



# Theme 4: Adaptive Learning

## Final Report

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University of Wollongong



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# FINAL REPORT TO CSIRO

## Theme 4: Adaptive learning theme

### Final report

**Date due:** 13 January 2013

**Theme leader:** Professor Tim Smith

### Milestone status

Has this milestone been achieved	<b>Yes</b>
Has the project been completed according to the schedule	<b>Yes</b>

## Project progress and achievements

### Overall progress of the project

- Final report completed and submitted.
- The adaptive learning toolkit has been completed and will be migrated to a new host website. The toolkit includes sections on What is Adaptive Learning, What are we learning for, What does an adaptive learning organisation look like?, Annotations, Case Studies and a Monitoring & Evaluation Tool (<http://coastalcluster.curtin.edu.au/themes/toolkit.cfm>) (Appendix 1).
- An on-line survey has been completed to benchmark the status of adaptive learning / monitoring and evaluation programs for coastal zone management (Appendix 2). This was populated through contributions of relevant coastal organisations. The data will form the basis of a refereed journal article currently in preparation.
- An additional deliverable has been completed (in addition to those in the original contract): The monitoring and evaluation framework has been piloted, modified and converted to an on-line version through a purpose-specific website (<http://www.coastaleval.com.au/framework>). Five workshops are proposed to work through the tool with coastal organisations and will form the basis of a research paper. One workshop has already occurred with SEQ Catchments.
- Six PhD candidates have been supported wholly or in part by Coastal Collaboration funding. Topics or research address coastal planning, adaptive learning, indigenous learning, response to dolphin feeding, and risk perception. The work has generated 8 conference presentations and 1 book chapter. Additional refereed journal articles are being prepared. Half of the PhD dissertations will be submitted by the end of 2013.

### Difficulties experienced

Two PhD candidates withdrew and were replaced with new students.

The adaptive learning toolkit will become fully-functional once the website host changes (expected to occur by the end of May 2013).

### Major achievements / activities completed during this final reporting period

- Completion of an on-line survey to benchmark adaptive learning / monitoring and evaluation within coastal organisations.
- Establishment of the Monitoring and evaluation framework as an on-line tool.
- Several publications and presentations on the research enabled by the Cluster.
- Satisfactory progress of PhD candidates, including publications from their work.

## Project outputs (October 2012 – January 2013)

### Committee participation

Smith: Invited international assessment panel member for the International Opportunities Fund (€20m) for the Belmont Forum and G8 Research Councils Initiative on Multilateral Research Funding (coastal vulnerability call)

Smith: Acting chair, Socio-economic Scientific Expert Panel, Healthy Waterways Partnership

Smith: CSIRO Coastal Collaboration Cluster Management Committee

### Presentations as part of Conference

Siddique, M. A. L., C. Baldwin, and R. W. Carter. (accepted). Co-, cooperative and collaborative learning: semantic differences or relevant to natural resource management. *2013 Annual Conference on Management and Social Sciences*, 16-18 April 2013. Management and Social Science, Bangkok, Thailand.

Tunbridge, A. and Baldwin, C. (accepted). Social Adaptation: The influence of perceptions of risk and adaptive capacity within a high risk community. Presentation at the '*Early Career Researchers Ninth National Forum & Workshop*', Australian Climate Change Adaptation Research Network for Settlements and Infrastructure, Sydney, 11-13 March 2013.

Tunbridge, A., and C. Baldwin. 2012. Visualising local climate change impacts and opportunities for change. conference poster at the *Visualization Technologies Workshop*. National Socio-Environmental Synthesis Centre, Annapolis, Maryland, United States 23-24 July 2012. (not previously reported)

### Journal articles

Thomsen, D. C., Smith, T.F. and Keys, N. 2012, 'Adaptation or Manipulation? Unpacking Climate Change Response Strategies', *Ecology and Society*, 17 (3): 20. [online] URL: [www.ecologyandsociety.org/vol17/iss3/art20/](http://www.ecologyandsociety.org/vol17/iss3/art20/)

### Web sites

Carter, R. W., C. Jacobson, D. Thomsen, and T. Smith. 2012. Benchmarking monitoring and evaluation, <http://www.coastaleval.com.au/benchmarking>. University of the Sunshine Coast, Sunshine Coast, Australia.

Thomsen, D., C. Jacobson, R. W. Carter, and T. Smith. 2012. Becoming an Adaptive Learning Organisation, <http://www.coastaleval.com.au/framework>. University of the Sunshine Coast, Sunshine Coast, Australia.

### Book chapters

Siddique, M. A. L., S. Zafrin, S. Myers, T. Smith, R. Babcock, and R. W. Carter. 2013. Chapter 15, Co-learning in marine protected area for integrated coastal zone management. Pages 192-205 in E. Moksness, E. Dahl, and J. Støttrup, editors. *Global Challenges in Integrated Coastal Zone Management*. Wiley-Blackwell Ltd. ISBN: 978-0-470-65756-0.

Myers, S., D. C. Thomsen, D. Tarte, L. X. C. Dutra, N. Ellis, O. Thébaud, M. Nursey-Bray, and T. F. Smith. 2012. Adaptive learning and coastal management in South-east Queensland. Pages 157-176 in R. Kenchington, L. Stocker, and D. Wood, editors. *Sustainable Coastal Management and Climate Change Adaptation: Lessons from Regional Approaches in Australia*. CSIRO Publishing, Canberra.

## Newsletter

Thomsen, D.C., Nursey-Bray, M., R W Carter, R.W., Stephenson, C., Jacobson, C., Fidelman, P., Smith, T.F. 2012. Adaptive Learning Toolkit: an online resource for improving the practice of coastal organisations, *Marine Adaptation Bulletin*, 4(3): 3 (ISSN: 2200-5692), online: [http://arnmbr.org/content/images/uploads/Spring\\_MAB\\_2012.pdf](http://arnmbr.org/content/images/uploads/Spring_MAB_2012.pdf)

## Papers/reports not specifically funded by the Cluster but which are relevant to the Cluster's work

Fidelman, P., Leitch, A., Nelson, D. (accepted) Unpacking Multilevel Adaptation to Climate Change in the Great Barrier Reef, Australia. *Global Environmental Change*.

Smith, T. F., D. C. Thomsen, S. Gould, K. Schmitt, and B. Schlegel. 2013. Cumulative Pressures on Sustainable Livelihoods: Coastal Adaptation in the Mekong Delta, *Sustainability* 5:228-241.

Carter RW, O'Rourke V, Livingstone T, McKenzie T, Lyell M, Brown J, Marsden P, Gray J, McMackin F, Knight J, Kelly K & Roiko A, 2013, *Strategic guidelines for sustainable tourism on the Khmer coast*, unpublished report to the Ministry of Tourism, Royal Government of Cambodia, University of the Sunshine Coast, Sippy Downs, Queensland, Australia.

Keys N, Bussey M, Thomsen DC, Lynam T and Smith TF, 2013, 'Building Adaptive Capacity in South East Queensland, Australia', *Regional Environmental Change*. (in press, published online). DOI 10.1007/s10113-012-0394-2.

Tunbridge, A. 2013. A Climate Change Vulnerability Assessment of Gili Trawangan, Lombok, poster presentation at the Local Government Workshop on Climate Change, Gili Trawangan, Lombok, Indonesia.

Fidelman, P.; Ekstrom, J. 2012. Mapping Seascapes of International Environmental Arrangements in the Coral Triangle. *Marine Policy*, 36(5): 993-1004; doi: 10.1016/j.marpol.2012.02.006

Thomas, M.; King, D.; Fidelman, P. 2012. Climate Change Adaptation in Coastal Cities along the Great Barrier Reef, Australia. *International Journal of Climate Change: Impacts and Responses*, 3(2): 107-128.

Carter, R. W., and D. M. Nguyen. 2012. *Realising the tourism potential of Kien Gieng Province and strategic actions for Dong Ho lagoon Viet Nam*, report of the GIZ-Australian AID Conservation and Development of the Kien Giang Biosphere Reserve Project, GIZ, Rach Gia, Viet Nam.

Carter, R. W. 2012. Towards a natural tourism product and destination: Kien Giang Province, Viet Nam, invited paper to the conference on "Conservation and promotion of the values of the Kien Giang Biosphere Reserve Việ Nam", Phu Quoc, Viet Nam, 16 December 2012.

Carter, R. W. 2012. Guidelines for integrated planning for conservation and development of Dong Ho lagoon Viet Nam. available at [http://kiengiangbiospherereserve.com.vn/project/uploads/doc/dong\\_ho\\_planning\\_guidelines\\_05032012\[1\].pdf](http://kiengiangbiospherereserve.com.vn/project/uploads/doc/dong_ho_planning_guidelines_05032012[1].pdf), report of the GIZ-Australian AID Conservation and Development of the Kien Giang Biosphere Reserve Project, GIZ, Rach Gia, Viet Nam.

Myers, S. A., M. J. Blackmore, T. F. Smith, and R. W. Carter. 2012. Climate change and stewardship: strategies to build community resilience in the Capricorn Coast. *Australasian Journal of Environmental Management* 19:164-181.

## PhD students

1. Mohammad Abdul (Latif) Siddique (Supervisors RW Carter, C Baldwin, T Smith and R Babcock (CSIRO)), *Co-learning in Marine Protected Area (MPA) management*, due for completion July 2013.
2. Lavenie Tawake (Supervisors D Thomsen, R.W. Carter, R Hill (CSIRO)) *Indigenous Approaches to Learning for/from Sea Country with the Apudthama people of the Northern Peninsula Area*, due for completion July 2013.
3. Sabiha Zafrin (Supervisors J Rosier and C Baldwin), *Towards sustainable coastal governance: an improved framework for planning*, due for completion July 2013.
4. Ximena Arango (Supervisors RW Carter, G Mayes, S Myers) *Socio-Economic and Dolphin Behavioural Impacts from Provisioning Indo-Pacific humpback dolphins (*Sousa chinensis*) in Tin Can Bay, South East Queensland*, due for completion September 2014.
5. Andrew Venning (Supervisors T Smith; M Nursey-Bray; A Young and N Powell) *Climate change vulnerability and the Queensland Affordable Housing Programme (QAHP) in South East Queensland (SEQ), a legal theme*, due for completion December 2014.
6. Amanda Tunbridge (Supervisors C Baldwin and C Jones) *Social adaptation: the influence of perceptions of risk and adaptive capacity within a high risk community*, due for completion September 2015.

## Connections with other projects

USC (Powell, Smith and Thomsen) were successful in partnering on a bid through the European Global Challenges program for the project: *Climate Adaptation and Water Governance* (2012-2015), funded by Riksbankens Jubileumsfond, Volkswagen Foundation, Compagnia di San Paolo. Smith will lead the "Institutions Work Package" (one of three) and Powell leads the overall Consortium of 10 partner organisations across 7 countries (the University of Tasmania are one of the partners). The CSIRO Coastal Collaboration Cluster will be used as an international case study to help inform European policy directives as part of the new initiative.

# FINAL REPORT OF THEME 4: ADAPTIVE LEARNING

## 1.0 Introduction

Adaptive learning is crucial for coastal organisations to navigate and improve their governance processes during times of complexity and change. There is a wide body of knowledge on the benefits of adaptive management, social learning, sustainability learning, and organisation learning. The adoption of the term 'adaptive learning' was used to emphasize learning for adaptive management, particularly coastal management. Further rationale for research focused on adaptive learning is articulated in the paper 'Enhancing Science Impact in the Coastal Zone through Adaptive Learning', which was one of the first outputs of the Adaptive Learning Theme (Smith *et al.*, 2009) – Appendix 3.

The adaptive learning theme aimed to:

- Analyse the barriers and opportunities to embed adaptive learning within coastal organisations (including government agencies, community groups, etc.).
- Determine the processes by which adaptive management frameworks function in the coastal management context.
- Assess institutional adaptability success factors.
- Develop and test a monitoring and evaluation framework.

The objectives were met through two major deliverables, including: (i) the Adaptive Learning Toolkit (Section 2.0); and (ii) a benchmark of adaptive learning in coastal organisations (Section 3.0). However, the research team also developed more detailed adaptive learning tools for coastal organisations to use. These tools have been designed to be either completed online or downloaded as pdfs (Section 4.0) to help facilitate collaborative approaches to learning within coastal organisations.

## 2.0 The adaptive learning toolkit

A version of the adaptive learning toolkit is currently accessible online via the Curtin University website. Appendix 1 shows the structure and some of the content of the toolkit. The toolkit provides content on both the theory of adaptive learning (e.g. 100 annotations of key references are included – 1-page each) and examples of practice. For example, the toolkit incorporates 15 case studies at the local, national and international levels on coastal management drawing on principles and practices of adaptive learning. The case studies provide coastal organisations with examples of adaptive learning across various contexts (e.g. various scales and issues). Primary case studies from Sunshine Coast Council, Coolum Coastcare, the CSIRO, and Healthy Waterways are also completed and included. This has involved conducting and analysing interviews before preparing summary reports, checked by participants, and condensed into 2-page downloadable PDFs to be made available from the toolkit website. The toolkit also has content on how to become an adaptive learning organisation and includes learning tools and examples of what an adaptive learning organisation would look like and do.

Several coastal organisations (from 3 states) have contacted the adaptive learning team for more information on the toolkit. Once the toolkit migrates to a new host website, we will publicise it through various networks, and promote it in various forums and conferences.

When the toolkit migrates to the new website it will also be fully integrated with the more detailed monitoring and evaluation tools discussed in sections 3.0 and 4.0.

## 3.0 Benchmarking adaptive learning (monitoring and evaluation) in the coastal zone

### 3.1 The adaptive learning survey

Note: A detailed report on benchmarking adaptive learning in coastal organisations is included in Appendix 2.

A purpose-specific on-line survey (<http://www.coastaleval.com.au/benchmarking>) was developed to establish the status of monitoring and evaluation (M&E) for coastal zone management. This was to enable annual assessment of M&E activity and thus provide insight to change in M&E activity over time. The survey sought information on the number of M&E programs, their focus and use, the type of data collected, the usefulness of monitoring data and attitudes to M&E. The management process cycle underpinned questions relating to use. The survey was piloted with staff of SEQ Catchments who identified a diversity of 'monitoring' programs for their operations, and that responses to survey questions varied depending on the specific program being considered. This prompted a change in the survey to assess the 'most useful' M&E program; as well as, an overview of all M&E programs of the organisation.

### 3.2 Survey results

The survey results revealed widespread recognition of the importance of M&E in coastal management and organisational activities. The major emphasis was on monitoring biophysical condition and on-ground outcomes from activities.

Based on the survey results the following benchmarks were established.

**Benchmark 1:** M&E is recognised by organisations as an essential part of the adaptive management process.

**Benchmark 2:** At least one formalised program of M&E exists in organisations for major programs of activity to inform future management action.

Preferred practice: The success of all activities is monitored and evaluated to inform future management action, with the level of monitoring being appropriate to the nature and importance of the activity to the achievement of organisational mission, goals and plans.

**Benchmark 3:** M&E programs focus on understanding the status of biophysical resources and outcomes from management action.

Preferred practice: Monitoring programs exist to assess the influence of socio-economic conditions, the clarity of objectives and plans, the adequacy of resourcing, the effectiveness of management systems, and activity outputs, in determining the status of biophysical resources and activity outcomes.

**Benchmark 4:** M&E is used to increase understanding of issues in the coastal zone, engage with local communities, modify decision-making, and for reporting internally and externally.

Preferred practice: M&E programs continue to be used for multiple purposes, but with increasing emphasis on formally testing assumptions upon which management decisions are made.

**Benchmark 5:** M&E programs are scheduled at regular intervals, according to the sensitivity of the parameter being assessed.

Preferred practice: M&E programs are a routine part of all management action, with programs in place to respond to unusual natural events or human perturbations to the coastal zone.

**Benchmark 6:** M&E programs use both quantitative and qualitative measures according to the degree of certainty needed for making a management decision.

**Benchmark 7:** Organisations always allow time for staff responsible for monitoring programs to evaluate the management effectiveness of activities.

Preferred practice: Organisations always allow time for staff responsible for monitoring programs to evaluate the management effectiveness of activities with colleagues and stakeholders.

**Benchmark 8:** Most M&E programs are designed to inform future management activity.

Preferred practice: All M&E programs are designed primarily to inform adaptation of all components of management activity, and secondarily for other uses.

**Benchmark 9:** M&E programs are sufficient to inform the most important activities of organisations.

Preferred practice: M&E programs exist for all organisational activities; the scale of the program being determined by the organisational mission, goals and plans.

## 4.0 Adaptive learning for coastal zone management

### 4.1 The adaptive learning on-line tool

The adaptive learning tool was converted to an on-line tool through a purpose-specific website (<http://www.coastaleval.com.au/framework>). For this tool, exhaustive lists of key points are problematic in formative evaluation, particularly where practice is diverse (Jacobson 2007) as occurs in the coastal zone. We therefore chose to focus on the most important (i.e. commonly identified) points, incorporated as 'elements' under each 'component' in our framework. For example, the summary component 'implementing learning' incorporates four elements: information, funding adequacy, staff time, and roles and responsibilities.

The use of assessment categories in association with checklists provides a means of incorporating best practice into evaluation in the form of judgements about management. For example, the summary component for implementing learning reads: *There are sufficient resources available for learning, and mechanisms (e.g. administrative structures, drivers) are in place to support it.* The assessment categories are: (1) *Mechanisms are in place to ensure learning occurs and resources are sufficient for the task;* (2) *Some mechanisms are in place to ensure learning occurs, although resources are sufficient for the task;* (3) *Some mechanisms*

*are in place to ensure learning occurs, but resources for the task are a constrained; and (4) There are few mechanisms in place to ensure learning occurs and resources are a constrained.* These assessment criteria include two parts (mechanisms and resources). In the criteria, mechanisms are privileged over resources (i.e. with constrained resources, the best possible assessment is 'constrained'), enabling greater 'expert' input into evaluation design.

We have created assessment criteria for summary components, but not for elements within them. Providing a scale instead of worked criteria will prompt groups using the framework to discuss what 'constrained' means for each element (e.g. sufficient funding). A secondary reason is the need to cater to the diversity of organisations within the coastal sector. Not all elements or all assessment criteria would be appropriate to the diversity of organisations likely to apply the framework. For example, the description of the element 'organisational structures *'Our organisation or group is structured and operates in ways that enable devolved decision-making and the ability to adapt actions on the basis of learning'* is unlikely to be relevant to Coastcare groups, and assessment criteria for large government organisations would be more likely to emphasise progress with administrative decentralisation; whereas an organisation such as and NRM body is more likely to emphasise devolution of decisions to community. There is additional space for participating organisations to add components to the framework as they see fit, enhancing its applicability to their context.

Lastly, the tool is designed to be used part of a group process. This could include a whole group (e.g. Coastcare), a section within an organisation (e.g. best practice group), or management teams. The reason for this is that the evaluation itself acts as a social learning tool, increasing reflection on practice, and providing opportunity for understanding of one another's perspectives. Used repeatedly, element assessment acts in place of a monitoring tool. Essentially, the framework is designed for learning about learning, enhancing the potential for transformation in management practice within organisations.

## **4.2 Piloting the 'adaptive learning through monitoring and evaluation' framework**

In September 2012, Carter and Jacobson met with staff from a coastal organisation to field test the adaptive learning on-line tool. The tool was designed to be part of a formative evaluation process to enhance learning in coastal organisations, helping teams to:

- understand learning processes,
- highlight successes and effective strategies,
- identify items that need more attention, and
- track progress towards becoming a learning organisation.

Details and justification of the framework design were covered in the 2012 report. In summary, the framework is based on nine components; four related to management capacity (learning, leadership, management and transitioning), and five to the components of the management cycle (vision, planning, strategies, reflection and networking). Each component includes formative assessment elements (graded on a scale of strongly agree, somewhat agree, disagree, strongly disagree, don't know or not applicable), plus summary assessment criteria. The tool and a guideline to its use are provided as part of the adaptive learning toolkit. The purpose of our exercise was to:

1. refine the framework itself (wording, structure, guidelines on its use); and
2. learn how the framework might help in facilitating adaptive learning within coastal organisations.

### 4.2.1 Tool refinements

No changes were made to the overall framework structure as a result of testing, although the following refinements were made.

- Wording of assessment components was changed to fit organisational language.
- Wording of assessment elements (within components) was simplified.
- One assessment element was removed given that it was thought to be implicitly captured in another item.
- The wording of summary assessment criteria was changed to ensure consistency in the style of criteria across components. These assessment criteria are double-jointed; a full score indicates both aspects are done well, a poor score indicates neither are done well, and we are able to privilege one aspect over the other in the relative scoring, enabling greater 'expert' input into evaluation design.
- Although summary assessment grading criteria for each component create an implicit set of standards for management, we removed the language associated with these (not constrained, somewhat constrained, constrained, very constrained) to avoid mis-placed perceptions of performance judgement.

### 4.2.2 What did we learn?

All participants commented on the value of the framework in promoting reflection on existing learning processes within their organisation. They discussed how elements should be interpreted, and why they felt they agreed (or did not agree) with each. They also commented that this discussion enabled them to more easily complete the summary assessment associated with each component. As a result, they were able to list a series of actions that would help improve learning processes in their organisation:

- the need to be clear whether learning is an explicit and structured process;
- the need to consider how to improve the use of existing information in management decision-making;
- the need to move towards a longer-term focus on learning;
- the need to consider non-biophysical constraints;
- the need for better integration between different functions within their organisation; and
- the need to promote the use of development funding within their organisation (especially as it was underspent in the last financial year).

During the assessment, some additional elements were added, for example, the desire for activities to have impact beyond the scope of the organisation was added to the component of visioning. This demonstrates that the framework could be useful in facilitating thinking about learning processes. Figure 1 provides an example of on-line tool completion.

## Dynamic system goals (visioning): What do we need to learn about and who needs to be involved?

Having a collective vision about what you hope to achieve as a learning organisation helps identify the areas where learning is needed and provides a basis for engagement with other stakeholders.

Assessment (complete as individuals or groups but discuss as a group)

		Strongly agree	Somewhat agree	Disagree	Strongly disagree	Don't know	N/A	Justification
Elements	<b>Focal points</b>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	There is consensus on targets and the balance of goals
	<b>Stakeholders</b>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	there has been a lot of effort on this
	<b>Involvement</b>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Although stakeholders have been contacted, they are not all engaged
	<b>Re-visioning</b>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Multiple lines of engagement facilitates this
	<b>Additional element(s)</b>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	this happens in waves

Summary	<b>Vision</b> A vision has been developed that identifies uncertainties so that appropriate engagement can occur. <i>This field is required.</i>	<b>Improvement actions</b> There is a vision for learning, although its is not obvious whether it implies structured or unstructured learning. This should be clarified.
	<b>Grading</b> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> A shared vision exists and appropriate engagement has been initiated.</li> <li><input type="radio"/> A vision exists and some appropriate engagement has been initiated.</li> <li><input type="radio"/> A vision exists although there has been minimal engagement.</li> <li><input type="radio"/> There is no clear or shared vision for learning within our organisation.</li> </ul>	

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**Figure 1: Example of a completed on-line component**

Ideally, we would re-visit organisations who had previously conducted the assessment to see whether there had been any improvements in learning. However, experience in other sectors (e.g. conservation) and in review of case studies in the adaptive learning toolkit has taught us that the shift from a responsive approach to management towards a learning organisation with an adaptive process embedded is not so simple, and requires the support of senior organisational leaders, change agents who drive the new focus, and willing participants. Thus, the framework ought not to be seen as a solution to a lack of adaptive learning, but one component in a program of organisational change.

Our field-testing also raised some cautions in the use of the framework as part of a benchmarking process. Organisational participants said they agreed with each of the elements in the *adaptive organisational goals* component. *However, they graded themselves on the second to lowest score for the summary assessment.* Thus, while the summary assessment can provide a benchmark, the elements need to be interpreted within a context that provides meaning to the formative scale used in assessment.

## 5.0 PhD research

### 5.1 Overview

Six PhD candidates have been supported wholly or in part by Coastal Collaboration funding. Topics of research address coastal planning, adaptive learning, indigenous learning, response to dolphin feeding, and risk perception. The work has generated 8 conference presentations and 1 book chapter.

CSIRO researchers co-supervise two of the PhD students. Dr Rosemary Hill is a co-supervisor of Lavenie Tawake and Dr Russ Babcock is a co-supervisor of Latif Siddique.

### 5.2 PhD topics

- Topic 1. Towards sustainable coastal governance: an improved framework for planning
- Topic 2. Co-learning in Marine Protected Area (MPA) management
- Topic 3. Socio-Economic and Dolphin Behavioural Impacts from Provisioning Indo-Pacific humpback dolphins (*Sousa chinensis*) in Tin Can Bay, South East Queensland
- Topic 4. Social adaptation: the influence of perceptions of risk and adaptive capacity within a high risk community
- Topic 5. Climate change vulnerability and the Queensland Affordable Housing Programme (QAHP) in South East Queensland (SEQ), a legal theme.
- Topic 6. Indigenous Approaches to Learning for/from Sea Country with the Apudthama people of the Northern Peninsula Area.

## 5.2.1 Topic 1. Towards sustainable coastal governance: an improved framework for planning

PhD candidate

Sabiha Zafrin

Supervisors

A/Prof. Johanna Rosier and Dr Claudia Baldwin

### Objectives

1. To examine Queensland's coastal governance system and evaluate its performance from a planning perspective.
2. To identify and understand the complex processes of coastal governance using three regional councils of South East Queensland (SEQ) as case-studies.
3. To demonstrate the strengths and weaknesses of available coastal planning instruments and identify possible areas to be modified to achieve best practice.

### Target outcomes

- To suggest a planning framework that would maintain a focus on long-term strategies to manage the coast effectively and ensure communities are inspired and encouraged to develop coastal management plans that include consideration of best available science to underpin policies related to coastal areas.

