) within these classes. However, final project selection also considered status of community engagement, ongoing maintenance costs, and adoption status of the relevant beach plan. Consulting a panel of experts to confirm the results helped overcome any limitations in the input data. Irrelevant of the criteria used for prioritisation in any given situation, the value of this decision making framework lies in its quantitative, scientifically based and transparent nature. We accept that more sophisticated conservation planning techniques are available (Ball et al., 2009; Watts and Pressey, 2005) and will seek to make better use of these once the conceptual framework of this type of prioritisation is better understood by the community and Council decision makers.

Management interventions across 16 beaches are underway, including coastal fencing, weed control, and revegetation. Council staff, contractors, not-for-profit groups, and coastal community volunteers are all involved in these activities. A monitoring database has been developed which collects spatially, details of management interventions underway. In time, it is

anticipated that this data will demonstrate reduced maintenance costs owing to the adoption of more strategic, integrated, and thus improved coastal management practices.

There has been a largely positive response to the program from coastal communities. During the consultation phase for the beach plans there was a 10 per cent attendance rate at beach events, and local contacts have been made at many beach communities. However, attracting and retaining volunteers at coastal community activities is a time-consuming exercise. The historical mis-management or lack of management of public coastal lands, sectorial resistance to change, and at times self-vested interests mean that challenges still remain in education and engagement campaigns. Residential beach communities across the Mackay region represent many different demographics, and it is critical to increase our understanding of the factors that drive their behavior to ensure that communication and education strategies are most effective.

CONCLUSION

An innovative partnership between a regional natural resource management organisation and regional government has seen the establishment of a strategic coastal management program across a large area of the central Queensland coast. The coasts and communities program was developed to ensure that the natural environment values of the Mackay coast are maintained and enhanced, whilst allowing for appropriate recreational access and use. Through the development of regional level coastal management policy, local beach management plans and a quantitative prioritisation framework, transparent and defensible decisions can now be made to determine where to invest limited resources to obtain the best coastal management outcome. The planning and decision making framework additionally offers a meaningful basis on which to engage and educate coastal communities, and provide opportunities for their involvement in coastal management initiatives. Although in early stages of operation, the coasts and communities program is already delivering strategic and measurable on-ground outcomes on the Mackay coast. This model provides a strategic, transparent and defensible approach to coastal management that could be extended along the Queensland coast and other urbanised coastlines.

TAKE HOME MESSAGES

Local coastal management plans, developed under a set of broader policy guidelines, can provide regionally strategic outcomes but with relevance at a local scale.

The concepts of systematic conservation planning can be used to develop simple, quantitative and transparent decision making frameworks to guide coastal management investment decisions where resources are limited.

Community education and engagement are a critical and ongoing component of any coastal management program.

ACKNOWLEDGEMENTS

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