### Status

Commencement date: July 2010

Confirmation date: 16 August 2011

Expected completion date: Early 2014

### Preliminary findings

Using three regional councils of South East Queensland (SEQ) as case-studies, this PhD study examines the transition in Queensland's coastal governance system, and evaluates its performance against a set of internationally derived Integrated Coastal Zone Management (ICZM) governance indicators. The results reveal the strengths and weaknesses of available planning instruments and identify possible areas to be modified to achieve best practice. The overall research focuses on the integration between State and SEQ councils and is based on analysis of existing State, regional and local policy documents to find the major strengths and weaknesses of plans and policies to achieve good governance in coastal areas.

Key actors involved in the decision-making process were interviewed to record their views, contributions and responsibilities in SEQ's coastal planning. I had also the opportunity to work at Sunshine Coast Regional Council, Queensland, Australia for one month, to gain an understanding how coastal planning decisions are applied; assisting with a range of coastal planning related tasks including researching coastal policy and reviewing and commenting on storm tide mapping, climate change adaptation research papers and state government policy reviews.

Queensland's coastal planning system has been reviewed, at the State level, several times since it was originally announced due to conflict between key stakeholders, political change and different attitudes about planning considerations for climate change. This study examines these complex processes to provide insight to how Queensland's coastal planning could be better equipped to achieve best practices for sustainable coastal governance.

In the beginning of a new political era, Queensland's coastal planning is going through a series of changes. In 2011, the draft Queensland Coastal Plan (QCP) was released for public comment. The preliminary version of the QCP received extensive comments from local government and the development sector before it came into effect on 3 February 2012. This plan mandated climate change and sea level rise as matters requiring consideration in planning for the first time in Australia. Since the change in the government in April 2012, the QCP and related legislation has been reviewed and changed significantly, reflecting the new government's political views and election promises to reduce 'red' and 'green tape'. Feedback from some of the stakeholders interviewed indicates that the new draft provisions appear to reflect economic development rather than sustainable planning provisions.

The Draft Coastal Protection State Planning Regulatory Provision (the Draft SPRP) took effect on 8 October 2012 and suspends the operation of the State Planning Policy 3/11: Coastal Protection (Coastal SPP). It created discord between state and local government planning objectives and reduced the importance of State planning policies to simple guidelines that do not necessarily need to be considered by Councils in preparing planning schemes. In interviews about coastal planning in Queensland, local government participants and community organisations emphasised their frustrations about working in a system that does not prioritise the concepts of sustainable development or climate change considerations. The document analysis of State and regional planning instruments highlights the policy vacuum being created in Queensland's coastal planning system through implementation of the new government policies.

#### Conferences attended

Coast to Coast conference, Adelaide, 20-24 September 2010.

Queensland Coastal Conference, Cairns, Australia, 19-21 October 2011

Coast to Coast Conference, Brisbane, Australia, 17-22 September 2012.

#### Conference presentations

**Zafrin, S.**, J. Rosier & C. Baldwin 2012, Queensland's coastal planning regime: challenges, strengths and weaknesses, oral presentation in the '*Coast to Coast Conference*', Brisbane, Australia, 17-22 September 2012.

**Zafrin, S.** & J. Rosier 2011, Queensland's coastal management: indicators to measure coastal governance outcomes, oral presentation in the '*Queensland Coastal Conference 2011*', Cairns, Australia, 19-21 October 2011.

## 5.2.2 Topic 2 Co-learning in Marine Protected Area (MPA) management

### PhD candidate

Mohammad Abdul (Latif) Siddique

### Supervisors

A/Prof. RW (Bill) Carter, Prof. Tim Smith, Dr Claudia Baldwin and Dr Russ Babcock

### Objectives

1. To explore whether co-learning forms part of MPA management.
2. To investigate what knowledge/learning is being used in planning, implementing, monitoring and evaluating the management instruments and informing on-site actions.
3. To identify the barriers to co-learning.
4. To develop participatory mechanism to remove these barriers.
5. To identify co-learning indicators to measure learning performance in MPA management.

### Target outcomes

- The research will identify the learning strengths and weaknesses of the various stakeholder groups in MPAs and approaches for updating applying this to management.
- Understanding the knowledge base for decisions and the process of co-learning will assist ocean system managers with the flexibility needed to learn over time and inform marine management beyond protected area boundaries.
- The developed co-learning framework and indicators will serve as a model for other areas and for future evaluations of learning in managed marine systems.

### Status

Commencement date: July 2010

Confirmation date: August 2011

Expected completion date: July 2013

### Preliminary findings

A finding from interviews is that 'learning' is not an easy understandable term among the stakeholders including those in government agencies. They equate learning with information dissemination and sharing. This might indicate less practice of learning within and beyond the organization. In terms of information, the data shows the difficulties of accessing both scientific and local information. Local information and knowledge are not acknowledged or used by management authorities in decision-making for for management of the Moreton Bay Marine Park. One of the commercial fishermen states that,

*"I could get four guys that have got 200 years' experience in this room tomorrow and you could ask them any question you want about Moreton Bay from the last 50 years, and even before that because their dad and their dad was fishing and they can answer it. We've got incredible knowledge that way but no one asks us."*

Similarly, Moreton Bay Access Alliance, the designated stakeholders (users) working group for the Moreton Bay Marine Park zoning plan 2008, said in relation to the MPA authority's arguments for denying their recommendations;

*"One of their arguments was, oh but we don't have access to scientific journals".*

Lack of real time catch data fuels mistrust between stakeholders. A recreational fishing group representative said,

*"The problem of getting access to information in a timely manner. We always keep saying to Fisheries, what you need is real-time data. You don't need data that's been two years old in that process. That was the problem with the snapper. They were using modelling information that came from 2005".*

The data suggests that interagency cooperation and personal relationships would improve access to information. A conservation council representative identified that,

*"I have access to databases through Queensland University; access to papers, access to my notes, access to Seagrass-Watch data, either through Seagrass-Watch head office, who publish heaps of scientific papers, on connections with Healthy Waterways and scientists there. I have very good connections with some Queensland leading scientists."*

#### Conferences attended

- Coast to Coast 2012 at Brisbane Convention and Exhibition Centre, 17-21 September 2012.
- Queensland Coastal Conference 2011 at Cairns, Queensland, 19-21 October 2011.
- 2<sup>nd</sup> International symposium on Integrated Coastal Zone Management, Arendal, Norway, 3-7 July 2011.

#### Conference presentations

**Siddique, M. A. L,** C. Baldwin & R.W. Carter, 2013, "Co-, cooperative and collaborative learning: semantic differences or relevant to natural resource management", accepted for oral presentation at the 2013 Annual Conference on Management and Social Sciences, Bangkok, Thailand on 16-18 April, 2013.

**Siddique, M. A. L,** S. Myers, T. Smith & R.W. Carter, 2011, Co-learning and stakeholders' participation in marine protected area management, oral presentation at the *Queensland Coastal Conference 2011*, Cairns, Queensland, Australia on 19-21 October 2011.

**Siddique, M. A. L,** S. Zafrin, S. Myers, T. Smith, R. Babcock & R.W. Carter, 2011, Co-learning in marine protected area for integrated coastal zone management. Poster presentation in the *2<sup>nd</sup> International Symposium on Integrated Coastal Zone Management*, Arendal, Norway, 3-7 July 2011.

#### Publications

**Siddique, M. A. L,** S. Zafrin, S. Myers, T. Smith, R. Babcock & R.W. Carter, 2013. Co-learning in marine protected area for integrated coastal zone management, in: Moksness, E., Dahl, E. & Støttrup, J. (Eds.) *Global Challenges in Integrated Coastal Zone Management*. Wiley-Blackwell Ltd. ISBN 13: 9780470657560.

### 5.2.3 Topic 3. Socio-Economic and Dolphin Behavioural Impacts from Provisioning Indo-Pacific humpback dolphins (*Sousa chinensis*) in Tin Can Bay, South East Queensland

#### PhD candidate

Ximena Arango

#### Supervisors

A/Prof. R.W (Bill) Carter, Dr Gayle Mayes, Dr Stephen Myers

#### Objectives

1. To determine perspectives, satisfaction and perception of dolphins and their environment resulting from participation in the dolphin provisioning activity at Tin Can Bay and changes in comparison with a decade earlier.
2. To determine the social, economic and cultural impacts of the *S. chinensis* provisioning activity at Tin Can Bay in the Great Sandy Biosphere, South-East Queensland.
3. To determine the effects of provisioning activity on dolphins associated with the provisioning program (identified through monitoring movement patterns and behaviour in comparison to their social grouping or associated pod).
4. To establish background biophysical conditions in the dolphin provisioning area and surroundings.

#### Target outcomes

- Improved understanding of human and dolphin interactions, and subsequent impacts on human behaviour.
- Improved understanding of theories informing human and dolphin encounters.
- Improved insight to the socio-economic benefits of provisioning (feeding) threatened dolphins in the wild.
- Improved understanding of local residents' perception of dolphin-based provisioning tourism. This is an important step in developing effective conservation strategies for *S. chinensis* of the Tin Can Bay Inlet. Such knowledge can be used to target environmental education programs.
- Improved understanding of the extent to which the natural behaviour of the provisioned *S. chinensis* is affected by the provisioning (compared with their social grouping).

#### Status

Commencement date: 1 September 2010

Confirmation date: October 2012

Expected completion date: 1 September 2014

#### Preliminary findings

Variables such as overall satisfaction, and satisfaction of visitors with the most aspects of the dolphin provisioning activity in Tin Can Bay in 2011 were not related to improvements in interpretation and education messages and operational procedures.

Improvement in presentation of interpretation and education messages, with more structured operational procedures, may result in increased changes in visitors' pro-environmental attitudes, behaviours and actions in Tin Can Bay.

#### Conferences attended

The 3<sup>rd</sup> National Wildlife Tourism Workshop at Currumbin Wildlife Sanctuary, Gold Coast, Australia, 16-18 May 2012.

#### Conference presentations

**Arango, X.**, G. Mayes and R.W Carter. 2012. *Impacts of dolphin provisioning (feeding) on visitors' intended pro-environmental attitudes, behaviours and actions in Tin Can Bay, South East Queensland*, poster presentation in the '3<sup>rd</sup> National Wildlife Tourism Workshop at Currumbin Wildlife Sanctuary', Gold Coast, Australia, 16-18 May 2012.

## 5.2.4 Topic 4. Social adaptation: the influence of perceptions of risk and adaptive capacity within a high risk community

PhD candidate

Amanda Tunbridge

Supervisors

Dr Claudia Baldwin and A/Prof. Christian Jones

Objectives

1. To establish if a community risk assessment within a participatory and visual forum, engages and modifies adaptation responses made by individuals in reaction to a social construction of risk.
2. To determine if stakeholders (such as local government) of a community (of place), involved in the social construction of risk to climate change impacts, engages and motivates opportunities for change in local policy and planning.

Target outcomes

- Identify residents' perceptions of risks to present and potential climate change impacts within a canal estate on the Sunshine Coast.
- Identify current methods of risk communication to stakeholders of canal estates.
- To understand linkages between risk perception and the communication of risk for climate change adaptation.
- Determine if the use of participatory and visual methods for the social construction of risk can contribute to the adaptive capacity of individuals.
- Establish attainable adaptation options for the community (of place) and provide information on community risk perceptions to other stakeholders (such as local government) for policy and planning purposes.

Status

Commencement date: 02 July 2012

Confirmation date: 03 July 2013

Expected completion date: 03 September 2015

Preliminary abstract

Climate change adaptation research has primarily been concerned with biophysical impacts focusing on assessing system vulnerability to climate change and adaptation options such as: avoid; retreat; accommodate; or protect and defend strategies for the built environment. Although these options can be assessed through economic cost-benefit analysis and through technological, financial, social and institutional constraints, the cognitive constraints of these options are largely under-researched (Grothmann and Patt 2005).

Uncertainties relating to the scale and scope of impacts and a lack of prior experience associated with projected changes in climate may contribute to psychological distress (Reser et al. 2012). The perception of risk and the perceived adaptive capacity of an individual, incorporated within a social construction of risk, can influence behavioural responses and provide a powerful motivator to respond (Harvett et al 2011, Slovic and Weber 2002).

This research will use an innovative visualisation technology (GroupMap) in a participatory group setting within a canal estate community, to document residents' perceptions of risk to climate change including their perceived adaptive capacities. Other stakeholders of canal

estates will be investigated to determine responsibilities and communication methods. The aim is to progress understanding of perceptions and communication of risk in relation to climate change adaptation, through the development of a social construction of risk and development of attainable adaptation options for the community.

### References

Grothmann, T. and Patt, A. (2005) Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change* 15, pp. 199-213.

Harvett, J., Petts, J. and Chilvers, J. (2011) Understanding householder responses to natural hazards: flooding and sea-level rise comparisons. *Journal of Risk Research* 14:1, pp. 63-83.

Reser, J.P., Bradley, G.L., Glendon, A., Ellul, M.C. and Callaghan, R. (2012) *Public Risk Perceptions, Understandings, and Responses to Climate Change and Natural Disasters in Australia and Great Britain- Final Report*, National Climate Change Adaptation Research Facility, Gold Coast, 297pp.

Slovic, P. and Weber, E.U. (2002) Perception of risk posed by extreme events. 'Risk Management Strategies in an Uncertain World' Conference, New York, April 12-13, 2002.

### Conferences attended

**Visualization Technologies Workshop:** Visualization Technologies to Support Research on Human - Environment Interactions, Annapolis, Maryland, United States 23-24 July 2012.

**Coast to Coast Conference:** Living on the Edge, Brisbane, Australia, 17-22 September 2012.

**Encountering climate change** - is seeing believing?, NCCARF/Griffith Climate Change Seminar, Griffith University, Nathan Campus, Brisbane, 31 January 2013.

**Early Career Researchers Ninth National Forum & Workshop**, Australian Climate Change Adaptation Research Network for Settlements and Infrastructure, Sydney, NSW, 11-13 March 2013.

### Conference presentations

**Tunbridge, A.** and Baldwin, C. 2012, *Visualising Local Climate Change Impacts and Opportunities for Change*, conference poster at the 'Visualization Technologies Workshop', National Socio-Environmental Synthesis Centre, Annapolis, Maryland, United States 23-24 July 2012.

**Tunbridge, A.** and Baldwin, C. 2012, Visualising local climate change impacts and opportunities for change, conference poster at the 'Coast to Coast Conference', Brisbane, Australia, 17-22 September 2012.

**Tunbridge, A.** and Baldwin, C. (2013) Social Adaptation: The influence of perceptions of risk and adaptive capacity within a high risk community. Presentation at the 'Early Career Researchers Ninth National Forum & Workshop', Australian Climate Change Adaptation Research Network for Settlements and Infrastructure, Sydney, 11-13 March 2013.

## 5.2.5 Topic 5. Climate change vulnerability and the Queensland Affordable Housing Programme (QAHP) in South East Queensland (SEQ), a legal theme.

### PhD candidate

Andrew Venning

### Supervisors

Professor Tim Smith; Dr Melissa Nursey-Bray; Mr Andrew Young and A/Prof Neil Powell.

### Objectives

1. To identify characteristics of the Queensland Affordable Housing Programme (QAHP).
2. To identify key concepts and terms in the realm of climate change adaptation.
3. To identify projected climate change impacts and climate change vulnerability for SEQ.
4. To identify and assess implications of legal instruments that are possible burdens or benefits, and hinder, constrain, support and enhance the desired outcomes of the QAHP in SEQ, in light of climate change vulnerabilities.
5. To identify and describe modifications to the provisions of legal instruments required to improve the efficacy of the QAHP in SEQ, in light of climate change vulnerability.

### Target outcomes

- Improved understanding and formulation of a IPPC vulnerability framework in the SEQ context.
- Application of the QAHP five capitals framework.
- Reduced constraints on QAHP achievements.
- Model legislative changes substantial/procedural for improved efficacy of QAHP.
- A framework for a Law of Adaptation for the Queensland jurisdiction.
- Establishment that Law of Adaptation is legitimate jurisprudence.

### Status

Commencement date: 20 December 2011

Confirmation date: to be announced

Expected completion date: 20 December 2014.

### Preliminary findings

Interpretive paradigm immersed in multiple realities and informed by constructionism (indissolubility) of subjectivism and objectivism (Crotty,1998).

Methodology is discourse analysis theory (Crotty,1998).

### Conferences attended

SRC reviews in November 2011 and November 2012.

### Conference presentations

Presented in SRC review in November, 2012.

## 5.2.6 Topic 6. Indigenous Approaches to Learning for/from Sea Country with the Apudthama people of the Northern Peninsula Area.

### PhD candidate

Lavenie Tawake

### Supervisors

Dr Dana Thomsen, A/Prof. R.W. (Bill) Carter, Dr Rosemary Hill

### Objectives

The research is focused on understanding the ways Indigenous people learn for their Sea Country that is;

1. How Indigenous Australians learn for/from Sea Country?
2. What influences Indigenous approaches to learning in the context of coastal management?
3. What learning mechanisms/techniques/styles used are by Indigenous Australians (Apudthama people of the Northern Peninsula Area) to learn for Sea Country?

### Target outcomes

- Documentation and awareness of Indigenous ways of learning for sea country that may be beneficial to traditional owners for maintaining their core ways of learning for Sea Country, as well as for stakeholders that collaborate with them on coastal and marine management.
- General descriptions of the influences and drivers of how Indigenous people learn for Sea Country. Results from this research have the potential to be used for policy from the perspectives of Indigenous Australians in terms of coastal management.
- A learning framework for co-management of coastal management projects with Indigenous communities in Australia.
- A dissertation (the primary outcome of this research) as well as co-authored peer reviewed publications on its findings. Potential pamphlets on Indigenous ways of learning for Sea Country in the Northern Peninsula area of the Cape York region will be possible with sufficient time and funding.

### Status

Commencement date: August 2010

Expected completion date: August 2013

### Preliminary findings

The research took a constructivist grounded theory approach with GERIS protocols to researching in Indigenous communities. The method of data collection consisted of in-depth interviews with a semi-structured approach. Guiding questions were asked to get focused information, yet allowing for flexibility.

Preliminary results of this study have found that some Indigenous ways of learning for sea country include demonstrating, observing, imitating, memorizing, learning in steps, repeating and practicing different fishing, hunting and survival skills at sea beginning from a young age and lasting an entire lifetime. It also involves acquiring moral traits such as of patience, respect and humility not only at sea but also in their community. Indigenous approaches to learning for sea country can be interpreted from some of the following responses to the in-depth interviews;

*...I just live, they watch em me...*

*...It is a lifestyle...*

*...I teach them the tides first because the tides don't wait for anyone...*

*...Well we used to sit down and watch them make their own and then we try it as we got older...*

*...when I was only 5 years old... I just hang on his back and his shoulders in the water and he show me, how to spear the Cray fish...*

Some Indigenous approaches to learning can be assimilated to different concepts of learning found in NRM literature such as experiential and social learning however some are unique to the Indigenous cultures. An example of this is the learning of sacred story places and the practice of rituals and beliefs that are associated with these places.

Results of the research have also shown different influences to learning. Some of the significant influences to learning in the Indigenous community studied include history of place, intercultural relationships, changing governance systems and cost of living.

#### Conferences attended

Coast to Coast conference, Adelaide, 20-24 September 2010.

Apudathama Cape Indigenous Sea Ranger Conference 29 June – 1 July 2011

Queensland Coastal Conference 2011 at Cairns, Queensland, 19-21 October 2011.

12<sup>th</sup> International Coral Reef Symposium, 9– 13 July 2012.

#### Conference presentations

**Tawake, L.**, D. Thomsen., R.W. Carter and R. Hill 2011, Indigenous Approaches to Learning for/from sea country, oral presentation in the 'Queensland Coastal Conference 2011', Cairns, Australia, 19-21 October 2011.

**Tawake, L.**, D. Thomsen., B. Carter and R. Hill 2011, Traditional owner learning mechanisms for Sea Country in the Northern Peninsula Area, Australia, abstract in the 'Coast to Coast Conference', Brisbane, Australia, 17-22 September 2012.

## Appendices

## Appendix 1: Online Adaptive Learning Toolkit

### Notes:

1. The current website will migrate to a new host in the next few months. Publisher files have been created for this migration, which include working links and a more user-friendly platform.
2. Due to the volume of content on the website not all of the online pages have been included in Appendix 1. For example, there are 100 annotations (1-page each) listed in the annotated bibliography currently online. For the purposes of the final report, one example of a 1-page annotation has been provided.

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### The Adaptive Learning Toolkit

Welcome to the Adaptive Learning Tool kit of the Coastal Collaboration Cluster. This site is designed to assist coastal organizations to become adaptive learning organizations. Use the tools and experiences captured on this site to improve your organisational processes and outcomes for coastal zone management.



#### What is adaptive learning?

Adaptive learning draws on organisational learning, sustainability learning and adaptive management to encourage responsive learning processes.

#### What are we learning for?

Adaptive learning seeks to produce adaptive behaviours with the ultimate goal of improved coastal socio-ecological systems.

#### What does an adaptive learning organization look like?

Adaptive learning organisations combine reflection with vision and are dynamic, flexible and defined by their focus on adaptive behaviours.

#### How do we become an adaptive learning organization?

Effective organisational structures and processes that connect individuals with broader organisational and societal goals are at the heart of adaptive learning.



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## What is Adaptive Learning

Adaptive learning draws on organisational learning, sustainability learning and adaptive management to institutionalise responsive learning processes for improved integrated coastal zone management (ICZM). As with most reflective learning practices, the processes of adaptive learning are cyclic and incremental with each stage providing the foundation for the next.



Figure 1 The adaptive learning cycle

The focus on ICZM outcomes requires that coastal practitioners and their organisations are intimately connected with the social and ecological dimensions of dynamic coastal systems - an adaptive learning approach needs to detect and respond to socio-ecological change cognisant of broader system goals. This requires knowledge, creativity, vision and the ability to link different scales of learning. Figure 1 illustrates the central role of adaptive learning in all stages of responsive practice, the creative role of networks and ideas generation in facilitating change, and the inspirational role of goal setting in focusing or guiding activities. Combined with an effective monitoring and evaluation strategy, this approach can facilitate tangible benefits for the coastal zone and those who live there.

In creating this page we were inspired by many authors. Some of our favourites are listed below

- Argyris, C., and D. Schön. 1974. *Theory in Practice*. Increasing professional effectiveness. San Francisco, CA: Jossey-Bass.
- Holling, C. S. (ed.) 1978. *Adaptive Environmental Assessment and Management*. Chichester: Wiley.
- Kolb, D. A. 1984. The process of experiential learning. In *Experiential learning: experience as the source of learning and development*. New Jersey: Prentice Hall.
- Schön, D. A. 1984. *The Reflective Practitioner: How professionals think in action*. New York: Basic Books.
- Senge, P. M. 2006. *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Currency Doubleday.
- Tábara, J. D., and C. Pahl-Wostl. 2007. Sustainability learning in natural resource use and management. *Ecology and Society* 12 (2):3. [online] URL: <http://www.ecologyandsociety.org/vol12/iss2/art3/>.





## What are we learning for?

The coastal zone is valued by many communities who rely on these diverse systems to meet fundamental needs and established ways of life. Located in the dynamic and transitional space between the marine and terrestrial ecosystems, the coastal zone is one of the most biologically productive ecosystems directly supporting the nutritional needs of many communities and indirectly supporting many others through contributions to marine and terrestrial ecosystems.

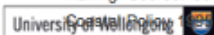
The coastal zone is also valued for aesthetic, recreational and spiritual amenities and attracts significant numbers of permanent residents and tourists. Globally, over 2.2 billion people live within 100km of the coastline<sup>1</sup>. In Australia, Approximately 90% of the population lives within 100km of the coastline<sup>1</sup> and coastal tourism was worth \$20 billion (2000-4)<sup>2</sup>.

The pressures of climate change (e.g. sea level rise and storm surge) and development in the coastal zone will significantly impact coastal communities and all those that benefit from coastal services.



### **i** Australia's Coastal Policy on Coastal Zone Management includes the following goals:

- Sustainable resource use ensuring that coastal resources are available in the long-term for fair and equitable use.
- Public participation so that multiples interests are included in planning and management decisions.
- Knowledge and understanding of coastal ecosystems, processes and human impacts underpin decision-making. Source: Commonwealth

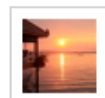


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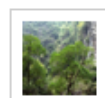
## What does an adaptive learning organization look like?

An adaptive learning organisation demonstrates learning across organisational goals, structures, processes and core behaviours. Use the following descriptive checklist to review features that may characterise a learning organisation.



### It would be

- Goal orientated
- Self organising at different levels
- Transparent
- Reflective and anticipatory
- Action orientated



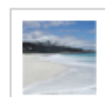
### It would have

- An orientation to learning
- Devolved management structures
- Nested goals across scales
- Monitoring and evaluation at required scales
- Societal validation of outcomes



### It would do

- Communicate effectively
- Eliminate information silos
- Utilise diverse knowledge
- Accept uncertainty and some loss of control
- Critically assess outcomes



### It would achieve

- Progress beyond reporting and auditing
- Mandate, capacity and influence
- Trust, openness and respect
- Flexibility, innovation and resilience
- A 'learning culture'

## • Governance

## • Socio-cultural Context

## • Knowledge Systems

### Adaptive Learning

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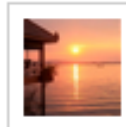
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## Becoming an adaptive learning organisation



### It would be

- Goal orientated
  - Self organising at different levels
  - Transparent
  - Reflective and anticipatory
  - Action orientated
- Goal setting can occur across all organisational levels and is necessary to establish purpose. This purpose should be clearly understood and broadly supported. For example: a goal for a community organisation might be 'to sustain dunal vegetation in the local area through restoration, management and educational networks.
  - While an overarching goal is necessary, being too prescriptive about how that goal is achieved will restrict the range of responses and creativity needed in dynamic coastal environments. One way flexibility and self-organisation can be encouraged is through structures and processes that facilitate experimentation and learning across the organisation.
  - Transparency is fundamental to promoting trust. Regular reflection can ensure that all actions are consistent with system and organisational goals and values. Reflective and anticipatory capacity will help an organisation to move beyond reactive responses, to proactive and transformative responses. It promotes questions regarding expectations, successes, failures and new strategies. This process should not be confused with a focus on increased efficiency. Instead, the focus should consider how to increase options, challenge entrenched beliefs and facilitate resilience within complex systems.
  - The adaptive learning process is fundamentally related to action and experience, and is most effectively achieved when directly linked to policy and practice. In this way, decision-making becomes an experimental process rather than a rigid set of rules. In dynamic and uncertain coastal contexts, the need to act with imperfect knowledge is best achieved when organisations gain internal and broader community support for actions.

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## Becoming an adaptive learning organisation



### It would have

- An orientation to learning
  - Devolved management structures
  - Nested goals across scales
  - Monitoring and evaluation at required scales
  - Societal validation of outcomes
- System and organisational goals provide the focus for learning. However, it is the underpinning organisational structures and processes that determine opportunities for learning and its role in decision making.
  - Hierarchical, command-and-control organisational structures are not conducive to effective adaptive learning within dynamic and complex systems. Devolved management structures based on trust, openness, cooperation and respect can enhance self-organising processes.
  - Short, medium and long term strategies provide a 'map' for learning. Flexibility, particularly in medium and long term strategies, allows for modification based on reflexive practice and new insights. Cycles of learning should be linked to other regular planning processes such as budget cycles.
  - The role of an adaptive learning organisation is to develop capacity to access or generate a range of information and associated responses to achieve system goals in a sustainable way. Monitoring and evaluation is vital to assess and demonstrate the links between goals, actions and outcomes across a diversity of scales.
  - Adaptive organisations form part of broader networks where they influence and are influenced through their decisions and activities by broader systems. Societal validation, underpinned by participatory processes that consciously and creatively addresses power imbalances and the need for meaningful engagement, is essential.

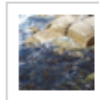


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## Becoming an adaptive learning organisation



### It would do

- Communicate effectively
- Eliminate information silos
- Utilise diverse knowledge
- Accept uncertainty and some loss of control
- Critically assess outcomes

*“ Learning from successes is important, however it is equally important to create a 'safe to fail' environment where less successful outcomes are used as learning instruments.”*

- Adaptive learning is a communicative process that identifies and opens pathways of communication across all organisational levels (and beyond) to share knowledge. Success and failure provide learning opportunities.
- Effective communication pathways avoid knowledge 'silos' and facilitate interdisciplinary or transdisciplinary approaches to knowledge generation to ensure that new understandings are conveyed broadly and inform future action.
- Adaptive systems utilise diverse forms of knowledge (e.g. local, indigenous, scientific). An accessible and up-to-date knowledge management system that accommodates a range of data sources and is supported by routine processes for system renewal can facilitate faster response times and increased adaptation-especially if linked to monitoring and evaluation systems.
- Uncertainty is challenging for organisational managers responsible in dynamic and complex coastal contexts. Nonetheless, command and control systems have been shown to be ineffective, and even harmful, in these contexts. Sharing responsibility for decision-making actions and outcomes can help release some of this perceived need for control.
- Learning outcomes should be assessed against system and organisational goals. Adaptive organisations are prepared to change broader goals if feedback indicates that these are no longer appropriate.

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## Becoming an adaptive learning organisation



### It would achieve

- Progress beyond reporting and auditing
- Mandate, capacity and influence
- Trust, openness and respect
- Flexibility, innovation and resilience
- A 'learning culture'

*“Adaptation is the cornerstone of an adaptive learning organisation”*

- Adaptive learning should lead to adaptive behaviour if effective pathways for transforming knowledge into mechanisms of change are developed. This can also be achieved through experiential (learning by doing) approaches.
- Without the mandate to effect the necessary changes emerging from lessons learnt, organisations will be frustrated in their attempts to generate change. Adaptive learning organisations can often achieve outcomes beyond their organisational ambit through networking or collaborative approaches with other organisations.
- Trust is critical in any learning environment. In complex coastal systems where boundaries are not always clear and responsibilities overlapping, trust often needs to be built between organisations through a culture of openness and respect to achieve system outcomes. Clarity in organisational goals, values and capacity is an important first step in establishing effective relationships.
- An adaptive learning organisation should begin to demonstrate increased capabilities and capacities when confronted with surprise events and situations of rapid change. These capacities are generated by a commitment to increased flexibility, diversity in options, and openness to novel approaches to problem definition and potential solutions. This is an active and ongoing process throughout all levels of the organisation.
- Establishing an adaptive learning culture should generate a sustainability perspective underpinned by continuous cycles of learning and adaptation.



## Becoming an Adaptive Learning Organisation: Monitoring and Evaluation Framework

Use the following monitoring and evaluation tool as part of a formative evaluation process to enhance learning within your organisation. This tool will help you and your team to:

- Understand learning processes;
- Highlight successes and effective strategies;
- Identify items that need more attention; and
- Track your progress towards becoming a learning organisation.

This tool is not about assessing management performance. It is about evaluating learning processes within your organisation. If you do not have formal processes of monitoring and evaluation, the tool will assist you in developing targeted monitoring and evaluation programs.

The tool includes nine components. The first five involve the tasks associated with organisational learning (dynamic system goals, adaptive organisational goals, adaptive strategies and activities, reflection on goals and strategies, networking and ideas generation).

The remaining four (learning ethos, leadership, management systems and transitioning) address capacities for organisational learning and should be considered at each stage in the organisational learning cycle.

The tool provides a preliminary foundation to build organisational learning capacity. It is neither prescriptive nor exhaustive. As with all tools, its use

will depend on user capacity, intentions and context. Adjust accordingly!



**Figure 1** Monitoring and evaluation framework for becoming an adaptive learning organisation (organisational focus)

### Guidelines for use

#### Who should complete it?

The tool is relevant for all groups and teams interested in learning. It is best undertaken in small groups (3-7 participants) and you may wish to consider having different participants focus on different sections to ensure relevance and/or timely completion (e.g. leadership, management systems etc.).

## How should it be used?

1. Begin with the organisational learning tasks and work through each component of the cycle from *dynamic system goals* through to *networking and ideas generation*. Once you have completed the cycle, consider your organisational capacity constraints and opportunities (learning ethos, leadership, management systems, transitioning). Decide as a group if all of the elements are relevant or if some should be deleted and others added.
2. Assess your performance for each task and capacity consideration using the templates provided on the following pages (see Figure 1 for a summary of the templates). Discuss as a group if you agree or disagree with each statement. Are there differences in opinion? We have included space for you to make note of your justification.
3. The summary component has its own grading scale. How would your organisation rate against these criteria?
4. Review your assessment. What are your organisational strengths and weaknesses? Could low scoring components be improved? Make a note of the possible changes that could be made, and who will be responsible. If you have answered 'don't know' at any stage, consider whether others need to be involved in the evaluation. If you have not marked any components poorly, question if your assessment is realistic.
5. Decide when to repeat this evaluation to check on your organisation's progress. If the evaluation framework is used more than once, an index can be developed to monitor learning rather than simply evaluating it.

The templates are included on the following pages.



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# Dynamic system goals (visioning): What do we need to learn about and who needs to be involved?

Having a collective vision about what you hope to achieve as a learning organisation helps identify the areas where learning is needed and provides a basis for engagement with other stakeholders.

Learn about and who needs to be involved?			Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
Having a collective vision about what you hope to achieve as a learning organisation helps identify the areas where learning is needed and provides a basis for engagement with other stakeholders.									
Elements	Focal points <sup>1</sup>	We have a shared understanding of the purpose and desired outcomes of learning.							
	Stakeholders <sup>2</sup>	We have identified the stakeholders important to each of our system goals.							
	Involvement	We have approached relevant stakeholders and they are ready to engage in learning.							
	Re-visioning	We have adopted a flexible approach to identifying what we want to achieve that allows adjustment over time.							
	Additional element(s)								

Summary

Vision

A vision has been developed from which areas for learning are identified and appropriate engagement can occur

Grading

**Not constrained** A shared vision exists with clearly identified areas for learning. Appropriate engagement has been initiated.

**Somewhat constrained** A vision exists but areas for learning are not clearly identified. Some appropriate engagement has been initiated.

**Constrained** A vision exists but areas for learning are not clearly identified. There has been minimal engagement.

**Very constrained** There is no clear or shared vision for learning within our organisation.

Improvement actions:

<sup>1</sup> These include the things your organisation would like to learn about. They could be for individual work areas (e.g. HR, regulation compliance), for different management levels (e.g. policy development, operational planning), or for whole of organisational issues (e.g. sustainability systems).

<sup>2</sup> Individuals or groups within or outside of your group/organisation with interests in learning on the same topics as you but with different knowledge and skill sets.

Adaptive organisational goals (planning): Ensuring learning happens

Learning can occur spontaneously, but planned learning allows for systematic cycling through the adaptive learning process. This includes making desired outcomes explicit and designing objectives that enable them to be achieved.

happens

Learning can occur spontaneously, but planned learning allows for systematic cycling through the adaptive learning process. This includes making desired outcomes explicit and designing objectives that enable them to be achieved.

		Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
Elements	Outcomes and objectives	We have defined desired outcomes and objectives for each area where learning is needed.						
	Monitoring and evaluation	We have a programme for monitoring and evaluation in areas where learning is needed.						
	Participation	Relevant stakeholders for each area where learning is needed are actively engaged in our learning processes.						
	Capacity to intensify	We have capacity to intensify learning in each area of need in the advent of surprise events (e.g. floods), or in anticipation of emerging risks.						
	Additional element(s)	For example, consider the integration of learning with existing processes, continuity, coherence with organisational objectives etc.						

Summary

Adaptive organisational goals

In each area where learning is needed, plans exist that will enable systematic and responsive learning to deliver system goals.

Grading

Not constrained

Somewhat constrained

Constrained

Very constrained

Improvement actions:

Adaptive strategies and activities: Implementing learning

The practice of learning offers insights into learning capacity. Learning processes may be formal, informal, experiential (through experience), social (learned from others) or collaborative (learned with others).

Assessment (complete as individuals or groups but discuss as a group)

Elements			Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
	Information	We have identified the type (e.g. water quality) and source (e.g. local, customary, and scientific) of information needed.							
	Funding adequacy	We have sufficient funding to support a learning oriented approach to our activities (e.g. funding for monitoring and evaluation and the development of support systems).							
	Staff time	We have sufficient time to invest in learning processes.							
	Flexibility	Organisational structures and processes facilitate adaptive responses and variations to activities based on learning.							
	Additional element(s)								

Summary

Adaptive strategies and activities

There are sufficient time, resources and organisational support for learning and organisational structures and processes encourage adaptive responses to lessons learned.

Grading

Not constrained

Mechanisms are in place to ensure learning occurs. Resources are sufficient and changes to practice based on learning are encouraged.

Somewhat constrained

Some mechanisms are in place to ensure learning. Resources are sufficient and there is flexibility in the implementation of activities.

Constrained

Some mechanisms are in place to ensure learning, but resources and opportunities to change practices are limited.

Very constrained

There are few mechanisms to ensure learning, minimal resources for it and no opportunities to change or implement new practices.

Improvement actions:

# Reflection on goals and strategies: generating and capturing new insights

Reflection and adaptation offer opportunities for generating and capturing new insights.

Elements	Data generation and capture	We systematically generate and capture information on goals and strategies (e.g. through the development of indicators and monitoring and evaluation).							
	Reflection	We give adequate time (e.g. as part of monitoring and evaluation) to reflect on (i) achievements in relation to goals, (ii) strategies used to achieve goals, and (3) the legitimacy of goals and strategies.							
	Management adaptation	We use reflection to adapt our activities where appropriate.							
	Re-visioning	We use reflection as the basis to re-visit and, if necessary, revise our system goals.							
	Additional element(s)								

Summary

Reflection on goals and strategies

Reflective processes are used to evaluate organisational goals and strategies and prompt adjustment where necessary.

Grading

Not constrained

Sufficient information exists to inform monitoring and evaluation processes and lessons influence goals and strategies.

Somewhat constrained

Information is sometimes sufficient to inform monitoring and evaluation processes and lessons influence goals and strategies.

Constrained

Information is sometimes sufficient to inform monitoring and evaluation processes, but lessons rarely influence goals or strategies.

Very constrained

Insufficient information exists to inform monitoring and evaluation processes, but lessons rarely influence goals or strategies.

Improvement actions:

# Networking and ideas generation: How can we extend our learning beyond our organisation?

Strategic partnerships within and between organisations can facilitate the generation of novel ideas, identify shared goals and lead to the joint development of strategies and activities.

Assessment (complete as individuals or groups but discuss as a group)

		Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
Elements	Internal partnerships	We have identified and collaborate with all relevant parties within our organisation.						
	External partnerships	We have identified and collaborate with all relevant parties external to our organisation.						
	Knowledge	We have processes in place to access and share knowledge with relevant stakeholders.						
	Resources	We have processes in place to access and share resources that support joint goals and activities.						
	Additional element(s)							

Summary

Networking and ideas generation

Strategic partnerships have been developed to facilitate the sharing and generation of knowledge, resources and support to extend our organisational outcomes.

Grading

Not constrained

Strategic partnerships exist and support interaction that leads to the realisation of mutually beneficial outcomes.

Somewhat constrained

Strategic partnerships exist, but levels of support have not realised mutually beneficial outcomes.

Constrained

Some strategic partnerships exist, but levels of support have not realised mutually beneficial outcomes.

Very constrained

There are limited learning partnerships within or beyond our organisation.

Improvement actions:

Learning ethos: Are we ready to learn?

A focus on learning ensures that organisations are prepared to adapt and position themselves to view surprises and mistakes as valuable triggers for change.

Assessment (complete as individuals or groups but discuss as a group)

Elements			Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
	Organisational focus	Our activities are planned to achieve specific system goals on the basis of the best available knowledge and we have mandate to take them despite persistent uncertainty.							
	Organisational structure	Our organisation is structured and operates in ways that enable devolved decision-making and the ability to adapt actions on the basis of learning.							
	Partnerships	We have developed strategic internal and external partnerships that enable our organisation to achieve desired learning outcomes.							
	Individual attributes	Individuals (including leaders) involved in learning processes are open minded, reflective, listen to the views of others and are committed to learning.							
	Additional element(s)								

Summary

**Learning ethos**

The organisation is committed to learning and has the individual and organisational elements that enable it to respond to uncertainty.

Grading

**Not constrained** Organisational structures and individual practices are aligned and supportive of a learning approach in all circumstances.

**Somewhat constrained** Organisational structures and individual practices are mostly aligned and supportive of a learning approach in most circumstances.

**Constrained** Organisational structures and individual practices align in some areas but support for a learning approach is variable.

**Very constrained** Organisational structures and individual practices are seldom aligned and support for a learning approach is minimal.

Improvement actions:

Leadership: Setting an example

Assessment (complete as individuals or groups but discuss as a group)

Leadership is fundamental to ensuring support for a learning-based culture.

		Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
Elements	Supportive context	Leaders create a supportive context (e.g. a 'safe to fail' environment) for learning based on mutual respect, trust and openness to alternative views.						
	Facilitation	Formal (e.g. working groups) and informal (e.g. multi-sectoral social activities) support structures and incentives for learning are provided.						
	Resources	Leaders have allocated sufficient resources to support a learning oriented approach to actions.						
	Enabling structures	Leaders have implemented structures and processes to receive and act upon lessons learned throughout the organisation/group.						
	Additional element(s)							

Summary	<b>Leadership</b>				
	Leadership supports a learning organisation by ensuring adequate resourcing to foster an appropriate culture.				
Grading	<b>Not constrained</b> Leaders provide sufficient resources for learning and foster an appropriate learning culture within the organisation.				
	<b>Somewhat constrained</b> Leaders provide some resources for learning and foster an appropriate learning culture within the organisation.				
	<b>Constrained</b> Leaders provide some resources for learning and have done some things to foster an appropriate learning culture within the organisation.				
	<b>Very constrained</b> Leaders provide few resources for learning and have done little to foster an appropriate learning culture within the organisation.				

Improvement actions:

Management systems: Linking goals, strategies and tools

The development of appropriate management systems facilitates learning by building organisational capacity to support activities.

The development of appropriate management systems facilitates learning by building organisational capacity to support activities.			Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
Elements	Organisational function	Organisational goals, strategies and tools are aligned, underpinned by a unifying management framework and a culture of learning and advanced through monitoring and evaluation.							
	Organisational support	We have access to appropriate tools to support learning (e.g. guidelines for adaptive learning, monitoring and evaluation, and planning).							
	Knowledge and information systems	We have knowledge and information systems that facilitate efficient and up-to-date information access (internally and externally) relevant to our needs.							
	Organisational memory	We have access to information storage, retrieval and sharing systems so we can learn from our experiences.							
	Additional element(s)								

Summary

**Management systems**

The purpose of learning is clearly communicated to staff through a management framework linked to support tools and information systems.

Grading

**Not constrained** A management framework and relevant support tools and information systems exist. These can be applied to the variety of activities undertaken by the organisation.

**Somewhat constrained** A management framework and relevant support tools and information systems exist, but these are only applicable to some activities.

**Constrained** A management framework exists for some activities. Support tools and information systems are only applicable to some activities.

**Very constrained** No management framework exists. Support tools and information systems (if any) are ineffective.

Improvement actions:

Transitioning to learning: Developing new ways of thinking

Systematic and ongoing processes are necessary to ensure a sustained transition to a learning organisation.

Assessment (complete as individuals or groups but discuss as a group)

Elements			Strongly agree	Agree	Disagree	Strongly disagree	Don't know	N/A	Justification
	Introducing learning	We have identified that existing structures and/or practices need to change to achieve system and organisational goals.							
	Developing learning	We have revised structures and/or practices to facilitate learning and to achieve an organisational culture focussed on learning.							
	Supporting learning	Leaders and champions of our learning vision are active and resourced across all organisational levels to support learning.							
	Evaluating learning	Our organisation uses monitoring and evaluation to advance learning.							
	Extending learning	We use strategic partnerships to develop collaborative learning networks and enhance system outcomes.							
	Additional element(s)								

Summary

Transitioning to learning

The organisation is committed to sustained changes in structure and activity to achieve organisational and system goals.

Grading

Not constrained

All changes necessary to meet goals have been identified and operationalized.

Somewhat constrained

Most changes to meet goals have been identified and operationalized.

Constrained

Most changes to meet goals have been identified but there is uncertainty regarding how to operationalize change.

Very constrained

There is limited knowledge regarding how to plan for and operationalize change.

Improvement actions:

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## Toolkit Case Studies

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[ALT Clean Up](#) [.pdf - 401Kb]

[ALT Coastcare](#) [.pdf- 306Kb]

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[ALT CSIRO Modeling](#) [.pdf- 281Kb]

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## British Shoreline Management

### Building science into policy

Shoreline Management Plans (SMPs) are one mechanism for managing coastal risks in the United Kingdom. Established in the 1990s, the SMP process is now reaching the end of its second round, with SMPs extending across the entire 6000 km coastline of England and Wales. SMP 2 specifically built on lessons learned from SMP 1, and also yielded lessons in its own right. This case study summarises some of the key lessons learned from both rounds of management, and the implications of such learning for the integration of science in policy for coastal management.

Shoreline Management Plans (SMPs) provide a policy framework by which individual sections of the coast may be managed. The first round of SMPs was based primarily on sediment boundaries in relation to the movement of sand and shingle along various coastlines. The plans were designed to then be implemented by the relevant operating authority, which would include them as part of individual strategic plans, and inform decision making about capital investment and environmental management. Specifically, they were the key mechanism by which flood and coastal erosion risks were managed.

Since their initiation, numerous other initiatives have had bearing on the SMP process (e.g. the UK Climate Projections 2009 report (Lowe et al. 2009); the implementation of catchment management plans; flood and coastal erosion strategies; strategic flood risk assessments; and the UK Climate Impacts Programme). Changes in the actual shoreline as a result of climate and other impacts also necessitated some new management approaches.



Photo: M Nursey-Bray

**Empowerment and responsibility are crucial elements in the exercise of any coastal management strategy.**

**O'Riordan and Ward, 1997.**

In particular, the Foresight program took a long-term view of national flooding and coastal erosion risks to 2100 and estimated that there were £130 billion of assets (homes, businesses etc.) at risk of coastal flooding with at least £10 billion of assets at risk of coastal erosion. Further, the study predicted that future climate change could lead to potentially significant increases in future risk by the end of this century with annual losses due to flooding increasing to between 2 and 20 times the current values with coastal erosion annual losses rising by 3-8 times.

### Organisational approach

Consequently, SMP 2 sought to meet future needs in light of anticipated risks in the short (0-20 years), medium (20-50 years) and long term (50-100 years). Management decisions within the plan were constructed according to the principles of (i) hold the line, (ii) retreat the line, (iii) do nothing or (iv) advance the line.

#### SMP 2 Management Directives

**Hold the line.** Retain the existing line of defence through maintenance of existing defences or by construction of new defences where necessary.

**Retreat the line.** Actively manage the rate and process by which the coast retreats (known as 'managed retreat').

**Do nothing but monitor.** The option chosen for stretches of coastline where it is not technically, economically or environmentally viable to undertake defence works.

**Advance the line.** Build new defences seaward of the existing line.

## Key lessons for adaptive learning

SMP 2 represents a new approach to shoreline management planning cognisant of the lessons from SMP 1, new science, and the experience and aspirations of a greater range of stakeholders that have become part of the process. The key lessons can be summarised as:

- Develop a futures focus for coastal planning that consistently addresses a range of time frames, especially longer-term horizons.
- Use reliable up-to-date science and embrace the uncertainty inherent in coastal zones through awareness-raising and flexibility.
- Engage and build trust with local communities.
- Improve links within and between the multiple planning systems and arrangements (e.g. estuaries can be considered within SMPs and their management linked to catchment flood management planning).
- Identify alternative strategies and anticipated funding sources to ensure the feasibility of implementing strategies.

In particular, SMP 2 endeavoured to conduct more efficient and targeted consultation. Stakeholders in each planning area were invited to comment through public meetings, stalls, website activities and many other means. Adopted policies thus made an attempt to incorporate all comments received. While it may appear a small thing, a standard template/format for all SMPs was developed, and attention paid to ensuring public access to plan drafts was enabled via distribution of a free CDROM, and upload of documents to the internet.

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## Final points

*"The integration of science into policy at the SMP2 level has created some opportunities. However, the SMPs are still very technically oriented, and often reliant on structural fixes, or, in their absence, a policy of no action. There are also many lessons from other contexts that could assist in refining future SMP programs, such as the use of boundary organisations as translators between science and policy institutions."*

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## Clean Up the World

### A global approach to cleaning up marine and coastal litter

Clean Up the World is a global, community-based program that inspires communities to clean up and care for their environment. The program is characterised by a weekend clean-up event, a week-long media campaign, and ongoing education and awareness activities. The ability to adapt activities in partnership with individual regions and related campaigns has contributed to its success.

#### Development and organisational approach

In response to increasing amounts of ocean litter observed when sailing competitively, Ian Kiernan organised the first Clean Up Sydney Harbour Day in 1989, achieving an enormous public response with over 40,000 participants. In 1990 over 300,000 volunteers turned out on the first Clean Up Australia Day and this is now Australia's largest community environmental not-for-profit organisation (CUA, n.d.).

With the success of Clean Up Australia, UNEP established Clean Up the World in 1993, with 35 million volunteers from 130 countries participating annually (CUW 2011a). UNEP has become the program partner of Clean Up Australia, and similar programs throughout the world (e.g. *Seaweed Marine Debris Survey*, New Zealand; *Adopt-a-Beach* and *Beachwatch*, United Kingdom; *Marine Debris Cleanup*, Hawaii).



Coastal debris, Queensland, Australia. Photo: DC Thomsen

*Being part of a global campaign makes us stronger to confront the challenges we face at home (CUW 2003).*

#### Partnerships and networks

With UNEP as the major global sponsor, partnerships have also been formed with governments, NGOs and the private sector with individual programs attracting their own local sponsors (e.g. Coles, McDonalds and Veolia in Australia).

These partnerships can have international impacts such as the partnership with the World Organisation of the Scout Movement that led to the Environmental Scout Organization of Lebanon carrying out the *Let me Breathe* Campaign on Palm Island Nature reserve, Tripoli as part of the Clean up the World campaign in 2009. Over 100 scouts removed glass, plastic and aluminium waste items from the coastline and learned about biodiversity and the importance of these areas as breeding grounds for sea turtles (CUW and WOSM, 2009).

The use of a networked approach also allows the program to contribute at regional and local scales by spawning or supporting related campaigns. For example, the Monofilament Recovery and Recycling Program, a state-wide initiative led by the Florida Fish and Wildlife Conservation Commission, raises awareness of the problems caused by discarded monofilament line and encourages recycling through a network of line recycling bins, drop-off locations and volunteer line Clean Up events (UNEP, n.d.).

The program also aligns with and supports other global initiatives such as the UN International Year of Forests (2011) and the UN World Water Day (CUW 2011b).

#### Research and education

Learning is fundamental to the program's success and

for experiences gained through participation to translate into positive socio-ecological outcomes. Learning can occur in formal and informal ways and can also be combined with research. For example, Clean Up has partnered with Coastwatch, an international educational network operating in 23 European countries with the aim to train and educate volunteers and students in field work, basic reporting methods and relevance of results research for policy and legislation (UNEP, n.d.).

In Australia, information on the amount and type of litter collected across various site types (e.g. beach, parks, bushland, river etc) has been recorded annually since 2001. In 2009, the data revealed that six of the top ten litter items were recyclable beverage containers (CUA 2009).

### Key lessons for adaptive learning

- Leadership and inspiration are important at all scales. UNEP provides significant global leadership for the program and Ian Kiernan, chairman and founder, continues to provide inspiration.
- Global campaigns can be successful through effective partnerships and networks that extend to the local scale. In combination with an adaptive and flexible approach, these relationships can improve the effectiveness of campaigns through a detailed understanding of target audiences.
- Linking global and local scales can provide a sense of legitimacy for activities and realistic expectations of what can be contributed at each scale.
- Tangible results (e.g. visibly cleaner beaches) provide an immediate reward and positive reinforcement of the value of participation. This can be further augmented by the reporting of litter counts that can be used as motivation for the next clean-up or additional programs.

Evolution of campaign themes and programs over time and place keeps participants interested and engaged, and has the ability to draw in others that might not otherwise contribute to a clean-up.

### Final points

Clean Up campaigns should be valued for their contribution to the health of ecosystems through the removal of litter *and* longer-term behavioural changes.

An approach to evaluation that includes both summative (outcomes-based) and formative (process-based) assessment could assist in the on-going effectiveness of such campaigns (Bates 2010).

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## Community capacity building through *Coastcare*

### Learning at the grass roots

*Coastcare* is a national network of local volunteer groups active in stewardship activities for the Australian coastline. *Coastcare* was established in 1995 following an inquiry into the management and use of coastal resources, led by the Resource Assessment Commission that established the need for a national and co-operative approach to coastal management (Clarke 2006).

This case study draws on interviews conducted with *Coastcare* representatives operating on the Sunshine Coast, Queensland to present insights emerging from a community capacity building process undertaken by *Coastcare* through regional government funding.

### Organisational approach

*Coastcare*'s Commonwealth role is implemented through an agreed set of Memoranda of Understanding (the Coasts and Clean Seas MoU) that includes all States and local governments (Harvey et al. 2001). In this role, *Coastcare* acts as a boundary organisation, providing an interface between various communities and different levels of government. *Coastcare* activities focus on on-ground works to address

various government grants (Clarke 2006; Harvey et al. 2001), along with other financial and in-kind support provided through a substantial network of partners. The organisation is voluntary in nature, although individual groups do source funding for part-time administrative positions.

The organisational structure of the local group participating in this case study is consistent with the general *Coastcare* approach described. The remaining discussion relates directly to this group's development of a strategic and business plan for community capacity building initiatives. This planning process was a requirement of the regional council's funding practice. The group adopted a values approach underpinned by wonderment and learning. These values were generated and collectively agreed upon through broad participatory engagement of the group's active members.

### Key lessons for adaptive learning

Participant experiences demonstrated that learning opportunities evolve over time and generated insights for learning at individual, organisational and network scales.

#### Individual

- Learning must be fun.
- Interpersonal relationships are important.
- Learning is best achieved through practice across a diverse range of contexts.
- Key individuals are pivotal to group and inter-group learning situations – loss of these individuals can affect the continuity and incremental nature of learning.
- Learning requires humility and an openness to learn.
- A variety of learning approaches (including those 'out-of-the-box') can be used to engage with diverse learning styles and needs.

"People learn through fun... I'm very much into using that as an important part of the way we do training"  
*Coastcare representative*

"... the more you learn the less you know"  
*Coastcare representative*



Photo: Craig A Stephenson

dune erosion, loss of native wildlife, storm water pollution, coastal weeds and damage to ecologically sensitive areas (Coastcare n.d.). *Coastcare* also has a prominent role in community education. These activities are funded through

## Organisational

- An open environment is essential for effective knowledge transfer.
- Training opportunities need to be encouraged throughout the organisation.
- Leadership training can enhance learning at all organisational levels.
- Integrative links across programs, activities and ideas need to be proactively sought.
- Clearly communicated and uncomplicated strategies that focus attention through readily identifiable and broadly accepted issues are effective in generating co-learning opportunities and providing a platform to address more complex issues.
- Action is the basis of learning and in creating a positive environment for learning to occur within communities.
- Surprise or stochastic events create a fertile environment for generating ideas, attracting resources and changing perceptions.

“... one of our strengths is that we practically do things...We actually go out there and do hands on things to try and make a difference. That gains a whole lot more community support than if we just tell people what they should and shouldn't do.”

Coastcare representative

## Networks

- Generating links to other organisations is critical to advance shared goals and ensure adequate and timely flows of information.
- Communicative learning is enhanced by engaging with key individuals who are sensitive to its importance.
- The ability to broker compromise is essential in creating learning opportunities within networks. It is not possible to see all outcomes from any given point, and sometimes learning emerges from unexpected areas.
- Involvement of high profile or key individuals or groups in niche areas provides important impetus for individual and collective learning.

“... you do learn that with every outcome you have to go down the middle line. If you're really hard line then you just alienate everybody about everything.”

Coastcare representative



Photo: Craig A Stephenson

## Final points

The Coastcare experience explored in this case study emphasises the importance of making actions and emergent learning within coastal environments, relevant to people's interests and needs. The key message for learning within diverse local communities is the need for variety, simplicity and fun.

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## Canadian Department of Fisheries and Oceans

### The collapse of the Newfoundland cod fishery

The Canadian Department of Fisheries and Oceans (DFO) is a federal government entity that manages Canada's navigable water resources to provide safe, healthy, productive waters and aquatic ecosystems for the benefit of present and future generations (DFO 2004). DFO has several key functions related to the management and protection of fisheries resources guided by the *Oceans Act*, the *Fisheries Act* and the *Species at Risk Act* (DFO 2008).

This case study analyses DFO's policy framework for the management of its fisheries since the dramatic collapse of the Grand Banks cod fishery in Newfoundland. Atlantic cod was recognised globally for the value and productivity of its fisheries, but overexploitation and ineffective management saw population levels reduced to the lowest in recorded history, with biomass levels currently estimated at only 6% of that recorded in the 1960s (Davies and Rangeley 2010).

Several reasons for this collapse are argued. Unregulated international pressure on seemingly vast fish stocks has a long history (Dybas 2006), and the situation on the Grand Banks has been described in terms of a tragedy of the commons that has led to the over-exploitation of the resource (Mason 2002). The expansion of the Exclusive Economic Zone (EEZ) from 3 to 200 miles in the 1970's provided an opportunity for the Canadian government to address such 'commons' issues. However, after some evidence of cod populations stabilising in the 1980's, catches and biomass declined rapidly with complete collapse in the early 1990's (Grafton et al. 2009). Further research into the underpinning causes revealed the impact of: (i) increased catch effectiveness through technological advances (Dybas 2006; Grafton et al. 2009); and (ii) the application of scientific models, unable to consider environmental stochasticity and population variability over time, to generate population estimates (Pilkey & Pilkey-Jarvis 2007; Grafton et al. 2009).

In particular, the collection and use of scientific data to determine total allowable catches (TAC's) remains controversial. TAC's were largely negotiated between the



Photo: Hans-Petter Fjeld ([CC-BY-SA](#))

DFO, the fishing industry and politicians. In the late eighties and early 1990's scientific data indicated that a more precautionary approach to the setting of TAC's should be taken, however conflicting data from the fishing industry, along with industry and political pressure, assured that TAC's remained high and well beyond sustainable limits (Anon 1995). This was evident when in January 1992 the DFO was advising a TAC of 185 000 tonnes, later revising this estimate to 120 000 tonnes, and finally declaring a moratorium on all cod fishing in June of the same year (Anon 1995).

### Organisational approach

The organisational approach of DFO has changed over time in response to the cod fishery collapse and the expansion of the EEZ, including efforts to reduce the harvesting and processing capacity of the fishing fleet (Anon 1995; Dybas 2006; Grafton et al. 2009) (Table 1). The 1990's saw the implementation of more inclusive and integrated strategies in fisheries management, culminating in 1999 with the launch of the Atlantic Fisheries Policy Review (AFPR). The review has undergone a number of iterations and attempts to modernise the policy framework for the governance of Atlantic fisheries (DFO 2010). This, in turn, led to the current Fisheries Renewal Initiative that focuses on three key areas: (i) long term sustainability using ecosystem based management and precautionary principles; (ii) economic prosperity; and (iii) improved governance through greater transparency and collective stewardship (DFO 2012). The Sustainable Fisheries Framework (SFF) is an adaptive approach to generate policy

Table 1 Evolution of management strategies

Year	Goals/triggers	Strategies
1970s	Establish control over fisheries in Canadian waters	Implementation of a 200 mile Exclusive Economic Zone
1980s	Improved management of fisheries	Limits on growth of harvesting and processing capacity; regulation of fleet sectors; promotion of interdependence of inshore fishers; limits on the concentration of ownership of fishing licences.
1990s	Response to ground-fishery collapse	Reduction in commercial fisheries; encouragement of more responsible fishing practices; formalised co-management systems; indigenous participation in fisheries management.
Late 1990's	Continuing response to ground-fishery collapse	Launch of the Atlantic Fisheries Policy Review (AFPR), emphasising collective stewardship, comprehensive risk assessment, and the adoption of a precautionary approach through ecosystem-based management

and management renewal and the key mechanism for driving this process (DFO 2009). The application of ‘sound science,’ and the methods by which this is achieved, features heavily within the SFF guidelines.

Key lessons for adaptive learning

- A transition from single loop learning (i.e. a focus on improved ‘effectiveness’ through increased regulation) to more adaptive forms of learning can enhance sustainable management.
- Thresholds are not always obvious until crossed. A precautionary approach can assist in avoiding substantial ecological, social and economic costs.
- Adaptive learning can be constrained when governance structures are limited in their ability to engage with all relevant stakeholders.
- All sources of data, including scientific, need to be applied adaptively and consider underlying values, power imbalances, and the impact of changing socio-ecological contexts (e.g. the implementation of new technologies).

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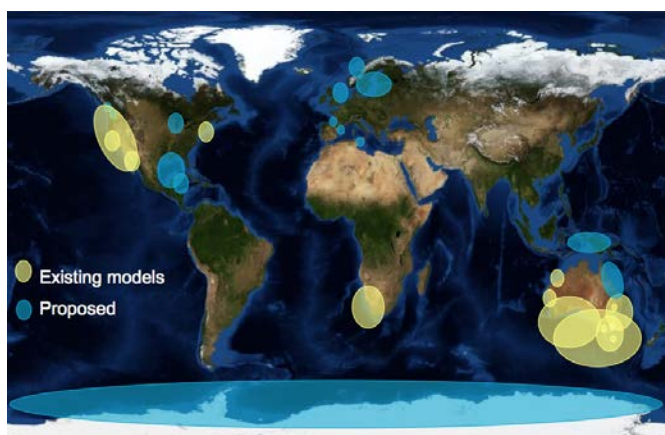
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## Marine Ecosystem Modelling

### Enabling a better understanding of ecosystem-based management

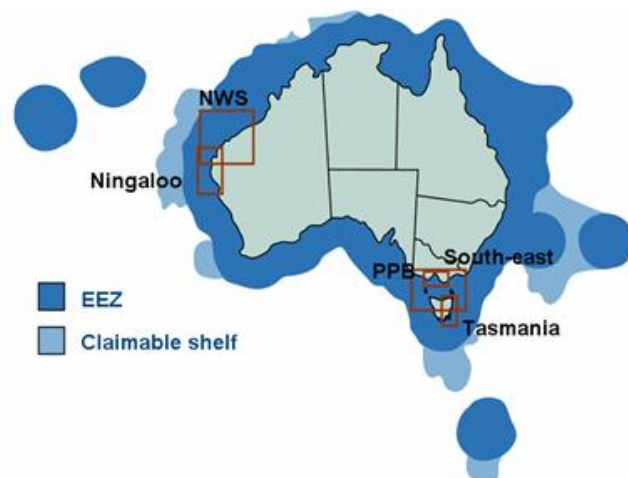
*Atlantis* and *InVitro* are ecosystem models developed by the CSIRO. *Atlantis* has been rated as one of the best whole-of-ecosystem models available for the marine environment. It has been used to inform the Australian Fisheries Management Authority, and applied to several marine ecosystems in Australia, United States, Norway, Mexico, South Africa and the Caribbean (Figure 1) (CSIRO, 2012a). *InVitro* allows consideration of multiple uses such as fishing, transport, tourism and oil and gas. For example, it has been used to evaluate regional marine plans in Australia under the national Oceans Policy (Figure 2) (CSIRO, 2012b). These models have been instrumental in enabling a better understanding of how marine ecosystems function and associated management.



**Figure 1** Examples of the application of *Atlantis* in marine systems (CSIRO, 2012a).

### Organisational approach

Key to the CSIRO approach is a focus on improved communication between science and policy. The CSIRO has used a range of alternative communication tools and strategies based on stakeholder preferences for the receipt of scientific information.



**Figure 2** Examples of the use of *InVitro* in Australia's marine systems (CSIRO, 2012b).

In the coastal and marine context, *Atlantis* and *InVitro* have been developed to support ecosystem-based management that takes into account resource use and conservation considerations. The models simulate the marine environment and include the behaviour of relevant industries, resource monitoring and assessment processes, and management options and their implementation.

The CSIRO has adopted a participatory approach to ecosystem modelling to support multi-stakeholder decision-making and encourage stakeholders to consider the system as an interconnected whole while exploring alternative management strategies. 'User friendly' models (i.e. simplified versions of the scientific models) are employed to help stakeholders learn how complex systems work. By being able to manipulate these models themselves, stakeholders are able to create scenarios, explore different strategies, and gain insights into each other's interests and viewpoints. By engaging stakeholders in modelling exercises, researchers have also been able to access the diversity and richness of stakeholder knowledge about ecosystems—adding to the available pool of information. Such participatory approaches are also effective in creating a sense of ownership of decision-making and problem-solving processes among stakeholders, and, importantly, provide opportunities for minimising conflicts and building consensus.

## Key lessons for adaptive learning

Lessons from the CSIRO ecosystem modelling experience include:

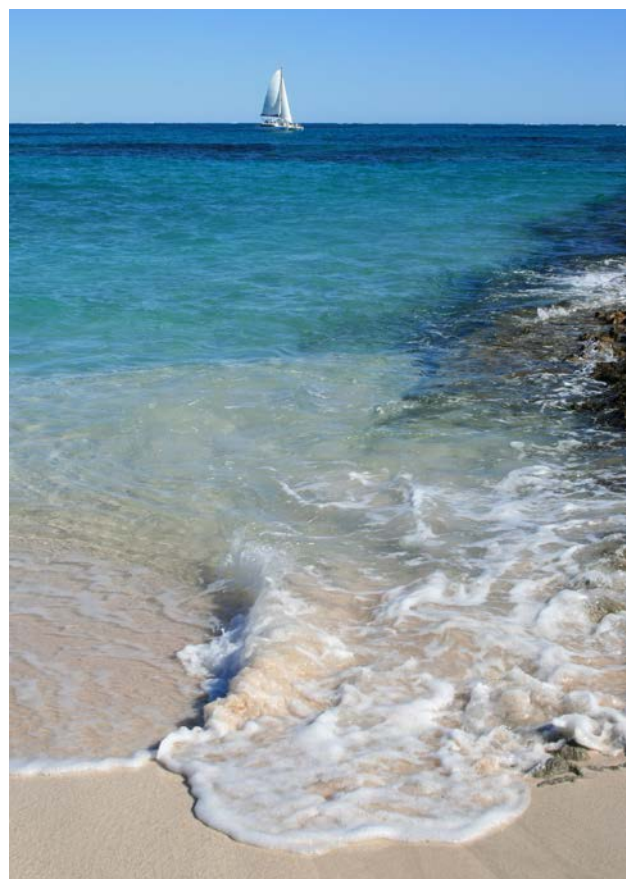
- Consideration of multiple dimensions of ecosystems (e.g. biophysical, economic and social)
- Engaging stakeholders in conceptualising problems and solutions to ensure ownership of associated decision-making processes
- Using interactive communication tools and strategies to improve the understanding of ecosystems and to explore alternative management strategies and their implications
- Using stakeholder knowledge to complement scientific information
- Creating opportunities for interaction and building consensus

## Summary

The CSIRO has developed ecosystem models to support the management of marine systems in an integrated way. These models consider biophysical, economic and social dimensions of the ecosystem, and have assisted stakeholders to understand and appreciate ecosystem-based management. This case study illustrates how science can be used in a participatory way to support ecosystem management by creating a sense of ownership of decision-making and problem-solving processes among stakeholders, facilitating collaborative learning, minimising conflicts and building consensus. The CSIRO approach has been regarded as a success in engaging stakeholders and decision-makers, and ultimately improving communication between science and policy.

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Ningaloo, Western Australia, one of the marine systems where the model *InVitro* has been used (Photo: Carl Koenig).

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Dong Ho lagoon, Viet Nam

*Landscape changes threaten the ecological integrity of Dong Ho, and with the aesthetic changes in the landscape from contemporary land-uses, the tourism potential of the area is at risk of being lost.*

Major changes in the lake commenced in the early 19<sup>th</sup> century when the Vietnamese king ordered the hand-construction of a 67km canal linking the Mekong with Ha Tien. The Vinh Te canal had strategic value in allowing soldiers and settlers to move to the western part of the delta, securing the area as part of Viet Nam. The military role of the canal continued in the late 1800s and early 1900s under French colonial rule (as well as during the American-Vietnamese war). However, the strategic importance of the area declined because France had colonised both Cambodia and Vietnam, and the area, with its canals, became neglected.

French engineers criss-crossed the delta with hundreds of kilometres of canals to enable agricultural use of the Mekong flood-plain. Many of these drained into the Vinh Te canal, bringing increased water-flows and sediments to Dong Ho.

urbanisation has been enabled by sea reclamation surrounding Dong Ho's sea entrance.



Figure 1 Dong Ho has changed from a deep-water port to shallow lagoon intruded by agriculture and aquaculture

Since the 1990s, sedimentation has shallowed the lagoon and formed alluvial islands occupied by settlers. Acidity has increased through the disturbance of acid-sulphate soils and eutrophication is a growing risk from elevated nutrient levels associated with aquaculture, agriculture and sewage from Ha Tien. The growing population increasingly take from naturally rich fisheries, and marine reclamation works that constrain flows are shifting the lagoon towards a freshwater dominated system.

Like much of the Mekong delta, Dong Ho is vulnerable to inundation from a minor rise in sea-level. With storm surge, loss of buffering mangrove vegetation, and the damming effect of lengthening the lagoon's sea outlet through marine reclamation, increased flooding and longer retention of flood waters are likely. Lands illegally occupied for agriculture and aquaculture will become unviable. Ultimately, the trajectory towards a freshwater system will be reversed and marine influences will predominate leading to salt intrusion and permanent flooding (MONRE, 2003).

## Stakeholder awareness and response

Recognizing the lagoon's cultural, spiritual and ecological significance and its potential role in development of the local economy, in 2001, on the recommendation of the local People's Committee, the Provincial Committee approved planning for Dong Ho with the focus on developing tourism services, planting ecological forests, and management of aquaculture. This was followed, in 2004, by a conference "Developing ecotourism of Dong Ho-Ha Tien"; and in 2006, by a report on what was known about the environmental condition of Dong Ho (Truong 2011a). This report indicated limited knowledge, but raised concerns for its environmental sustainability.

In 2011, upon advice from provincial departments, the Kien Giang People's Committee reaffirmed that planning must have as its objective sustainable conservation, restoration and development, including protection of its historical and cultural values. The achievement of this is now supported by the GIZ-Australian AID Conservation and Development of the Kien Giang Biosphere Reserve Project.

## Development commitments

A 2011 community workshop on integrated planning for conservation and development of Dong Ho revealed continuing commitment to coastal reclamation, development of islands within Dong Ho and increased dredging. This was despite evidence that interference with the poorly understood hydrodynamics of the lagoon-marine system was the major driver of environmental concerns. However, there was consensus that major changes were needed, including actions to address pollution, restore degraded natural areas, reduce fishery take, improve aquaculture practices, and review approvals and proposals in the interests of transitioning to a sustainable future and greater economic dependency on tourism (see Carter 2012).

## Adaptive behaviours and socio-ecological outcomes

The possible collapse of the Dong Ho ecological system and the ecosystem services it provides has precipitated adaptive action at the planning stage only. Desired ecological outcomes will necessitate significant land-use changes, with resultant social impacts including displacement of some individuals and communities and major changes in livelihoods. Investment in restoration works and pollution control will be considerable, and major

approved and proposed development works will require review.

## Key lessons for adaptive learning

- Historical decisions can limit capacity to address environmental challenges.
- Without knowledge of key ecosystem processes, economic development commitments can affect opportunities to achieve ecological sustainability.
- The time between problem recognition and action can be lengthy, with continued environmental degradation.
- Adaptation towards more sustainable livelihoods can come with considerable community disruption.
- Understanding system dynamics can be more important than immediately addressing environmental degradation.

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## Great Barrier Reef Marine Park Rezoning

### Developing Biophysical Operational Principles

Australia's Great Barrier Reef (GBR) is the largest marine protected area in the world. It encompasses an area of approximately 344,400 km<sup>2</sup>, spanning 2,300 km along the coast of the state of Queensland (fig.1). The GBR features outstanding ecological, social, economic and cultural values that have been recognised and protected since 1975 as a Commonwealth Marine Park. The Marine Park is an area of multiple-uses where a range of activities such as recreation, tourism, fishing, boating and shipping take place. A Zoning Plan regulates where such activities are permitted and where they are not. In 2004, the rezoning of the Marine Park increased the areas where fishing and collecting are not permitted (no-take marine protected areas) from 5 to 33%.

*The **Biophysical Operational Principles** were designed to assist managers to make transparent planning decisions, achieve their stated objectives and enable explicit recognition of the trade-offs between biophysical and socioeconomic considerations.*

Fernandes et al. (2009)

### Organisational approach

During the GBR rezoning, the Great Barrier Reef Marine Park Authority (GBRMPA) recognised political and institutional constraints to improving biodiversity outcomes using no-take areas and the need to balance conservation with social, economic and cultural values. However, consensus on the area and level of zoning protection required was lacking. Fernandes et al. (2009) highlight that making decisions about how many, how big, and where to locate marine protected areas is often difficult and constrained due to inadequate data.

A collaborative process to design a set of Biophysical Operational Principles to guide the establishment of a network of no-take areas was initiated. GBRMPA interviewed 82 experts, who recommended the establishment of a Scientific Steering Committee (SSC) to provide independent advice. The SSC was established and requested GBRMPA to develop more detailed objectives for its Representative Areas program, which included consultation with more than 200 stakeholders. GBRMPA also reviewed the information and data available on reserve design and levels of protection. Since no perfect set of principles had been documented in the literature, the committee recommended that decisions should be based on the available knowledge and expertise. Furthermore, the new Zoning Plan could be reviewed to incorporate new information as it became available in the future. Biophysical Operational Principles were designed and made public; and the public was invited to comment on them. The Great Barrier Reef Zoning Plan was approved by the Minister for the Environment and Heritage in December 2003, taking effect in July 2004.

The developmental process of the Biophysical Operational Principles for the GBR rezoning was instrumental in generating the acceptance and understanding necessary for the

Fig. 1: The Great Barrier Reef.

implementation of zoning strategies. The process generated operational principles to guide the planning program, publicised the principles to relevant stakeholders, raised awareness and understanding to enable acceptance of those principles, and, used the principles in a transparent way to guide decision-making (Fernandes et al., 2009).

The development of the Biophysical Operational Principles involved many elements of an adaptive learning approach, such as networking and ideas generation, setting of organisational and systems goals, developing strategies to arrive at those principles, and reflection on the principles with the participation of staff, stakeholders and community.

Key lessons for adaptive learning

The following lessons, in the context of imperfect information, are summarised from Fernandes et al. (2005):

- Strategic objectives need to be well-defined and detailed.
- Experts (local and scientific) need to be involved early.
- An independent advisory panel can provide a greater range of knowledge, expertise and a different perspective.
- Plans need to consider all that is known and unknown.
- Internal and public scrutiny of implications, across a range of sectors, should be sought prior to implementation.

Summary

In the absence of consensus and adequate data to guide the design of no-take protected areas in the GBR, GBRMPA engaged with experts and stakeholders using a collaborative approach in developing the GBR Zoning Plan.

This case illustrates how planning and management activities could be forged in the face of incomplete data and information; and how the available knowledge could be legitimised through stakeholder and community engagement. In addition, acceptance by those affected by decisions is likely to increase when decision-making is transparent.



The Great Barrier Reef (Photo: Debra Law/Dreamstime)

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GBRMPA. Great Barrier Reef Marine Park Authority, <http://www.gbrmpa.gov.au/> [16.03.2012]

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## The Helsinki Commission

### Science, policy and multi-institutional collaboration

Coastal ecosystems are complex, dynamic and unconstrained by political boundaries (Österblom et al. 2010; Holling 2001). Thus, management strategies need to be adaptive, draw upon the best available knowledge and adopted by stakeholders across jurisdictions (Österblom et al. 2010).

An ecosystems approach to marine resource management (EAM) applied in the Baltic Sea demonstrates a governance approach that depends on multi-jurisdictional and multi-agency cooperation. The approach emphasises the cyclical interaction between science and policy, and the importance of adaptive governance that is precautionary and knowledge-based (Österblom et al. 2010).

*The critical governance issue is to coordinate action, informed by the best available knowledge, across multi-jurisdictions with different socio-economic characteristics and sea dependencies.*

### Challenges for Baltic Sea management

The Baltic Sea is a brackish-water ecosystem with topographically defined sub-catchments: the western Baltic transition zone to the North Sea (S), the Central Baltic deep basins (BP), the shallower Gulfs of Riga (GR) and Finland (GF), and the Bothnian Sea (BS) and Bothnian Bay (BB) in the North (Figure 1) (Ojaveer & Kalejs 2008; Österblom et al. 2010). Human use and exploitation threaten the ability of these ecosystems to continue to provide essential services. Thus, the nine bordering countries collectively experience, and are responsible for, the degraded state of the region (Backer et al. 2010) as well as its restoration.

The key environmental issues for the Baltic region are:

1. ongoing wide-scale nutrient pollution and eutrophication,
2. water contamination by hazardous substances,
3. risks associated with marine traffic; and
4. unsustainable fishing practices (Backer et al., 2010).

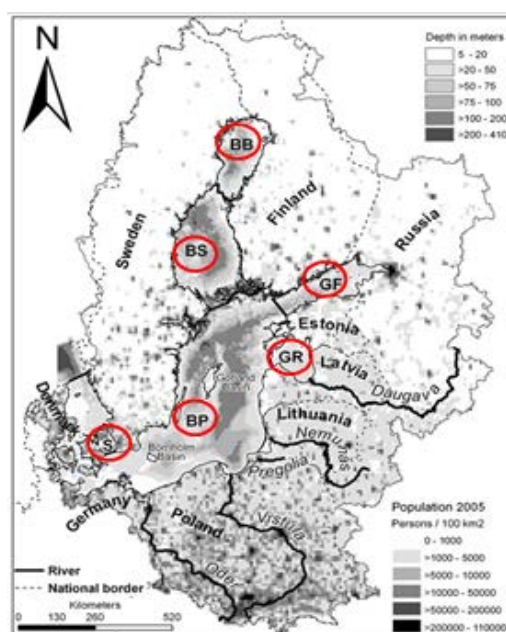


Figure 1 The Baltic Sea sub-catchments (from Österblom et al., 2010)

### Organisational approach

Historically, environmental policies in the Baltic Sea were developed sector-by-sector (environmental, fisheries, agriculture) (Österblom et al. 2010). Since the 1970s, Helsinki Commission (HELCOM) has been the main forum for international environmental cooperation. Despite three decades of political declarations to reduce overfishing and eutrophication impacts, goals were not achieved because implementation of agreed measures did not always occur due to the voluntary nature of cooperation and the absence of sanctioning mechanisms (Österblom et al. 2010).

Since 2003, EAM has been the accepted management framework underpinning policy. HELCOM, and the Contracting Parties (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden and the European Community) have developed and adopted unified regional management objectives for EAM implementation (Backer et al. 2010). The Baltic Sea Action Plan (BSAP) (HELCOM 2007) defined nutrient input ceilings and required HELCOM contracting parties, coastal county governments and the European Commission to commit to achieving agreed ecological objectives, and a Baltic Sea in 'Good Environmental Status' by 2021 (Backer et al. 2010).

**“... to combat eutrophication (especially in the open sea), nutrient reduction measures should be considered jointly for the whole Baltic Sea region”**

*(HELCOM cited by Larsson & Granstedt 2010).*

## Key lessons for adaptive learning

- Mandatory targets: the ‘provisional’ targets of the BSAP can be ignored if deemed too costly or politically difficult to implement (Backer et al. 2010). Given the history of failure to address nutrient loads, despite agreements, it seems that the importance of sanctions has not been learnt.
- Institutional collaboration: despite high-level agreement, coordinated action at operational levels is limited. Relations between science, stakeholders and decision-makers from local to broader scales, across jurisdictions, have been built (Österblom et al. 2010). Yet, institutional barriers to integrated marine management remain (Österblom et al. 2010; Hammer et al. 2003). Österblom et al. (2010) suggest the need to establish stakeholder inclusive collaborative learning platforms, at the sub-basin level, to address spatially relevant issues at larger scales.
- Establish common understanding of issues: An accepted science-based frame to inform and motivate collaborative, cross-jurisdictional action and learning is useful to achieving common understanding of issues and for defining needed action.

## Adaptive behaviours and socio-ecological outcomes

While the science-based EAM framework provided a basis for learning and informing government agencies of needed policy, ‘good environmental status’ is yet to be delivered solely through the legally-founded, centralised authority of HELCOM. Informal, decentralised governance appears to be needed, and delivered through a collective decision-making system of stakeholders (see Griffin 2010).

Governance will not be effective under one rule or law, institution or economic policy. It requires a multi-faceted and multi-disciplinary approach that engages and enlists many actors and agencies across many jurisdictions (Sampford, 2002).

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## Collaborative learning for healthy catchments

### Insights for incorporating diverse viewpoints

*Healthy Waterways* is a not-for-profit, non-government organisation that works collaboratively with a range of organisations to ensure waterway health in South East Queensland. Member organisations include representatives from government, community, industry and research sectors. The organisation conducts activities in four main program areas, including: (i) science and innovation; (ii) ecosystem health and monitoring; (iii) water by design; and (iv) communication, education and motivation ([www.healthywaterways.org](http://www.healthywaterways.org)). Working with a range of member organisations is essential to achieving outcomes in the coastal and catchment contexts where issues are complex, multi-dimensional, and inter-related. *Healthy Waterways* has been particularly successful in raising water quality awareness and facilitating adaptive management responses through its use of ecosystem health report cards.

**“By 2026, our waterways and catchments will be healthy ecosystems supporting the livelihoods and lifestyles of people in South East Queensland, and will be managed through collaboration between community, government and industry.”**

*Healthy Waterways* vision [www.healthywaterways.org](http://www.healthywaterways.org)

This case study explores insights emerging from catchment scale decision-making involving the integration of diverse perspectives to achieve sustainable management outcomes.

### Collaborative learning and decision-making

There are many stages in collaborative learning and decision-making. This case illustrates the challenges and opportunities inherent in collaboration. It highlights the pivotal advantages of problem re-framing offered early in such processes and effective communication throughout.

#### Problem re-framing

The role of problem re-framing is demonstrated by the example of a proposed extension to a water storage facility.

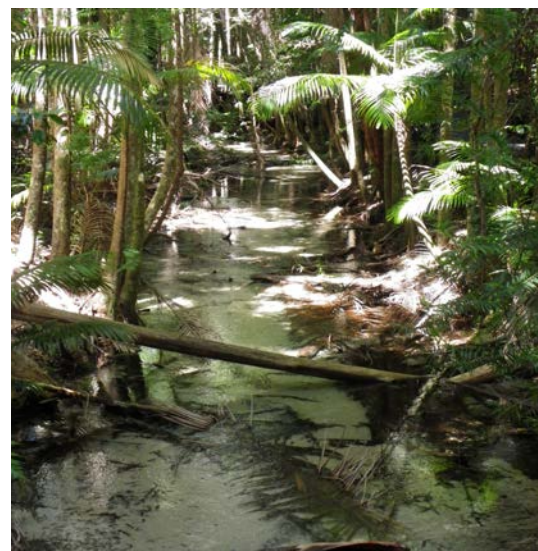


Photo: C A Stephenson

The proposed development involved inundation of vegetation adjacent to the water storage facility. Engineers raised concerns that the submerged vegetation would result in carbon loading of the dam sediments. However, burning of the vegetation would cause an undesirable reduction in air quality and greenhouse gas emissions. From the engineers' perspective, the mitigation of this side effect (reduced air quality and increased greenhouse gases) was paramount. When they approached other scientists to see how this could be minimised, additional side effects became evident. Removal of the vegetation would also result in soil erosion during heavy rains and increase sediment run-off. This meant that not only air quality but remnant vegetation, soil erosion and dam infill rates would all be affected. Incorporating a greater diversity of viewpoints allowed a more complete evaluation of the possible impacts and a revised perception of the relevant issues.

**“Some of the most positive activities I’ve been involved in to change the way we as humans use the landscape... bring together the different vested interests...”**  
*Healthy Waterways* representative

Combining diverse knowledge sets also allows for the development of integrated solutions. For example, considering natural assets and built assets as synergistic parts of the same system can facilitate positive system outcomes and options that are more successful than that achievable by considering any one part of the system in isolation. This has recently been demonstrated by the maintenance of riparian vegetation upstream of a bridge to reduce the erosive strength of extreme flood events and allow for the modification to the design specifications for such bridges.

“Historically, people never really looked at providing solutions that used a percentage of natural assets and a percentage of built assets to achieve an outcome”

*Healthy Waterways representative*

Participants in the decision-making process reflected that the ‘learning was in the interaction’ between the different disciplines whereby validation of a range of alternative viewpoints and/or identification of a ‘common thread’ facilitated ‘a totally different solution set’. It was also apparent that for decision-making to proceed efficiently, such consultation needed to occur early in the decision-making process.

Effective communication

Achieving goals in complex system contexts requires communication strategies that are effective across a range of organisations and stakeholders. Communication modes need to consider the needs and preferences of all participants.

The Ecosystem Health Monitoring Program (EHMP) coordinated by *Healthy Waterways* and delivered by a range of experts from government, the CSIRO and universities is an example of highly effective communication between agencies and communities. The EHMP is regarded as one of the most comprehensive waterway monitoring programs in Australia. It assesses the health of Moreton Bay; as well as, the major catchments, rivers and estuaries within South East Queensland ([www.healthywaterways.org/ehmphone.aspx](http://www.healthywaterways.org/ehmphone.aspx)).

The use of Report Cards to communicate the results of the EHMP using rating grades (‘A’ to ‘F’) that combine a range of measures into a single score, has proved a particularly effective communication strategy for over ten years that enhances widespread understanding of waterway health and provides the knowledge base for management responses, especially when coupled with the conceptual system models of ecosystem health developed by *Healthy Waterways*.

Key lessons for adaptive learning

Learning insights emerging from these experiences include:

- Understanding of issues affects the development and implementation of solutions.
- Problem framing for complex, multi-dimensional issues is best achieved early in decision-making processes using collaborative processes that validate a range of perspectives.
- Seeking common ground can provide a solid foundation for the development of integrated or novel solutions.
- Modes of communication need to be tailored to needs and preferences of the intended recipients.
- Learning is a continuous process and not limited to a single problem or a defined area of professional life.



Photo: D C Thomsen

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## Indigenous learning strategies

### Lessons from the Nhunggabarra people

The information for this case study is based substantially on the book 'Treading Lightly: The Hidden Wisdom of the World's Oldest People' (Sveiby & Skuthorpe 2006). In this book Karl-Erik Sveiby, a Western scholar in knowledge management, and Tex Skuthorpe, an Indigenous custodian of the Nhunggabarra people, assess the Nhunggabarra 'recipe' for sustainability. In doing so, they apply a knowledge-based theory approach and draw lessons that are applicable to current organisational adaptive learning in complex, uncertain environments.

The Nhunggabarra occupied an extensive area between the Narran and Bokhara rivers in north-western NSW, extending from the southern Queensland border. While this was not a coastal group, and the intention is not to generalise, it is likely that many Australian Aboriginal societies were characterised by similar organisational systems (Sveiby & Skuthorpe 2006).



Source: Jenny Solomon/Dreamstime.com

### Organisational approach

For the Nhunggabarra, the simple but profound societal or organisational goal was to 'keep all alive'. This mission or aim was extended to both human and non-human inhabitants of the land, as they saw the two inextricably linked, and was achieved through a complex, holistic and fully integrated system of societal structures and processes. These structures and processes were underpinned by shared core beliefs and values that were applied practically in their interactions with the environment to which they felt intensely connected.

The Nhunggabarra had a range of tools, methods and strategies that created an integrated response to their 'management' of country. The information used to support this relationship was learnt from a very young age through stories, dance, art and ceremonies and constantly reinforced throughout the community.

Rather than reduce the status of earthly beings to that of a 'natural resource' to be used or manipulated according to whatever purposes they might invent, each being had status as a sacred reality.

The Nhunggabarra system required a constant flow of information and feedbacks from their direct, experiential relationship with country. This involved a view of country in relation to a complex network of stories and 'sacred places' that reflected specific knowledge about the functioning of their integrated social-ecological system and the system of 'sacred law' that allowed it to thrive. When linked together, the stories essentially formed travel routes, 'learning paths,' or 'narrative maps' which defined what their country was and how it was to be sustained. In this way, sustainability could be viewed as being 'spoken' by the country itself, rather than an abstract concept applied to country.

Two principles that were fundamental to the effective organisation of the society were context-specific leadership and

Each individual knew that with knowledge came great responsibility.

knowledge-based organising. These principles meant that leadership, rather than being hierarchical, was shared in a way that roles shifted depending on which individual had the appropriate knowledge for each particular circumstance. Sveiby & Skuthorpe (2006) identify this as a highly advanced form of leadership confined mostly to high performing teams and knowledge-intensive organisations. This system was maintained through trust and respect both from those being led in one particular context and those who may be leading in another. The source of this trust and respect was reinforced through the stories and ceremonies. This system also meant that ‘experts’ were not confined to their field of specialty, but were instead involved both as learners and teachers encouraging a natural networking and transdisciplinary approach.

Key lessons for adaptive learning

Learning insights from the Nhunggabarra’s system of organisation include:

- Integrate economic, ecological, social and spiritual elements in such a way that each serves to strengthen the other
- Create viable and effective networks that provide effective feedback from all parts of the system
- Generate the capacity to respond to feedback in a timely and appropriate way
- Create and encourage truly participative processes that distribute power equitably
- Explore contextual leadership such that ‘experts’ become both learners and teachers
- Generate reflexivity and flexibility as an inherent part of the organisational structure
- Foster trust and respect through formal and informal processes
- Do not force learning or manipulate outcomes according to preconceived ideas or notions
- Listen actively

Final points

For Western learning systems to function effectively across system, organisational and individual scales it will be critical to integrate policy frameworks such that policies become mutually supportive and strengthening – in a sense policy needs to become ‘story.’ Reconnecting organisations to their broader socio-ecological contexts through equitable learning structures and processes offers significant opportunities for adaptation.

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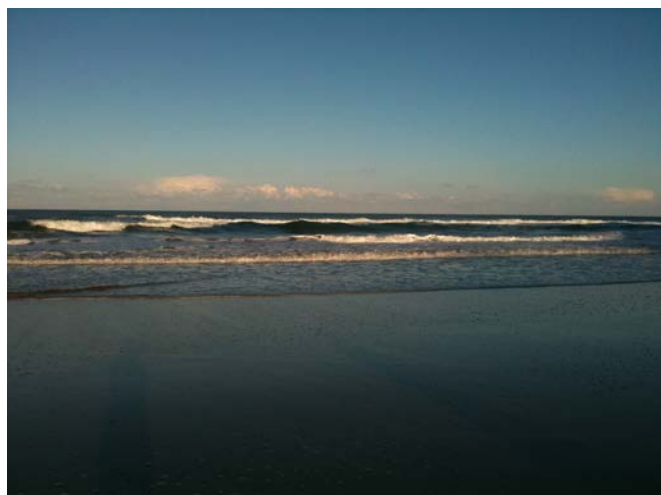


## Initiating sustainability in local government

### A whole-of-organisation approach

The Sunshine Coast Council (SCC), Queensland, Australia is committed to fostering 'Australia's most sustainable region' and governs coastal areas from Caloundra in the South to Noosa in the North that are popular with residents and tourists alike. The council has adopted a range of strategies to achieve its mission (e.g. *The Climate Change and Peak Oil Strategy*, *The Affordable Living Strategy*, and *The Sustainable Transport Strategy*). Of particular significance to the coastal zone, the SCC recently adopted *The Waterways and Coastal Management Strategy* (2011-2021) to guide the management of the region's waterways and coastal foreshores (see [www.sunshinecoast.qld.gov.au](http://www.sunshinecoast.qld.gov.au)).

Consistent with the local government's vision and strategies for the region, the Sunshine Coast Council has also committed to enhancing sustainability across all levels of the organisation. Initiated by the CEO and driven by a small and dedicated team, a range of internal strategies has been implemented since 2009. This case study draws on these experiences to demonstrate how learning can be embedded across a range of organisational levels by using a combination of generic and more targeted strategies to maintain enthusiasm and meet specific needs and expectations of organisation members.



Sunshine Beach. Photo: D C Thomsen.

**"Council's vision is for the Sunshine Coast to become Australia's most sustainable region—vibrant, green, diverse."**

[www.sunshinecoast.qld.gov.au](http://www.sunshinecoast.qld.gov.au)

### Organisational approach

The SCC sustainability vision is a 'major driving force' in ensuring a whole-of-organisation approach to achieving sustainability that is further supported by genuine commitment from the CEO and champions that have volunteered from all areas within the organisation. Importantly, the council also created a cross-departmental Sustainability and Innovation Group that includes a staff position focussed specifically on developing organisational sustainability.

In this way, there is consistency between the SCC regional (broader system) goals, organisational goals, and related organisational structures that provide a platform to develop and encourage sustainable behaviours. The main strategies of the sustainability group have included awareness raising and education using a combination of formal and informal techniques.

Formal strategies included a seminar series and workshops to raise awareness and generate sustainability initiatives from within council. These demonstrated the need for specific or targeted activities as people wanted to see substantial and/or systemic changes quickly and often felt frustrated or disempowered when change was slow. To this end, sustainability champions on every floor and every building have been sought to be the 'go to' person for sustainability and to facilitate programs such as Green Work Week or initiatives such as recycling and reusable coffee mugs. Approximately 150 sustainability champions are currently active across the organisation.

The SCC has also supported 65 staff to complete an accredited Diploma of Sustainability with the Sunshine Coast TAFE. This

has realised three main benefits for the SCC including: (i) the development of a range of new projects explicitly incorporating sustainability; (ii) networking between staff from different departments to break down organisational silos; and (iii) staff development in terms of gaining a broader appreciation of sustainability. A recent review of the program has highlighted the need to tailor training to the needs of specific organisational roles (e.g. an innovation course for managers). The SCC also supports the implementation of ecoBiz (a sustainability business program) in key facilities, and also supports sustainable business practice in tender processes. Most recently, a sustainability action plan has been developed to embed sustainability as ‘business as usual’ into existing processes.

To continue to drive the sustainability agenda and to provide an accessible reference point, the Sustainability and Innovation Group has also developed an intranet site to raise awareness of strategies and achievements and ‘green user tips’ are sent out regularly to all council staff.

Informal strategies, while less visible, are particularly significant and initiated through the sustainability group and champions. These often involve reflective ‘corridor conversations’ concerning ‘how could we do this better?’ Indeed, recent strategies have begun to concentrate on staff that don’t actively identify with sustainability.

The capacity for adaptive learning within the SCC is demonstrated by a combination of clearly identified system goals, organisational goals, and a diversity of strategies at the individual scale that are supported by a formal commitment to learning. In particular, the internal review processes associated with strategies for learning offer significant opportunities for adaptation.

**Key lessons for adaptive learning**

- Ensure that strategies and goals are achievable through clearly identified activities and resources.
- Seek champions and support across all organisational areas and levels.
- Go where the energy is and focus on what works.
- Embed strategies within existing processes.
- Provide accessible and on-going communication and support systems for staff.
- Ensure alignment between system goals, organisational goals and action plans.



Noosa Main Beach. Photo: D C Thomsen.

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## Sea Grass Watch: A collaborative community-based habitat monitoring program

### Building scientific knowledge and empowering local groups

Seagrass-Watch (SGW) is an award winning, community-based, habitat assessment program established in Australia in 1998 (AMCS 2007; McKenzie et al. 2001). SGW functions as a partnership between local conservation groups, industry, government, and various other communities of interest (Finn et al. 2010). The key aim is to raise awareness of the condition and trend of near-shore seagrass ecosystems and provide an early warning for major coastal environmental changes (Finn et al. 2010). This case study relates to the SGW program operating in South-east Queensland.



Source: Mark Doherty/Dreamstime.com

The declining condition and loss of sea grasses from natural and anthropogenic causes was a key driver for SGW in South-east Queensland (Finn et al. 2010). In particular, increasing intensity of human activity in coastal regions and associated impacts on water quality entering estuarine systems is a critical factor in this decline and loss (McKenzie et al. 2001). The combination of limited government resources for extensive seagrass monitoring and pressure from coastal communities concerned about the condition and loss of seagrass was an important factor in the

establishment of the SGW in the region (McKenzie et al. 2001).

### Organisational approach

SGW was developed initially through the Queensland Department of Primary Industries (QDPI), establishing and co-ordinating several steering groups to capture local enthusiasm. The steering groups included representatives from local community organisations, Queensland Parks & Wildlife Services (Environment Protection Authority) and the QDPI. This led to early support through the first round of Natural Heritage Trust funding (NHT1). Key monitoring areas (representing a particular management focus) were identified jointly by community groups and QDPI, with community and industry groups also providing input into initial planning and ongoing monitoring (McKenzie et al. 2001).

The monitoring program utilises simple, but scientifically rigorous methods, with comprehensive training provided for volunteers. A website ensures the data is freely available to all volunteers and relevant management agencies (Finn et al. 2010). Among other uses, data from Seagrass Watch is used by the *SEQ Healthy Waterways* partnership in their Ecosystem Health Monitoring Program, supplementing water quality data (Finn et al. 2010).

**The program strongly emphasises its scientific underpinnings; including consistent data collection, recording and reporting.**

A wide range of associated activities are also used to engage community volunteers. For example, a seminar series on local wildlife and environmental processes involved with seagrass habitat and night time spotlighting expeditions that increase the natural history skills of participants (Finn et al. 2010).

Ongoing funding is supplied largely through *SEQ Catchments*, a regional natural resource management body. Additional funding is provided by the Ecosystem Health Monitoring Program, part of the *SEQ Healthy Waterways* Partnership, as well as industry

representatives and a private trust. In-kind support is also made available through Queensland Parks and Wildlife Service, commercial supporters and various non-government organisations (Finn et al. 2010).

Key lessons for adaptive learning

Learning outcomes emerging from the SGW program include:

- Improved monitoring capacity of coastal issues and resources that is accessible to both resource managers and the community.
- Enhanced communication pathways between government agencies and local communities.
- Improved collaboration between state government agencies in developing information for use in management plans and associated evaluation.
- Integrated community engagement including industry and commercial interests, educational facilities, NGO’s and community groups.
- Community capacity and ownership building through training, experiential learning and collaboration with a range of organisations.

Final points

Seagrass Watch is an innovative and proactive community-based approach that demonstrates the value of community input in the production and application of scientific data. It also provides a mechanism by which communities can directly influence local planning and decision-making.

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## Acknowledging change, cause and probable implications

### Tourism, water and reef quality in Phuket, Thailand

Runoff and sewage discharge from land development can affect the water quality of coastal waters and cause coral reef degradation. Monitoring around Phuket reveals water and reef quality decline with increasing tourist intensity, but improvement with increasing distance from sewage discharge. The effect of wastewater discharge is not localised, but elevated nutrients and turbidity appear to be transported to non-developed sites by currents, and exacerbated in the wet season (Reopanichkul et al., 2010).

*Maintenance or restoration of ecological reef health requires improved wastewater management and run-off control for reefs to deliver their valuable ecosystems services (Reopanichkul et al. 2009).*

The resulting decline in water quality causes substantial ecological shifts including increased macroalgal density and species richness, lower cover of hard corals, and significant declines in fish abundance. Thus, the effects of nutrient pollution and turbidity can cascade across several levels of ecological organisation to change key properties of the benthos and coral and fish communities (Reopanichkul et al. 2009b).

### Community awareness and response

Reopanichkul (2009a) explored tourist, operator and government response to declining water and reef quality to find that marine-focused **international tourists** were largely unaware of any degradation, but would holiday elsewhere if water and reef quality declined significantly. In contrast, **domestic tourists** were well aware of the decline and linked the level of tourism with water and reef quality decline. They indicated willingness to contribute to conservation measures and programs to restore water quality. However, they expressed concern that no such program existed.

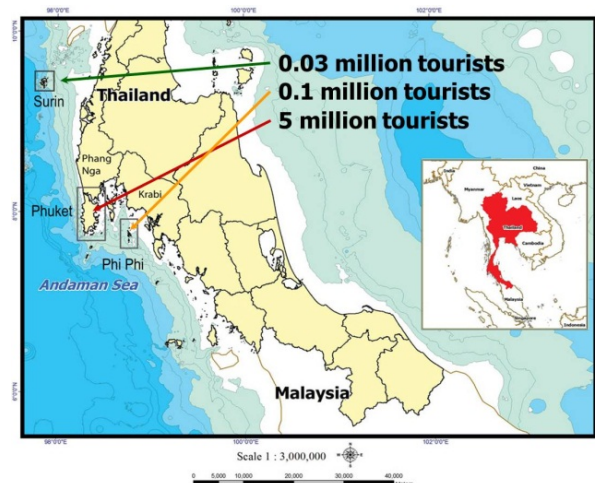


Figure 1 Tourist destinations in the Phuket, Thailand area and visitor numbers

### Institutional awareness and response

**Tourist operators** were also aware of environmental degradation, and their economic dependence on quality natural environments, but did not acknowledge the influence of sewage effluent from accommodation centres. They attributed the cause of environmental decline to residential growth. When asked what might remedy the situation, there were few solutions proposed and little knowledge about waste water management approaches and technologies.

**Government officers** at the national and regional level expressed considerable concern for the situation, especially its economic implications for tourism and fisheries. They cited legislation for impact assessment and sewage plants for developments over 80 rooms. However, developers bypass these requirements by dividing projects into smaller entities. This has led Thai authorities to implement regulations that require resorts or hotels with less than 40 rooms (ONEP 2006; Wong 1998) to comply with water quality protection measures. However, government has been slow in responding to rapid development and its impacts, with little or no enforcement (Wong 1998), and the impact of unplanned tourism development continues.

## Budget constraints leading to ignorance and inaction

Water quality issues can be partly explained by the lack of qualified technicians and budgets for routine maintenance and monitoring of wastewater treatment systems. Construction of public wastewater treatment facilities is usually central government funded, with operation and maintenance transferred to local governments that tend to have limited budgets for such responsibilities—especially in rapidly growing regional areas. Budget constraints also affect capacity for regional water quality monitoring and analysis of effluent from treatment plants. Thus, local and regional management of tourism and urban growth proceeds with limited information.

## Community self-interest and political lack of will

Wastewater treatment fees exist in the two main tourist areas of Thailand (Pattaya and Phuket) for the operation of sewage treatment plants. However, fee collection is not always pursued because many local people strongly resist payment. Mayors and community representatives are democratically elected in most municipalities, making them extremely sensitive to public backlash regarding wastewater charges. Accordingly, the wastewater treatment fees policy is all but moribund (Simachaya 2000).

## Key lessons for adaptive learning

- An effective adaptive response to a threat can be constrained by: (i) personal, community and institutional self-interest, and (ii) institutional ignorance and unwillingness to accept responsibility for environmental decline.
- Institutional ignorance may stem from a lack of knowledge and a short-term economic focus.
- Governance approaches to ameliorate environmental degradation can be constrained by community expectations.
- Financial capacity to address historically-based degrading activity is needed, with a whole of government and community approach, to reverse trends in degradation.

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## The US National Estuary Program

### Applying an Ecosystem-Based Approach to Estuaries and Coastal Catchments

The National Estuary Program (NEP) was created in 1987 to restore and maintain the water quality and ecological integrity of estuaries of national significance that were threatened by pollution, development or overuse. NEP is voluntary and involves federal financial and technical support to estuary projects to facilitate a collaborative planning process. It is administered by the US Environmental Protection Agency (EPA) and currently includes 28 estuary projects in 18 American states and Puerto Rico (Fig. 1). Each of these estuary projects consists of a group of stakeholders who work together to address a wide range of issues facing their estuaries (EPA, n.d.).

#### Organisational approach

The NEP strives to consider the interconnections between estuaries and their catchments, such as the links between upstream causes and downstream impacts (EPA, n.d.). It was established under amendments to the Clean Water Act; and to integrate the NEP, estuaries need to meet the EPA criteria as an estuary of national significance and be nominated by their respective states (Schneider et al., 2006). The 28 estuaries accepted into the NEP receive financial and technical support to develop an integrated Comprehensive Conservation Management Plan (CCMP). The development of the CCMP is the responsibility of a management conference, formed by representatives from federal, state

“Networks in NEP areas span more levels of government, integrate more experts into policy discussions, nurture stronger interpersonal ties between stakeholders, and create greater faith in the procedural fairness of local policy than other comparable estuaries.”

Schneider et al. (2003)

and local governments, NGOs, industries and businesses, academia and the community (EPA, n.d.). Management conferences represent the functional, administrative and institutional structure of an estuary project and comprise a planning process that emphasizes problem definition and flexibility. They are expected to employ diverse forms of information gathering and sharing, public awareness and participation to achieve consensus on management goals and actions, and ensure implementation. Management conferences should also be sensitive to the needs of the stakeholders affected by their decisions while taking in consideration time and financial constraints. Thus, the process underpinning the identification of priority issues and desirable uses of estuaries operates at the ecosystem scale and is collaborative and consensus-based. Imperial and Hennessey (1996) also highlight the iterative nature of the NEP process where problems are continually redefined and actions and strategies regularly assessed.



Florida everglades. Photo: Snehitdesign

## Key lessons for adaptive learning

The lessons accounting for NEP success are summarised from EPA (n.d.), and include:

- Recognising catchment or ecosystem boundaries since environmental issues transcend political jurisdictions
- Providing a neutral forum to bring together diverse interest groups and create an equitable decision-making process
- Engaging citizens in decision-making and problem-solving process
- Employing consensus-building processes to identify goals, objectives, and actions that reflect stakeholder priorities and interests
- Ensuring that decisions are based on sound science and implemented using adaptive strategies
- Sharing information with policy-makers and the public
- Developing and applying innovative and adaptive approaches to environmental issues
- Securing long-term stakeholder commitment
- Sharing lessons learned through outreach and education efforts.

## Summary

The NEP was created to address threats to estuaries of national significance by employing an ecosystem-based approach. It is illustrative of how integrated approaches to major coastal issues could be developed through a holistic view that considers the ecological and social interconnections of coastal environments, the engagement of relevant stakeholders and community, and promotion of collaborative and consensus decision-making. The NEP has been regarded as a success in creating networks across different levels of government, integrating experts into policy discussions, nurturing strong interpersonal ties between stakeholders, and creating trust in the fairness of local policy (see Schneider et al., 2006).



Photo: John Wollwerth

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## Project Twin Streams

### Voluntary property acquisition in a vulnerable coastal community

Waitakere City (population approximately 204,000) is located within the Auckland Regional Council area of New Zealand. The Project Twin Streams area focused on in this case study covers 10,000 hectares of mostly urban residential development intersected by streams draining from the Waitakere Ranges to the west of Auckland and flowing into a number of other streams and the Waitemata Harbour.

Development within the catchment has enlarged the extent of impermeable surfaces leading to increased storm water runoff, erosion and sedimentation of streams and flooding of houses. Storm water studies and flood modelling carried out in the late 1990s resulted in the development of Project Twin Streams in 2002. Recognition of the likelihood of more frequent and severe storms projected from climate change have also focussed attention on addressing problems related to flooding (Atlas Communications & Media Ltd 2010).

The objectives for the Project are consistent with sustainability principles for long-term social and environmental well-being. After consideration of storm water studies, flood plain modelling and engineering options, the Council decided that acquiring the private properties lying within the 100-year flood plain level to allow natural flow paths and flood reserves would best meet these objectives.



Image source: Wikimedia Commons

**Waitakere City Council prides itself as New Zealand's first *Ecocity* and is committed to the principles of sustainability and enacting Agenda 21.**

[www.waitakere.govt.nz/abtcit/ec/agenda21.asp](http://www.waitakere.govt.nz/abtcit/ec/agenda21.asp)



Image source: Creative Commons / Sandy Austin

It also decided that the social impact and potentially drawn out legal costs of compulsory purchase could be ameliorated through a more conciliatory approach. Specifically, the Council's goal was to purchase properties "in a way which respects property owners' rights, avoids coercion and is fair," (Atlas Communications & Media Ltd 2010, p.6). Auckland Regional Holdings, a statutory infrastructure development fund, funded the Project.

### Organisational approach

A project team, with social and technical skills, spent nine months developing an action plan with clear lines of communication and responsibilities to facilitate property owners' understanding of the local catchment, the risks, and options for sale and resettlement. Extensive information resources were produced for use in home visits, a drop-in information day, and a call centre. Communication with property owners, political representatives, legal aid and the media, was coordinated to avoid misinformation and perceptions of coercion.

## Key lessons for adaptive learning

The following have been summarised from Atlas Communications & Media Ltd (2010):

- Ensure an appropriate mix of skills relevant to the context (e.g. social and technical skills)
- Ensure transparency, consistency and clarity in purpose and process
- Engage affected community members from the beginning
- Provide flexibility by ensuring a range of options
- Provide accessible communication and support systems for community members

## Adaptive behaviours and socio-ecological outcomes

Some 98 properties and 83 partial properties were identified as being at risk of flooding. Two years before its planned completion date, Project Twin Streams has acquired the majority of properties at risk of flooding without using compulsory purchase statutes, created gardens and walk and cycle ways on the land now in public reserves, and re-established riparian zones (Atlas Communications & Media Ltd 2010).

- Reduced risk of flooding of property and harm to residents
- Improved ecosystem functionality
- Increased recreational amenity

The decision to acquire at-risk properties through a well-resourced, collaborative approach was underpinned by a commitment to sustainability and represents a proactive approach to reducing the risk to the community from flooding. Adequate resourcing to ensure clear communication of scientific, technical, legal and logistical information, and support for property owners while they negotiated challenging and sometimes emotional decisions was important. This case illustrates how the challenges of ensuring human health and safety while restoring ecosystem function can be achieved through a partnership approach with those affected.

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## Final points

*"Adaptive learning can be triggered by information at different scales, especially when the relationship between scales is clear. Biophysical information alone is insufficient to achieve adaptive behaviours; a much broader suite of information and resources are needed. Local community knowledge and trust are vital and can be gained through the sharing of information and direct interaction."*

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## Toolkit Annotations

- Adaptive Management
- Integrated Coastal Zone Management
- Organisational Learning
- Resilience
- Sustainable Learning



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**Holling, C.S. 1978. Adaptive Environmental Assessment and Management. Chinchester, USA: Wiley.**

**Publication type:** Book

**Aim/objectives:** Describes an alternative approach to environmental assessment, recognising that uncertainty cannot always be resolved and therefore the need for management to learn from actions.

**Geographic focus:** General application

**Methods:** Theory and case studies (USA)

**Key findings:** This is a core book in instigating the adaptive management movement. It reports on the findings from a workshop at the International Institute for Applied Systems Analysis in Vienna, Austria. In the first chapter, Hollings presents myths of modern environmental assessment, wherein stable policy, the consideration of the environment after social and economic considerations, and the need (and utility) of detailed science are challenged, given the view of nature as a shifting target for managers. Holling argues that scientists and managers should come together to share existing knowledge, identify uncertainties, consider multiple possible management options, evaluate these options using ecological models, monitor (i.e. by treating policy implementation and management actions as experiments), and adapt management on the basis of newly gained information. The remainder of the book details assessment and workshop procedures, and provides a diversity of case studies in which the approach was applied. Hollings's emphasis is on mathematical modelling and experimentation (including 'treatment' and 'non-treatment' study sites). The concept of adaptive management has advanced in two directions since this book was published. Firstly, computer power has increased dramatically, enabling massive advances in tools and techniques for model development and policy simulation capacity (e.g. fisheries assessment and management). Secondly, much greater understanding has been gained about how to include non-specialist input into the process of assessing what is known, and about the institutional challenges for adaptive management.

**Lessons for adaptive learning:** There are two key lessons that are relevant to adaptive learning. First is the notion of domains of attraction. Essentially, Holling argues for an alternative world view to the one that underpins (or underpinned) environmental management – i.e. that systems, outside of undue human influence, are in equilibrium, that there is a singular point of 'balance'. Instead, he argues that systems have multiple 'domains of attraction' and that processes can cause system flips from one domain to another. These domains are also shifting. Second, Holling contributes the notion of models to adaptive learning. Although he argues for the use of mathematical models, the point is that all models, whether mathematical, a graphic of the relationship between two or more variables, or a series of boxes and arrows, represent assertions about how the 'world,' relevant to the learning task at hand, works. Thus, models make assumptions explicit and testable. Models are also a useful means to capture different views of what is occurring, and a way to link these different views together to form a shared understanding of a situation, given that they enable points of disagreement between different stakeholders to be easily identified.

**Keywords:** adaptive management, learning, assessment

# Appendix 2: Benchmark of adaptive learning



# Preliminary summative data from the survey of monitoring and evaluation in the coastal zone

[www.csiro.au](http://www.csiro.au)

Report prepared by

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University of Wollongong



Citing this report

Carter RW, Jacobson C, Thomsen DC and Smith TF 2013, *Preliminary summative data from the survey of monitoring and evaluation in the coastal zone*, unpublished report for the CSIRO Coastal Collaboration Cluster, Sustainability Research Centre, University of the Sunshine Coast, Sippy Downs, Queensland, Australia.

## Summary

An adaptive management approach is essential in the coastal zone given the inherent complexity and uncertainty involved in coastal socio-ecological systems, and the numbers of actors involved.

Monitoring and evaluation (M&E) performs a critical role in adaptive management, helping to identify outcomes and the factors that contribute to them, so that management can be adapted accordingly.

We conducted a baseline survey of M&E programs in coastal organisations, involving respondents from 40 organisations from all States and Territories and from the Federal Government. M&E was an important focus of all respondent organisations, predominantly for the purposes of increased understanding, community engagement, adapting decision-making and reporting; with an average of 9 programs per respondent organisation. The most useful programs were scheduled regularly, conducted quarterly or more regularly, combined qualitative and quantitative information, and involved data on biophysical or organisational aspects of management. Further, these programmes were most likely to involve the review of outcomes or biophysical conditions. The comprehensiveness of elements that M&E programs focus on was not however high; a focus on reviewing socio-economic conditions, resourcing and activity implementation were likely to be neglected when M&E program breadth decreased. Without limited M&E focus, respondent organisations are less well placed to identify appropriate adaptive actions related to resourcing, social capacity and capability or implementation methods. Although respondents normally had time to evaluate M&E information, most considered M&E light or insufficient. Without improvements in the breadth and extent of M&E, the practice of adaptive management will likely remain limited.

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## 1.0 Introduction

Marine and coastal areas in Australia consist of ecosystems in which there are many actors. The effects of activities in one part of an ecosystem have implications for other ecosystems. This results in high levels of complexity and uncertainty. An adaptive approach to management is therefore essential. Effective implementation of adaptive management requires appropriate indicators for monitoring and evaluating management outcomes and the factors that affect them (e.g. biophysical and socio-ecological conditions, planning and objective setting, activity implementation, resourcing, and management outputs), timely assessment, and opportunity for evaluation. The survey presented here provides the first step in understanding the use of science to inform management decision-making in the coastal zone, by reviewing the extent of monitoring and evaluation in the coastal zone. It is constrained by the multiplicity of monitoring activities for a range of different purposes other than adaptive management (e.g., reporting), although we suspect an emphasis on condition reporting exists, rather than adaptive management and learning.

## 2.0 Methods

We created a purposely-built online survey to assess monitoring and evaluation activities. The survey included questions about:

- the organisation type and location;
- the importance of monitoring and evaluation;
- the generic uses of monitoring and evaluation data;
- the numbers of monitoring and evaluation programs for different purposes;
- the most important monitoring and evaluation activity (including purpose, regularity, frequency, data type);
- Sufficiency of evaluation processes (including time for reflection on results, and influence on actions
- Overall perspective on monitoring and evaluation.

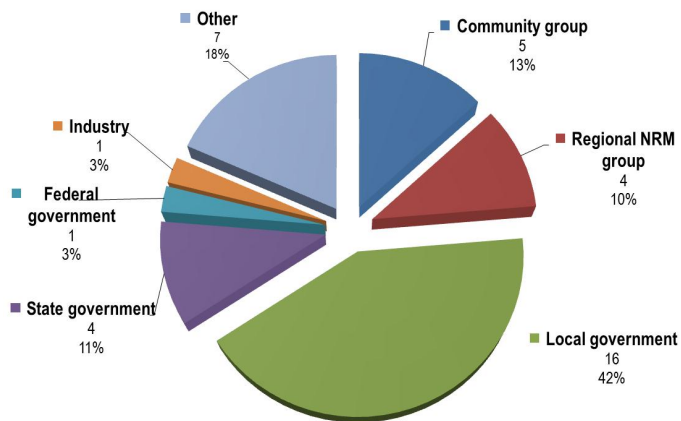
A copy of the full online survey is included in Appendix A. The survey was circulated to the following organisations:

- Coastal-based Natural Resource Management Regional Management Bodies and Catchment Management Authorities
  - Industry groups (e.g. Australian Coastal Society)
  - Community groups, e.g. Ocean Watch Australia, Surf Lifesavings Australia)
  - Universities and research institutes
  - Consulting firms (Ainley project, Coastal Zone Management Pty, DHI Group)
  - Coastcare groups
  - Local Councils and Local Council Groups (e.g. Sydney Coastal Councils Group)
  - Federal and State Government departments (e.g. Great Barrier Reef Marine Park Authority)
-

## 3.0 Results

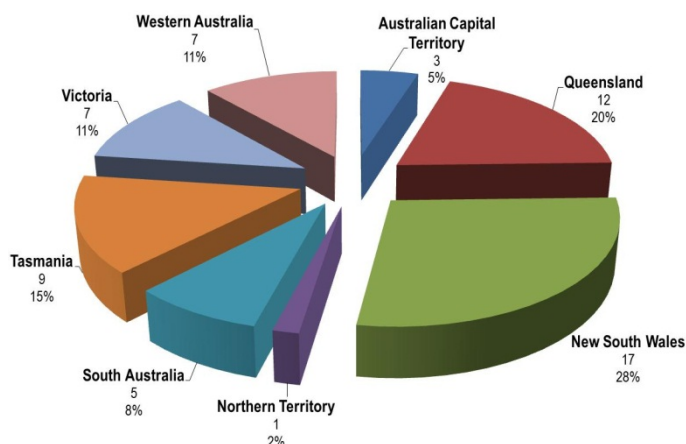
### 3.1 Survey respondents

Respondents to the survey were dominated by local government, community groups and Regional NRM groups (65%) (Figure 1). Other respondents were mainly from government. This reflects the number and nature of organisations invited to take the survey.



*Figure 1 Agencies of respondents (n=38)*

Nearly 50 per cent of respondents were from either Queensland or New South Wales (Figure 2).

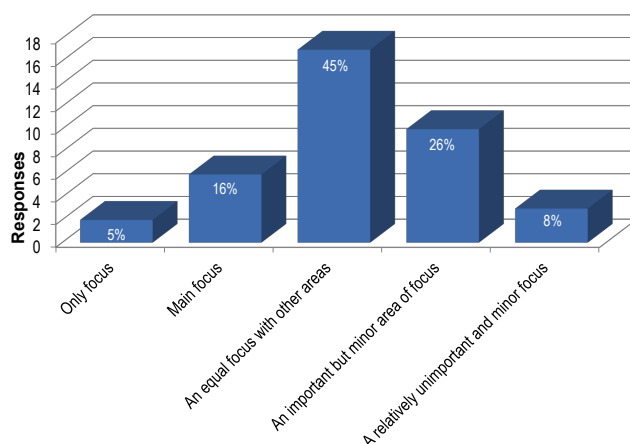


*Figure 2 Home states of respondents (n=38)*

The bias in respondents is directly related to the invitations to participate. Additional invitations have been sent to gain a more representative sample.

### 3.2 M&E focus of respondent organisations

Around 65 per cent of respondents indicated that M&E was either the only, of equal with other areas, or the main focus of their organisation (Figure 3).



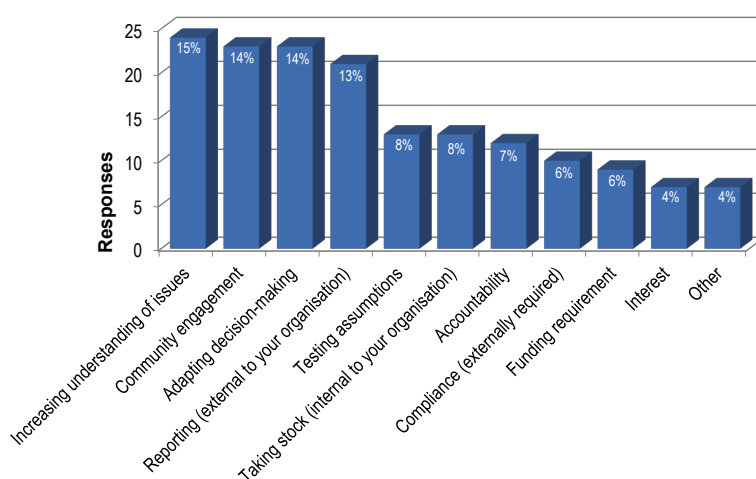
**Figure 3 M&E focus for respondent organisations (n=38)**

Ninety per cent of respondents reported that their organisations had M&E programs. Most organisations had 1-5 M&E programs (average 9), with an emphasis on reviewing bio-physical conditions and program objectives (Table 1).

**Table 1 Number of M&E programs and focus (n=30)**

	20+	16-20	11-15	6-10	1-5	0
Reviewing bio-physical conditions	2	0	1	2	19	6
Reviewing socio-economic conditions	0	1	1	2	14	12
Reviewing objectives	1	2	2	1	18	6
Reviewing plans	1	2	1	0	20	3
Reviewing resourcing	1	1	1	4	15	8
Reviewing how activities were implemented	1	1	3	4	16	5
Reviewing outputs	3	0	2	4	16	5
Reviewing outcomes	3	0	3	2	20	2
Average	1.5	0.9	1.8	2.4	17.2	5.2
n	12	7	14	19	138	47
%	5.1	3.0	5.9	8.0	58.2	19.8

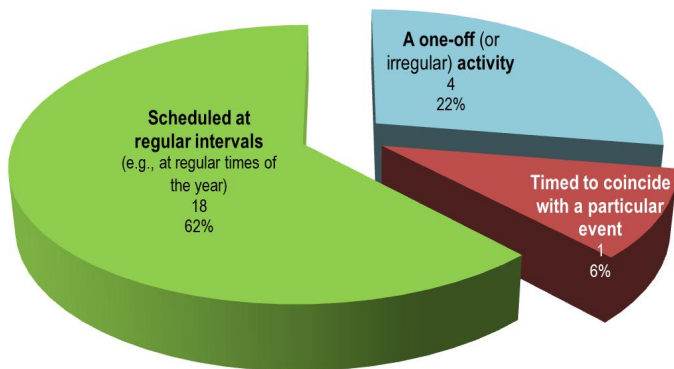
Use of M&E information was most often applied to increase understanding of issues, for community engagement, to adapt decision making and for external reporting (Figure 4). However, fewer than half of the respondent organisations reported that they applied M&E to test assumptions, which is a key part of the adaptive management cycle (Figure 4).



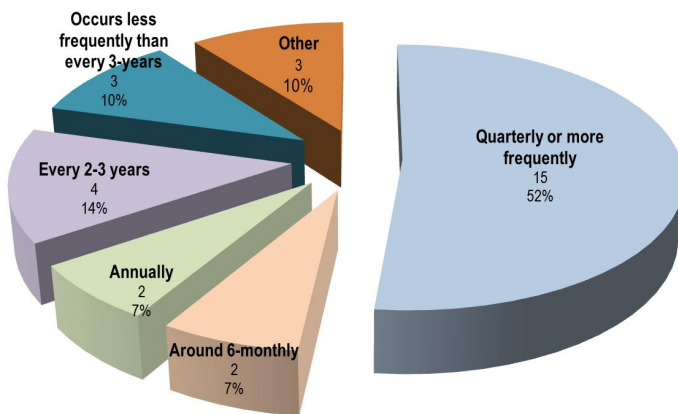
**Figure 4 Uses of M&E data (n=162 from 30 respondents)**

### 3.3 Profile of the most useful M&E program

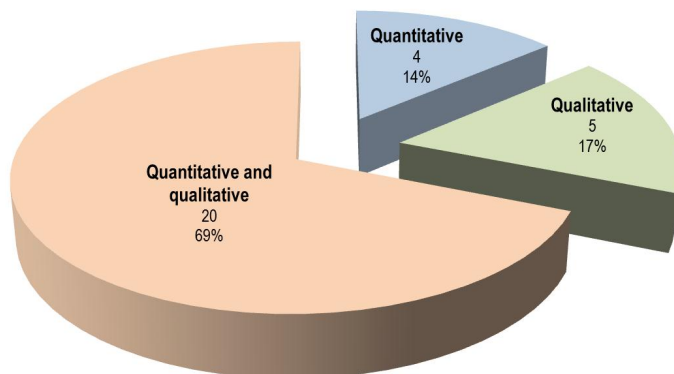
The most useful M&E programs are characterised by being scheduled at regular intervals (Figure 5), quarterly or more frequently (Figure 6), collecting both quantitative and qualitative data (Figure 7), and an emphasis on monitoring and evaluating biophysical status and management (Figure 8).



*Figure 5 Regularity of most important M&E activity (n=23)*



*Figure 6 Frequency of most important M&E activity (n=29)*



*Figure 7 Data type for most important M&E program*

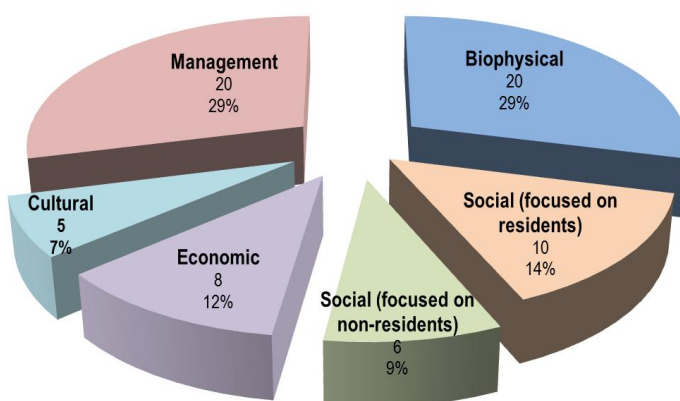


Figure 8 Focus of most important M&E program

### 3.4 Use of the most useful M&E information

Reviewing outcomes of activities was reported as the major use of the most useful M&E program (Figure 9). However, use for reviewing resourcing, plans and outputs were around half of this (Figure 9). To effectively learn from experience and adapt management appropriately, monitoring and evaluation needs to focus on all of the elements of the management cycle. Gaps in assessment across elements of the management cycle limit the ability to do adapt management appropriately.

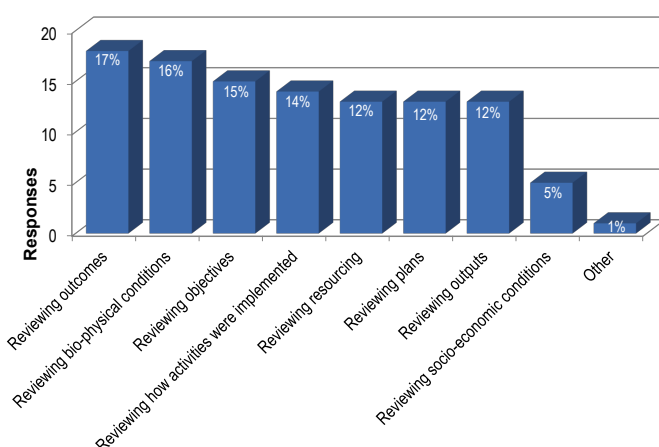


Figure 9 Use of the most useful M&E program

To determine the effectiveness of M&E for adaptive management, we analysed the breadth of monitoring and evaluation focus for the most useful programs for those organisations that used M&E for adaptive management (22 respondents). Table 2 summarises the relationship between assessment breadth, and gaps in element assessment focus for this sub-sample.

Table 2 Gaps in M&E focus in relation to breadth (n=22)

		Number of elements missing					
		1	2	3	4	5	7
M&E focus elements	Reviewing bio-physical conditions		33%	33%	40%	50%	100%
	Reviewing socio-economic conditions	100%	100%	100%	40%	100%	100%
	Reviewing objectives		33%	33%	60%	50%	25%
	Reviewing plans		33%	33%	40%	75%	100%
	Reviewing resourcing			67%	60%	100%	100%
	Reviewing how activities were implemented			33%	60%	25%	100%
	Reviewing outputs				20%	50%	100%
	Reviewing outcomes						75%
n		1	3	3	5	4	4

Two respondents (University and Local Government) focussed on all elements of the management cycle; whilst four focussed on only one element. While the former are effective in their approach to adaptive management, the latter are managing more reactively, given their inability to use M&E to identify how to adapt. Only 41% of respondents covered half or more of the elements of the management cycle.

Aside from Universities and Local Councils being the most comprehensive in assessments, there was no apparent pattern in comprehensiveness of responses by institutional type. This is somewhat surprising given the emphasis on MERI evaluation in Natural Resource Management.

For those claiming to conduct M&E for the purpose of adaptive management, elements most likely to be excluded from assessment focus are resourcing and socio-economic conditions. This means it is difficult to assess the cost-effectiveness of programs, or to determine the likely capacity for undertaking activities, particularly given high reliance on volunteers in the coastal zone.

Assessment focus on biophysical condition is typically the 2<sup>nd</sup> or 3<sup>rd</sup> element omitted from assessments, and makes it difficult to distinguish the effectiveness of management activities from broader environmental change.

An M&E focus on informing planning and objective setting were also likely to be the 2<sup>nd</sup> or 3<sup>rd</sup> elements omitted. This is a concern if plans and objectives are driving actions – the appropriateness of the plan/objective cannot be assessed. However, ¾ participants only assessing one element were assessing planning.

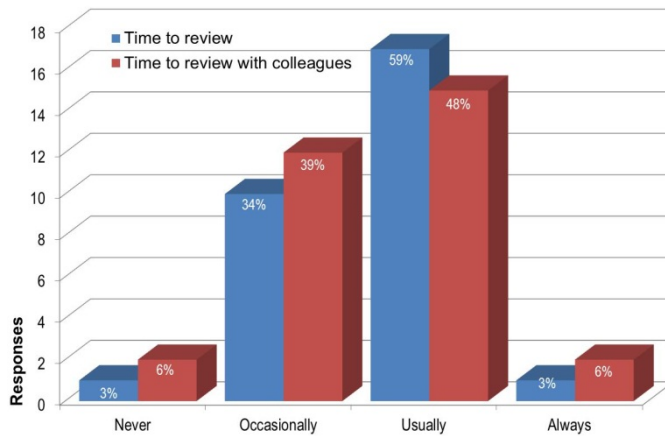
An assessment focus on implementation is typically the 4<sup>th</sup> or latter element omitted. This is less concerning than the omission of other elements, but means that respondent organisations are missing the opportunity to identify more effective methods for undertaking their activities.

An M&E assessment focus on outputs and outcomes are the least common omissions from M&E programs overall. They are typically the 4<sup>th</sup> or later elements omitted. However, these figures suggest some people are adapting management without a clear understanding of the outcomes they are achieving. Three respondents measured neither outcomes nor objectives. These programs are about the condition of erosion protection structures, coastal recession assessment for improved beach access, and water quality and ecosystem health. At least the first ought to have output/outcome assessment.

### **3.5 Reflecting on and applying M&E**

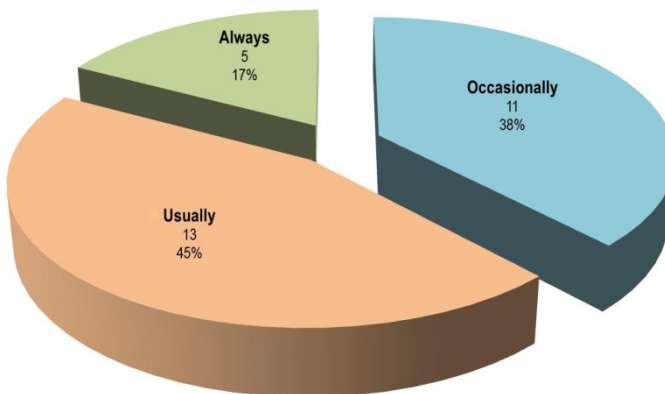
Just under 60 per cent of respondents indicated there was usually time available to review the monitoring data collected; however, under 50% per cent of respondents reported that time was available to review the monitoring data with colleagues (Figure 10). The result that 40% of monitoring data are reviewed occasionally or never challenges any assertion that the canvassed organisations are using M&E as an adaptive learning stimulus. Personal learning may occur, but collective learning is more limited.

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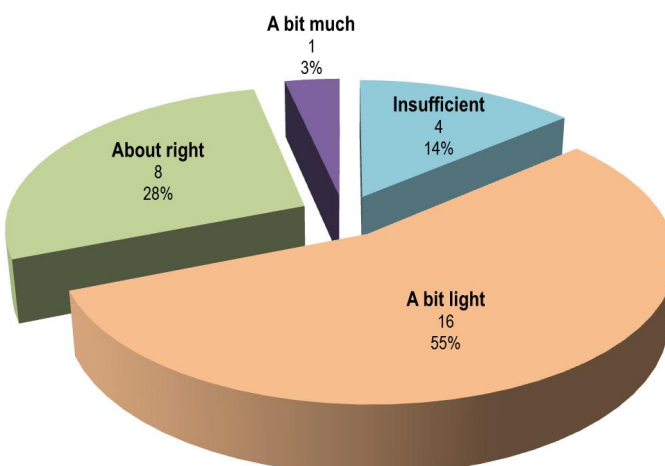
**Figure 10 Time available to review/evaluate M&E data**

While over 80 per cent of respondents reported that M&E usually or occasionally informed actions, only 17 per cent reported that it always informed actions (Figure 11). While M&E has many uses, an adaptive approach to management demands that monitoring and evaluation should almost always inform actions.



**Figure 11 M&E informs action**

Nearly 70 per cent of respondents considered that their organisation's emphasis on M&E was either insufficient or a bit light (Figure 12). This indicates that M&E and adaptive learning are not yet normative approaches to management in the coastal zone.



**Figure 12 Sufficiency of agency M&E programs**

### 3.7 Perspectives of M&E

The invitation to describe respondent's perspective of M&E elicited responses dominated by the importance of M&E. Over 60 per cent of respondents used the words 'critical', 'essential', 'vital' or 'important' in the context of:

*"Essential to adaptive management but not funded appropriately"*

*"Vital for increased understanding of coastal processes"*

*"Important, without it very hard to argue for future action"*

Others emphasised the need for *"comprehensible parameters"*, approaches that moved beyond *"box-ticking"* and expression that M&E was *"undervalued and complicated"*.

## 4.0 Discussion and benchmarks

### 4.1 Discussion

The survey responses indicate clear support for M&E and appreciation of its role in adaptive management of the coastal zone. While most organisations have a number of formal M&E programs, the responses indicate that organisational review is not always present and hence, application of adaptive learning may be less than desired.

Monitoring tends to emphasise assessment of outcomes in the biophysical and management areas. However, the absence of M&E programs covering all elements of the management cycle means that biophysical status and management outcome success (or lack of success) cannot be attributed to any specific part of the management process (e.g. resourcing, planning, processes, outputs), and therefore the effectiveness of adaptive management responses is likely to be limited.

### 4.2 Benchmarks

**Benchmark 1:** Monitoring and evaluation is recognised by organisations as an essential part of the adaptive management process.

**Benchmark 2:** At least one formalised program of M&E exists in organisations for major programs of activity to inform future management action.

Preferred practice: The success of all activities is monitored and evaluated to inform future management action, with the level of monitoring being appropriate to the nature and importance of the activity to the achievement of organisational mission, goals and plans.

**Benchmark 3:** M&E programs focus on understanding the status of biophysical resources and outcomes from management action.

Preferred practice: Monitoring programs exist to assess the influence of socio-economic conditions, the clarity of objectives and plans, the adequacy of resourcing, the effectiveness of management systems, and activity outputs, in determining the status of biophysical resources and activity outcomes.

**Benchmark 4:** M&E is used to increase understanding of issues in the coastal zone, engage with local communities, modify decision-making, and for reporting to internal and external stakeholders.

Preferred practice: M&E programs continue to be used for multiple purposes, but with increasing emphasis on formally testing assumptions upon which management decisions are made.

**Benchmark 5:** M&E programs are scheduled at regular intervals, according to the sensitivity of the parameter being assessed.

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Preferred practice: M&E programs are a routine part of all management action, with programs in place to respond to unusual natural events or human perturbations to the coastal zone.

**Benchmark 6:** M&E programs use both quantitative and qualitative measures according to the degree of certainty needed for making a management decision.

**Benchmark 7:** Organisations always allow time for staff responsible for monitoring programs to evaluate the management effectiveness of activities.

Preferred practice: Organisations always allow time for staff responsible for monitoring programs to evaluate the management effectiveness of activities with colleagues and stakeholders.

**Benchmark 8:** Most M&E programs are designed to inform future management activity.

Preferred practice: All M&E programs are designed primarily to inform adaptation of all components of management activity, and secondarily for other uses.

**Benchmark 9:** M&E programs are sufficient to inform the most important activities of organisations.

Preferred practice: M&E programs exist for all organisational activities; the scale of the program being determined by the organisational mission, goals and plans.

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## Appendix A: Online survey



### Welcome to the monitoring and evaluation and adaptive learning website

The 'Benchmarking monitoring and evaluation in the coastal zone' survey and the 'Becoming an Adaptive Learning Organisation' tool form part of a major 2-years (2010-12) partnership between the CSIRO Wealth from Oceans and Climate Adaptation Flagships with the University of the Sunshine Coast, Curtin University of Technology, Adelaide, Flinders, Deakin, Tasmania and Wollongong Universities. The research partnership aims to identify barriers to uptake of science in the coastal zone; generate a clearer model of how researchers can engage more effectively with stakeholders and decision makers; enable better science uptake; and ultimately improve management outcomes. For more information about the project please visit <http://www.csiro.au/en/Organisation-Structure/Flagships/Wealth-from-Oceans-Flagship/Coastal-Cluster.aspx>

In this part of the project, we are seeking to identify the nature and extent of monitoring and evaluation activity that informs management in the coastal zone of Australia, and to assist organisations in using evaluations to improve learning.

#### Benchmarking monitoring and evaluation

The 'Benchmarking monitoring and evaluation in the coastal zone' survey will be used to identify the status of monitoring and evaluation activity in the coastal zone. It also seeks to help you consider how your monitoring and evaluation activities might be better focused and improved to inform future activities. Additional information on the purpose and use of the survey is given at the start of the survey. The survey should take no more than 10 mins to complete.

#### Becoming an adaptive learning organisation

The 'Becoming an adaptive learning organisation' tool provides a framework for individuals or groups to review how their organisation is learning from experience and use of monitoring and evaluation activities. It seeks to stimulate ideas on how adaptive learning can be improved in your organisation. Additional information on the purpose and use of the survey is given at the start of the survey. The survey requires careful consideration, so it may take some time to complete.



### Benchmarking monitoring and evaluation in the coastal zone

#### Confidentiality and consent

By **taking the surveys** you are acknowledging you understand their purposes and intended uses (benchmarking monitoring and evaluation and adaptive learning). You are also acknowledging that your responses will be used for reporting collective responses and that no individual or organisation will be identified.

By **registering as a site user**, you are acknowledging that your responses can be tracked over time and only used for the purposes of this project. Each survey requires you to give consent for use of your responses.

Your formal consent to use the information you provide is sought at the start of the survey and tool.

#### Project team

The team for this part of the project is: RW (Bill) Carter (M&E Project leader), Chris Jacobson (Research Fellow), Dana Thomsen (Adaptive learning Project leader) and Tim Smith (Team leader), from the Sustainability Research Centre, University of the Sunshine Coast, Sippy Downs, Queensland 4556. Bill can be contacted at [bcarter@usc.edu.au](mailto:bcarter@usc.edu.au).





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## Benchmarking monitoring and evaluation

We invite you to complete a short survey that forms part of a major 2-years (2010-14) partnership between the CSIRO Wealth from Oceans and Climate Adaptation Flagships with the University of the Sunshine Coast, Curtin University of Technology, Adelaide, Flinders, Deakin, Tasmania and Wollongong Universities. The research partnership aims to identify barriers to uptake of science in the coastal zone; generate a clearer model of how researchers can engage more effectively with stakeholders and decision makers; enable better science uptake; and ultimately improve management outcomes.

For more information about the project please visit <http://www.csiro.au/en/Organisation-Structure/Flagships/Wealth-from-Oceans-Flagship/Coastal-Cluster.aspx>

We are seeking to identify the nature and extent of monitoring and evaluation activity that informs management in the coastal zone of Australia. We are aware that monitoring and evaluation occurs informally in most areas of an agencies activities, but we would like to particularly clarify the extent of formal programs and their contribution to adaptive management.

### Project team

The team for this part of the project is: Bill Carter (M&E Project leader), Chris Jacobson (Research Fellow), Dana Thomsen (Adaptive learning Project leader) and Tim Smith (Team leader), from the Sustainability Research Centre, University of the Sunshine Coast, Sippy Downs, Queensland 4556. Bill can be contacted at [bcarter@usc.edu.au](mailto:bcarter@usc.edu.au).

### Confidentiality and consent

The University of the Sunshine Coast conducts research in accordance with the National Statement on Ethical Conduct in Human Research. This research has been approved by the University of the Sunshine Coast's Ethics Committee under the number A/12/390.

ALL SURVEY RESPONSES ARE CONFIDENTIAL. YOUR NAME AND ORGANISATION WILL NOT BE USED IN ANY PUBLICATIONS RESULTING FROM THE SURVEY WITHOUT YOUR CONSENT.

Any of the Project team can be contacted to answer questions regarding the research and procedures. If there are any concerns or complaints regarding the way in which this research is conducted, contact the University's Research Ethics Officer on (07) 5439 4374 or [humanethics@usc.edu.au](mailto:humanethics@usc.edu.au).

By taking the survey you confirm your understanding of its purpose and intended uses (benchmarking monitoring and evaluation and adaptive learning). You are also acknowledging that your responses will be used for reporting collective responses and that no individual or organization will be identified.

To proceed to Survey Questions please consent to the confidentiality agreement and click start

☒ To provide your consent check this box +

 **Start**



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## Benchmarking monitoring and evaluation in the coastal zone

### About your organisation

Q1 What type of organization do you represent? \*

- ☐ Community group
- ☐ Regional NRM group
- ☐ Local government
- ☐ State government
- ☐ Federal government
- ☐ Industry
- ☐ Other - please specify

Q2 In which area(s) of Australia is your organisation located? \*

- ☐ Australian Capital Territory
- ☐ Queensland
- ☐ New South Wales
- ☐ Northern Territory
- ☐ South Australia
- ☐ Tasmania
- ☒ Victoria
- ☐ Western Australia

Q3 How important is coastal management compared to other issues within your organisation? \*

- ☐ Only focus
- ☐ Main focus
- ☐ An equal focus with other areas
- ☐ An important but minor area of focus
- ☐ A relatively unimportant and minor focus

Q4 Does your organisation conduct any monitoring and evaluation? \*

- ☐ Yes
- ☐ No

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## Benchmarking monitoring and evaluation in the coastal zone

### Monitoring and evaluation purpose

Q5 How do you use the information from your monitoring and evaluation activities? (Tick all that apply) \*

- ☐ Adapting decision-making
- ☐ Increasing understanding of issues
- ☐ Testing assumptions
- ☐ Funding requirement
- ☐ Accountability
- ☐ Compliance (externally required)
- ☐ Community engagement
- ☐ Taking stock (internal to your organisation)
- ☐ Reporting (external to your organisation)
- ☐ Interest
- ☐ Other

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## Benchmarking monitoring and evaluation in the coastal zone

### Monitoring and evaluation scope

Q5 How many of your monitoring and evaluation activities include the following?

Number of activities

	0	1-5	6-10	11-15	16-20	20+
Reviewing bio-physical conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing socio-economic conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing resourcing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing how activities were implemented	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing outputs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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## Benchmarking monitoring and evaluation in the coastal zone

### Your most important monitoring and evaluation activity

Q7 Name/describe your most important monitoring and evaluation activity \*

Q8 For your most important monitoring and evaluation activity, what is its focus? (Tick all that apply) \*

- ☐ Reviewing bio-physical conditions
- ☐ Reviewing socio-economic conditions
- ☐ Reviewing objectives
- ☐ Reviewing plans
- ☐ Reviewing resourcing
- ☐ Reviewing how activities were implemented
- ☐ Reviewing outputs
- ☐ Reviewing outcomes
- ☐ Other

Q9 For your most important monitoring and evaluation activity, is it... \*

- ☐ a one-off (or irregular) activity
- ☐ timed to coincide with a particular event (e.g., during a storm event)
- ☐ scheduled at regular intervals (e.g., at regular times of the year)

Q10 For your most important monitoring and evaluation activity, how often is it undertaken? \*

- ☐ Quarterly or more frequently
- ☐ Around 6-monthly
- ☐ Annually
- ☐ Every 2-3 years
- ☐ Occurs less frequently than every 4-years
- ☐ Other

Q11 For your most important monitoring and evaluation activity, is the type of data you collect... \*

- ☐ Quantitative
- ☐ Qualitative
- ☐ A mixture of quantitative and qualitative

Q12 For your most important monitoring and evaluation activity, is the type of data you collect... (Tick all that apply) \*

- ☐ Biophysical
- ☐ Social (focused on residents)
- ☐ Social (focused on non-residents)
- ☐ Economic
- ☐ Cultural
- ☐ Management

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## Benchmarking monitoring and evaluation in the coastal zone

### Monitoring and evaluation impact and sufficiency of your overall program

**Q12 Is there sufficient time available for you to critically consider the implications of the monitoring and evaluation information you collect?** \*

- ☐ Never
- ☐ Occasionally
- ☐ Usually
- ☐ Always

**Q13 Is there sufficient time available for you to critically consider the implications of the monitoring and evaluation information you collect with colleagues?** \*

- ☐ Never
- ☐ Occasionally
- ☐ Usually
- ☐ Always

**Q14 Do your monitoring and evaluation activities inform the actions of your organisation?** \*

- ☐ Never
- ☐ Occasionally
- ☐ Usually
- ☐ Always

**Q15 Do you consider the monitoring and evaluation activities of your organisation to be** \*

- ☐ insufficient
- ☐ a bit light
- ☐ about right
- ☐ a bit much
- ☐ excessive

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## Benchmarking monitoring and evaluation in the coastal zone

### Overall perception of monitoring and evaluation

**Q17** In one or two words describe your overall perspective on monitoring and evaluation \*

**Q18** Is there anything else you would like to tell us about monitoring and evaluation or this survey?

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# Appendix 3: Journal articles

# Enhancing Science Impact in the Coastal Zone through Adaptive Learning

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## ABSTRACT

SMITH, T. F., CARTER, R. W., THOMSEN, D. C., MAYES, G., NURSEY-BRAY, M., WHISSON, G., JONES, R., DOVERS, S., and O'TOOLE, K., 2009. Enhancing science impact in the coastal zone through adaptive learning. Journal of Coastal Research, SI 56 (Proceedings of the 10th International Coastal Symposium), pg 1306–1310, Lisbon, Portugal.

The impact of science to support coastal management may be reduced through social and institutional barriers. Some of these barriers include ineffective community engagement, lack of interaction between scientists and decision makers, and institutional decision-making tradition related to hierarchical mandates. A three-year project has commenced to examine the role of adaptive learning in overcoming some of these barriers to maximize pathways for science and improve decisions made in the coastal zone. Adaptive learning is one of five project areas targeted to enhance science impact, being undertaken by a consortium of nine Australian universities funded through the CSIRO Collaboration Fund. Two of the strategies being explored to maximize adaptive learning to improve science impact include: (i) development of an on-line toolkit for embedding adaptive learning within coastal organizations; and (ii) development and testing of monitoring and evaluation frameworks to improve adaptive learning interventions. While focused on an Australian context, the project addresses broad issues of social and institutional barriers that have relevance for many coastal scientists and decision makers around the globe.

**ADDITIONAL INDEX WORDS:** *Social learning, coastal management, data forms, organizations*

## INTRODUCTION

Complexity, uncertainty and high decision-stakes are typical characteristics of many coastal systems. Adaptive management has recently emerged as a paradigm for responding to ecological and social uncertainty within coastal systems, yet little attention has been focused on mechanisms crucial to its success (SMITH and SMITH, 2006). Adaptive management has been used as a model for experimentation (adaptive experimental management) that focuses on 'how' to manage (see PARKES et al., 2006), as well as a model for collaboration (adaptive collaborative management) that focuses on 'what' to manage and 'who' ought to manage (see BUCK et al., 2001). While these differences may confound practice (see DUNCAN, 2001; PARMA et al., 1998; WILDERE, 2002) relating to specific issues, we posit that the capacity of institutions to integrate information (to actively learn at all levels within and between institutions) is the major impediment to realizing the benefits of an adaptive management approach when responding to uncertainty (see DOVERS, 2001a, 2003; SMITH and SMITH, 2006). This particularly applies to complex problems, with multiple affecting and affected communities, such as exist in coastal zone management.

In such circumstances, social learning (shared learning by decision makers, scientists, communities and institutions) is needed to drive the adaptive management process and facilitate connections between the best available knowledge and collective management action. This will maximize pathways for science and other forms of knowledge to influence change in management. Therefore, adaptive learning, in the case of coastal zone management, needs to embrace the processes of social learning, to include purposeful reflection by multiple stakeholders, on multiple data sources, towards modifying individual and collective actions.

This paper explores adaptive learning to enhance science impact in the coastal zone through discussion of: (i) the key dimensions of adaptive learning for coastal management; and (ii) a proposed approach to understanding adaptive learning to enhance science impact in the coastal zone.

## KEY DIMENSIONS OF ADAPTIVE LEARNING FOR COASTAL MANAGEMENT

Key dimensions of adaptive learning for coastal management include social learning, sustainability learning, organizational learning, and a bias towards reviewing and changing policy and management practice. That is, adaptive learning, while embracing these other forms of learning, is linked to the adaptive management paradigm. This necessarily introduces the need to consider the inputs (data forms and sources) that stimulate learning at different levels within organizations and the degree of overlap and sharing that occurs between organizations.

### Social learning and Sustainability Learning

Lester Milbrath was the first to associate social learning with progress towards sustainability in his book *Envisioning a Sustainable Society: Learning Our Way Out* (MILBRATH, 1989). Certainly, collective decision-making has been shown to be enhanced through social learning processes (PAHL-WOSTL and HARE, 2004). Furthermore, holistic social learning processes in sustainability contexts should involve the diversity of overlapping and inter-related communities (see THOMSEN *et al.*, this edition) that include affected and affecting stakeholders, citizens, decision-makers, researchers, and relevant organizations (SMITH and LAZAROW, 2006). However, as TABARA and PAHL-WOSTL (2007) have highlighted, social learning does not necessarily facilitate sustainability outcomes. Similarly, GLASSER (2007) noted that social learning may be active or passive. Consequently, TABARA and PAHL-WOSTL (2007) introduced the notion of “sustainability learning” as being action-orientated and content driven with an explicit focus on developing “the capacity to manage options for the adaptation of human societies to the limits and changing conditions that are imposed by their own socio-ecological systems” (TABARA and PAHL-WOSTL, 2007, p.11). In this sense, adaptive learning represents a subsidiary concept of sustainability learning, but inextricably linked to the processes of adaptive management.

In addition, SMITH and SMITH (2006) point out that the structure of learning is also important as learning approaches are often unstructured, re-active, piecemeal, and do not support the higher level systems or conceptual thinking required to address sustainability issues and to convert knowledge to action (SMITH *in press*). As THOMSEN (2008) suggests, learning (through mechanisms such as community-based research) can help facilitate sustainability outcomes by encouraging a shift in emphasis from social interaction and social learning to sustainability learning: a concept amplified by JACOBSON *et al.* (*in press*) when identifying an approach to integrating and expanding community input to adaptive experimental management (see PARKES *et al.*, 2006).

### Organizational Learning

Coastal management organizations are fundamental to facilitating sustainability learning. “In the knowledge economy, more and more organizations are seeking to create and use knowledge through learning” (LINDLEY, 2002, p. 115). In Australia, organizations are increasingly committed to adopting and implementing learning organization principles (PHILLIPS, 2003). In learning organizations, people learn how to learn, with an emphasis on the facilitation and application of learning and knowledge (BOYLE, 2002). The effective facilitation of learning processes – the ability to acquire applicable knowledge, to reflect and learn, and, most importantly, to adopt, integrate adapt and apply new insights – is vital to coastal management organizations

to inform successive cycles of adaptive management. Efficiency and synergy will increase where processes exist to facilitate sharing of knowledge between organizations (and communities).

Learning organizations appear to have eight common characteristics: “a systems approach to learning; commitment to lifelong learning; flexibility and adaptability; shared vision; flat management structure; participation in a co-operative industrial framework; a wide view of learning; and acceptance by managers that learning and work are intertwined” (BURNS, 1995, p. 65). Additionally, human development, expressed in both human and social capital, is at the core of the learning organization (NYHAN *et al.*, 2004). BARTOL *et al.* (2008, p. 364; after PHILLIPS, 2003) proposed a ten-pillar learning organization model that characterizes an ideal learning organization. The organizational attributes are:

1. **will:** passionate and enthusiastic commitment to continuous improvement through continuous learning;
2. **leadership:** facilitative, coaching, supportive/caring, emotional intelligence;
3. **strategic thinking and vision:** clarity and acceptance of strategic direction, realistic and achievable goals;
4. **communication:** free and open communication, idea sharing, knowledge and insights, trust;
5. **learning and development:** a continuous learning philosophy based on both individuals and teams, learning by doing (experiential learning), acquisition of new knowledge and technology;
6. **innovation and decision-making:** innovative mindset across the organization, encouragement for initiative and experimentation;
7. **change management:** challenge and change, continual questioning of the core knowledge base;
8. **intellectual capital and knowledge management:** sharing of responsibility for development of intellectual capital, diffusion of new information, benchmarking and adoption of best practice;
9. **measurement and assessment:** indicators of attitude, behavior, performance change, and commitment to continuous improvement;
10. **reward and recognition:** improves performance, strengthens motivation, encourages personal learning and advancement and fosters job satisfaction.

To these attributes, we add **sharing and exchange** with other learning organizations across and between all levels in the organizational structure. These eleven attributes guided and informed the design and research methods of this project.

## PROJECT OVERVIEW

Social and organizational barriers to science impact in the Australian coastal zone are being explored through a multi-organizational research program, including nine universities and the CSIRO. The research program is operating over three years and is focused on the themes of: (i) governance and organizational arrangements; (ii) socio-cultural context; (iii) knowledge systems; (iv) adaptive learning; (v) Indigenous, tropical and remote contexts, and (vi) integration and synthesis. The focus of this paper is on the adaptive learning theme.

## PROJECT OBJECTIVES

The aim of the adaptive learning theme is to provide knowledge to coastal managers, researchers, and community groups to enable enhanced learning for progressive improvement in coastal management. The adaptive learning theme has two main components: (i) the development of an on-line toolkit to enhance

adaptive learning; and (ii) the development and testing of a monitoring and evaluation framework to assess the impacts of scientific research in sustainable coastal zone management. To successfully complete the two components, the adaptive learning theme will:

- analyze the barriers and opportunities to embed adaptive learning within coastal organizations;
- determine the processes by which adaptive learning frameworks function in the coastal management context;
- assess organizational adaptability success factors; and
- develop and test a monitoring and evaluation framework for assessing science impact in the coastal zone.

### PROPOSED APPROACH

The principal focus of the research is on adaptive learning within and between organizations, be they businesses, government, NGOs, or community groups, and the level of sharing of information and learning. That is, what information is used in decision-making and how does this vary within organizational structures, what are its sources, and what processes facilitate the integration and application of new knowledge throughout the organizational hierarchy.

The research is based on two principal assumptions that effective coastal management requires: (i) adaptive learning organizations; and (ii) learning networks between these organizations. These assumptions are based on literature from a range of relevant contexts including coastal management, natural resource management, resilience, and sustainability science (see for example LEE, 1993; HOLLING, 1995; DOVERS, 2001b; FOLK *et al.*, 2002; BELLAMY *et al.*, 2005; SMITH and SMITH, 2006; WALKER and SALT, 2006; JACOBSON, in press) and are being explored through: (i) the characteristics of adaptive learning organizations; (ii) data use at levels within organizations; and (iii) identifying the nature and characteristics of adaptive learning networks.

### Exploring Adaptive Learning Organizations

Adaptive learning organizations are characterized by:

- proactively seeking current information and using multiple sources and forms of data to guide decision-making;
- being open to change in practice and reward the application of learning;
- having formalized processes for monitoring and evaluating the management process/es;
- having formalized processes for reflection on management and proactive modification of management action/s; and
- being proactive in seeking knowledge sharing partnerships.

With the ten attributes of learning organizations identified by BARTOL *et al.* (2008), these characteristics provide the framework for identifying indicators of processes and definition of data sources used at different levels within organizations to facilitate learning and adaptive management.

### Exploring Data Use

Different levels in the organizational hierarchy and different functional roles use different forms of data (raw data, analyzed data, synthesized data, interpreted data, and integrated data) in decision-making. Higher levels in the organizational hierarchy tend to be more influenced by socio-political perspectives, give greater attention to risk (including personal exposure), and use interpreted data more than lower levels. Lower levels in the hierarchy are more likely to use scientific data in decision-making, but may be constrained by corporate policy.

These concepts provide the framework for considering the role of data (qualitative vs quantitative, intuitive vs empirical, theoretical vs applied, social vs disciplinary, raw vs extrapolated) in learning and decision making at different levels in the organizational structure. They will also be used to identify the major influences on adaptive management and impediments to the use and exchange of information within and between organizations.

### Exploring Adaptive Learning Networks

The need for the same information exists for many coastal zone managing organizations and often the cost of acquiring information works against informed decision making and use of best available knowledge (see SEYMOUR *et al.*, 2008). Learning networks therefore may exist between learning organizations because the individual organizations collectively appreciate the advantages of partnerships in knowledge sharing.

Learning networks are needed:

- to maximize access to available data and experience;
- to enact adaptive management within and between organizations at various scales;
- to maximize the effect and mutual benefit gained from collaborative action.

Different levels in organizational hierarchies have different opportunities to establish and maintain knowledge sharing networks. The types of information shared will vary between organizational levels and between organizations. Again, the principles outlined above provide a framework for defining the existence and nature of knowledge sharing and learning networks.

### Expected Insights From The Research

We expect:

- finding truly adaptive learning organizations relevant to coastal zone management will be unlikely, but we will find benchmarking examples within organizations;
- adaptive learning networks will exist, but they will be fragmented, not comprehensive and exist mostly where information exists in a form of relevance to different levels in the hierarchy;
- different levels in the hierarchy will be dominated by different types of learning (e.g., experiential versus collaborative);
- science will influence management more at lower levels in the organizational hierarchy;
- adaptive learning will be constrained by access to relevant information and data forms at all levels in organizational hierarchies;
- within organizations, elements of the adaptive learning process will be developed to varying degrees, which will be an indicator of an organizations capacity for adaptive learning and hence its adaptive learning status;
- to find a fear of reporting and reflecting on failure, and hence the loss of important adaptive management insights;
- monitoring and evaluation of management actions not to be comprehensive; and
- limited pathways for the effective and efficient integration of information relating to contemporary issues such as climate change.

### Methods

To maximize research uptake and ground the research within specific contexts, participatory methodologies, where feasible, will be adopted. Multi-methods will also be used to triangulate

data sources and analysis to maximize transferability of research outputs. Data will be gathered through key informant interviews, focus groups, participant observation, document content analysis, and in-depth analysis of exemplar adaptive learning processes. Data will be analyzed using both quantitative and qualitative means to determine trends and add depth and meaning to analyses.

The adaptive learning theme will focus research in South East Queensland (SEQ), but include cases for comparative analysis in Western Victoria and in the South West of Western Australia. The comparative analysis will be focused on 'sea-change' regions in the three locations and enhance the transferability of the research findings. The comparative assessment will also allow greater integration with other research themes of governance and organizational arrangements and knowledge systems. The SEQ activities will build on past CSIRO activities in Moreton Bay and also the recent Ag-SIP funded project "Enhancing Community Engagement in NRM"; as well as, be linked to existing and emerging CSIRO initiatives in the region, particularly those of the Climate Adaptation Flagship in relation to building adaptive capacity to respond to climate change.

### PROJECT DELIVERABLES

Expected project deliverables include:

- an on-line toolkit for embedding adaptive learning within coastal organizations and other organizations, including:
- mechanisms to enable adaptive learning within coastal organizations (what to do and how to do it);
- principles of adaptive learning (including a searchable annotated bibliography);
- a trouble-shooting guide for overcoming barriers to embedding adaptive learning;
- examples of adaptive learning successes (i.e., examples of functioning pathways to science impact);
- a simplified framework for coastal organizations to monitor and evaluate their institutionalization of adaptive learning;
- a report that details a framework for monitoring and evaluating science impact in the coastal zone; and
- a report benchmarking science impact in the coastal zone.

### EXPECTED OUTCOMES

Expected project outcomes include:

- embedding of adaptive learning within coastal management organizations;
- enhanced pathways for on-going science research impact in the coastal zone;
- enhanced uptake of science to maximise economic, social and environmental wealth in the coastal zone.

### CONCLUSIONS

Adaptive learning is crucial to the success of adaptive coastal management, yet little is known about the factors contributing to institutionalizing adaptive learning within coastal organizations. This project seeks to expand the understanding of adaptive learning through exploring: (i) the characteristics of adaptive learning organizations; (ii) data use; and (iii) adaptive learning networks. It is expected that the project will provide tools and processes to support the transition of coastal management organizations towards becoming learning organizations and thus facilitate enhanced science impact in the coastal zone.

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# Defining community: understanding the meaning of ‘the community’ in coastal zone management

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## ABSTRACT

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A reoccurring question in coastal zone management towards sustainability concerns how to engage ‘the wider community’. With appropriate human behaviour being the key to sustainability, if scientists and managers could just involve and influence ‘the masses’, it seems that many coastal management issues would be solved. But the very framing of the problem, using terms such as ‘the wider community’, belies the truism that the wider community does not exist. Instead, multiple communities exist, overlap and are constantly changing. With a multiplicity of community types described in the literature, two overarching types are commonly used to understand social processes in coastal areas - communities of place and communities of interest. Whilst these conceptualisations may adequately describe relationships between people and what various social groupings gain from the coastal zone, they are ambiguous with regard to impacts upon these areas. In the context of coastal sustainability, we argue that communities also need to be defined in terms of their impact on sustainability. The challenge for coastal scientists and managers is to understand the impacts of various groups on the coastal zone and how these are influenced and change across space and time. This will illuminate key interventions as well as diverse entry points for effective engagement and learning with multiple communities. This paper synthesises and builds on current research focused on characteristics of coastal communities and strategies for successful engagement to both enhance coastal science impact and the adoption of coastal management initiatives.

**ADDITIONAL INDEX WORDS:** *Engagement, Sustainability, Socio-ecological systems*

## INTRODUCTION

There is a significant amount of coastal science conducted as evidenced by the number of articles published in journals on coastal issues, with several journals specifically dedicated to coastal science (including the *Journal of Coastal Research*). However, there has been limited documented evidence of the impact of science in the coastal zone, which in many instances is in quality decline (in terms of water quality, fish stocks, and the viability of near-shore and off-shore ecosystems). A possible reason for the limited impact of science may relate to the coastal zone being a highly contested and transitional (ecologically and socially) landscape with diverse perceptions and interests regarding its management and functions. In working within contested landscapes, a large volume of literature suggests that participatory processes are critical to enabling consensus building and informed action towards sustainability (see for the coastal zone – CHRISTIE *et al.*, 2003; CHIRCOP, 1998; HILDEBRAND, 1997). Furthermore, KORFMACHER (2001) summarises the benefits of public participation in environmental research and management as democratic, substantive and pragmatic. Of relevance to this paper, there is also an emerging body of literature that addresses engagement for improved environmental management in transitional landscapes with a diverse range of stakeholders (SMITH *et al.*, 2005; SMITH and THOMSEN, 2008). The

understanding of community engagement presented in this paper is underpinned by discussions that both define communities and describe strategies for enhancing engagement for science impact in the coastal zone.

## DEFINING THE COMMUNITY IN COASTAL CONTEXTS

‘The community’ is often conceived as an overarching pathway for finding solutions to sustainability issues, but as MEPPEM (2000) pointed out, this tends to gloss ‘over the complexity of variety in human relationships’ (p. 52). In fact, people may be members of multiple and overlapping social networks with both complementary and competitive associations (MEPPEM, 2000). Consequently, there are many definitions of community in the social science literature (e.g. HILLERY found over 90 definitions in 1955) and, with the advent of new communication technologies and processes such as globalisation, there are likely to many more by now.

It is not the purpose of this paper to review the diversity of definitions except to note that, for sustainability issues, these are commonly distilled into two types: communities of place (e.g. residents) and communities of interest (e.g. tourists and those with external associations with the coast such as shareholders of

companies) (see CAMERON, 2003; RELPH, 1992; SMITH and THOMSEN, 2008). Furthermore, processes such as population growth, urbanisation and globalisation are eroding traditional notions of the coastal community. For example, GURRAN *et al.* (2005) identified five profiles of coastal communities of place within Australia, including coastal commuters, getaways, cities, lifestyle destinations and hamlets (see Table 1). The study focussed on the 'Sea Change' phenomenon and these profiles were designed to highlight significant 'push' and 'pull' factors with regard to populations in coastal areas. Of interest to this paper is that the first three examples included in the table summarising GURRAN *et al.* (2005) have already effectively merged into one continuous urban form, with Noosa and Maroochy (and Caloundra) also amalgamating local government jurisdictions to form the Sunshine Coast Regional Council. Indeed, the Sunshine Coast is one of the fastest growing regions in Queensland with an annual growth rate of 3.5% - more than double the national growth rate of 1.7% (ABS, 2008).

The implications of this rate, magnitude and geographic extent of change means traditional and even relatively recent perceptions of coastal communities are rapidly becoming irrelevant as dominant urban metropolises spread continuously into these areas with significant influxes of both daily and weekend commuters. For example, SMITH and DOHERTY (2006) observed the common perception that such coastal communities are only inundated by tourists at certain times of the year. While this is the case for some regions (particularly more remote locations), tourism on the Sunshine Coast, although still seasonal, is much more persistent with high numbers of visitors on weekends throughout the year and holiday peaks (TOURISM RESEARCH AUSTRALIA, 2004).

The combination of rapidly increasing resident populations with significant and consistent numbers of national and international tourists to coastal areas, such as the Sunshine Coast, can result in a constantly growing net population, with dramatic and frequent changes to community composition and structure (e.g. the demographics of rapidly growing resident populations driven by immigration have the potential to change at the same pace as the growth rate and tourist numbers and type can vary weekly). Within most planning and management timeframes, such communities may never reach a definable stable state. Furthermore, lessons from evolutionary and ecological theory suggest that rapid (often non-evolved and unplanned) increases in complexity and connectedness are likely to increase the vulnerability of a system (YOUNG *et al.*, 2006).

Certainly, these sudden, substantial, and often unplanned influxes put considerable strain on the existing social and

ecological systems to their long-term detriment; destroying the very attributes that attracted people to the area in the first place (e.g. unpolluted water, highly vegetated areas, minimal traffic, friendly and familiar residents). For example, RICHINS AND PEARCE (2000) cite over usage, development near sensitive sites, and the polarisation of community needs and values as a sample of the pressures placed on coastal communities in growing regions where the interests of residents, tourists, investors and various levels of government are often competing. Similarly, CARTER (2008) highlights the social and environmental implications of sporadic growth in coastal destinations as well as changes brought to cultural integrity.

These examples highlight the need to understand communities as diverse and increasingly dynamic with substantial influences beyond those of the immediate geographic bounds. With increasing awareness of the global nature of climate as well as citizenry, it can be argued that the two scales of most relevance to the sustainability of the coastal zone are the local community (where actions take place) and the global community (where the summative effects are felt).

Consequently, we focus on actions within the local community cognizant of the global sustainability context. We argue that communities need to be defined in terms of their impact on sustainability, rather than as beneficiaries of unsustainable activities. Importantly, this is a definition and not a label - an honest starting point to engage with diverse communities rather than an endpoint. As MEPPEN (2000) noted, clarity regarding the current situation is vital before moving on to what might be done and it provides 'a structured approach based on listening, not telling' (p. 48). Furthermore, without full awareness of the present (including needs and values), management strategies are likely to reproduce the same power structures that have already proven ineffective and promoted calls for change (MEPPEN, 2000).

Our focus on impact on the socio-ecological coastal system also represents a more holistic or complex systems perspective of communities that attempts to understand communities as dynamic socio-ecological systems (see GALLOPÍN *et al.*, 1989), unlike the more anthropocentric stakeholder perspectives of interest and association. Using a socio-ecological framework, examples of impact may include effects upon the biophysical attributes of a system (e.g. water quality, biodiversity, vegetation cover) as well as effects upon the social attributes of a system (e.g. social capital, human health levels, livelihoods). This integrative framework is important with growing awareness that human societies have embedded themselves within the structures of biophysical systems so completely that these have become truly socio-ecological systems (YOUNG *et al.*, 2006).

It is also important to note the general trend that when people invoke 'the community' with regard to coastal management, it is often implicit that 'the community' are local residents *en masse* that need to be mobilised to change their behaviours in accordance with scientific findings or proposed management. However, the preceding arguments illustrate that (1) there may be significant difficulties engaging with many residents given the limited sense of community resulting from their newness or changing composition, (2) a significant number of people impacting on the area may reside outside of the area (e.g. tourists, developers, landlords) and may only have a short-term or passing interest in the area or completely miss any locally-based engagement efforts, and (3) that the person/entity framing the problem to be addressed does not see themselves as part of 'the community' and is effectively externalising the issue(s).

Thus, in addition to our focus on impact, we argue that researchers, managers and other decision-makers need to

Table 1: Profiles of coastal communities in Australia (summarized from GURRAN *et al.*, 2005).

Profile	Description	Examples
Coastal commuters	Suburbanised satellite communities within 1.5 hours drive of a capital city	Caboolture, Queensland
Coastal getaways	Small to medium towns within three hours drive of a capital city	Noosa, Queensland
Coastal cities	Substantial urban centres	Maroochy, Queensland
Coastal lifestyle destinations	Tourism and leisure communities	Byron, New South Wales
Coastal hamlets	Small and remote coastal communities	Bellingen, New South Wales

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acknowledge that in their professional roles they are also part of communities of place and interest, with their inherent dogma, as well as being part of the communities they wish to influence. Hence, their proactive, meaningful and reciprocal engagement with the multiple communities involved in coastal management issues is imperative to finding and actioning solutions to pressing problems within the coastal zone.

## ENGAGEMENT FOR SCIENCE IMPACT IN THE COASTAL ZONE

There is a range of 'tools' for community engagement suitable for use with coastal communities. For example, the Citizen Science Toolbox of the Coastal CRC lists over 60 different tools applicable for a diversity of issues and contexts including citizen juries, visioning, photovoice, consensus conferences, and community fairs<sup>1</sup>. These tools are designed to promote more widespread participation in decision-making through equitable relationships between participants and to address issues of power that can compromise relationships. Drawing on the research of ARNSTEIN (1969) and, more recently PRETTY (1994), there is strong evidence to suggest that more even distributions of power lead to more effective partnerships.

Although engagement theory now encompasses notions of empowerment and learning consistent with the issues of power distribution highlighted by ARNSTEIN (1969), in practice there is evidence to suggest that in many contexts engagement remains driven by external agencies with pre-formulated agendas such that the formation of equitable or learning partnerships is the exception rather than the norm (e.g. MEPPEN, 2000; SMITH *et al.*, 2005).

Given the transitional nature of coastal communities in social as well as ecological terms, it is instructive to draw upon research in other transitional communities. For example, recent research into engagement in peri-urban areas identified the need to engage with a broad range of stakeholders, that traditional approaches may be inappropriate in transitioning landscapes, and that engagement processes must be self-sustaining given the uncertain nature of government support (SMITH *et al.*, 2005). Of particular importance to this paper, SMITH *et al.* (2005) proposed a novel typology of engagement that can be populated with the motivations and preferences of potential participants and permits the selection of a mix of engagement tools tailored to specific communities. They also noted the importance of taking into account the capacity of all participants, including community members as well as agencies, when developing an engagement strategy – a variable that is also included in the 'chooser' function of the Citizen Science Toolbox.

Existing community-based groups including Coastcare, Waterwatch and Landcare also provide valuable opportunities to engage with highly motivated and knowledgeable sectors of the community. As THOMSEN (2008) explained, these groups often have in-depth knowledge of the social and ecological dimensions of a community. In addition, they regularly conduct their own environmental monitoring and research projects in conjunction or with support from scientists and agency representatives (THOMSEN, 2008). Thus, these projects provide excellent examples of participatory research and mechanisms to facilitate sustainability learning (THOMSEN, 2008) as well as established avenues through which to enhance science impact in the coastal zone both within groups and with the local communities within which they interact. JACOBSON *et al.* (in press) go even further in proposing a mechanism for promoting reflection on both ecological and social uncertainties relating to the management

context in adaptive management. This approach to issues in the coastal zone is recognized as having the greatest potential for achieving desired outcomes.

Finally, while advocating that simply acknowledging the existence of multiple, inter-related communities will have important ramifications for approaches to coastal management and improve the success of management strategies, we propose the following principles to enhance and maintain community engagement for science impact and sustainable outcomes.

### Obtaining commitment

1. Use multiple engagement tools to address the communities within 'the community'. Understand community composition and target a range of engagement processes accordingly.
2. Promote holistic engagement strategies that address a range of issues simultaneously to ensure community balance.
3. Work with existing community networks (e.g. local community organisations such as Waterwatch) and use preferred sources of information (e.g. internet).
4. For long-term residents, use face to face meetings, and participatory approaches.
5. For absentee residents (landlords and developers) use written and, increasingly, electronic forms of communication. Also engage with the regulators of these.
6. For short-term residents (tourists), use on-site high impact, easily comprehensible/visible signage (e.g. beach), reinforced through messages relayed at accommodation and/or events (work with resort/hotel owners and/or with event management).
7. Go global with your message! Such issues are unlikely to relate solely to one area.

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### Sustaining commitment

8. Engage communities in defining problems and desired outcomes, rather than simply engaging them in projects or conceptual ideals.
9. Consider the use of developing (simple) cause and effect models with communities to clarify understanding of issues and enhance understanding of multiple perspectives.
10. Provide opportunities for communities to be involved in implementing agreed actions. This may include activities to enhance the capacity of communities to be involved.
11. Involve communities in monitoring the effect of management action and the formal process of reflecting on success and failure, and what has been learnt - including feedback to communities on process, decision-making and impact outcomes.
12. Involve communities in rewarding social processes including celebrating successes.

These principles are fundamental to engagement and learning, but learning needs to be embedded within communities of place and interest to enhance science impact.

## CONCLUSIONS

Acknowledgement by decision makers and stakeholders in coastal management issues that there are multiple, inter-related and often rapidly changing communities is an important first step in

<sup>1</sup> <https://www3.secure.griffith.edu.au/03/toolbox/index.php>

improving coastal management strategies towards sustainable outcomes. Acknowledgement includes recognizing that communities of place and interest (and probably in time) exist and that decision makers are part of these communities, and bring to the decision making process biases born of their associations. Effective engagement between communities requires targeted strategies to capture holistic community representation, meaningful dialogue and exchange, and ongoing commitment to addressing pressing issues. Only through sustaining the engagement of the multiple communities will collective action be possible and lasting solutions found.

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*Insight*

## Adaptation or Manipulation? Unpacking Climate Change Response Strategies

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**ABSTRACT.** Adaptation is a key feature of sustainable social–ecological systems. As societies traverse various temporal and spatial scales, they are exposed to differing contexts and precursors for adaptation. A cursory view of the response to these differing contexts and precursors suggests the particular ability of persistent societies to adapt to changing circumstances. Yet a closer examination into the meaning of adaptation and its relationship to concepts of resilience, vulnerability, and sustainability illustrates that, in many cases, societies actually manipulate their social–ecological contexts rather than adapt to them. It could be argued that manipulative behaviors are a subset of a broader suite of adaptive behaviors; however, this paper suggests that manipulative behaviors have fundamentally different intentions and outcomes. Specifically, adaptive behaviors are respectful of the intrinsic integrity of social–ecological systems and change is directed toward internal or self-regulating modification. By way of contrast, manipulative behaviors tend to disregard the integrity of social–ecological systems and focus on external change or manipulating the broader system with the aim of making self-regulation unnecessary. It is argued that adaptive behaviors represent long-term strategies for building resilience, whereas manipulative behaviors represent short-term strategies with uncertain consequences for resilience, vulnerability, and the sustainability of social–ecological systems. Of greatest significance; however, is that manipulative strategies have the potential to avoid authentic experiences of system dynamics, obscure valuable learning opportunities, create adverse path dependencies, and lessen the likelihood of effective adaptation in future contexts.

**Key Words:** *adaptation, adaptive capacity, climate change, learning, manipulation, path dependency, resilience*

### INTRODUCTION

Adaptation is a recent and increasing focus for research and policy concerned with responding to the unavoidable impacts of climate change (Adger et al. 2007). In the late 1990s, Smit et al. (1999, 2000) began to critique the meaning of adaptation in relation to climate change by asking: (i) adaptation to what; (ii) who or what adapts; and (iii) how does adaptation occur? This line of questioning provided an avenue for evaluating the merits of adaptation beyond the needs and experiences of those seeking change toward a much broader exploration of impacts at the system level. It also allows for consideration of the values and ethics associated with adaptation toward sustainable societal processes and aspirations. This is consistent with recommendations for a greater focus on adaptations that support sustainable development in the *Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Adger et al. 2007) and indicates that the critique of Smit and colleagues has yet to influence adaptation policy, and that the clarity that answering such questions could have achieved is yet to emerge. For example, a review of major international reports such as those by the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC) and publications in journals including *Nature* and *Science* revealed that use of the term “adaptation” is still gaining currency, and a consensus definition has yet to be defined (Levina and Tirpak 2006). In particular, studies concerning the social and ethical dimensions of adaptation are just beginning to emerge (e.g., Adger 2009, Jones and Boyd 2011).

Nevertheless, societal adaptation to a range of stressors is a prevalent and defining feature of persistent societies (e.g., Bussey et al. 2011). Research in traditional disciplines such as archeology (e.g., Morrison 2006) and interdisciplinary fields such as resilience (e.g., Gunderson and Holling 2002) illustrates that adaptation to changing social–ecological systems, including climatic variables, is not a recent attribute of human societies. However, recognition of “dangerous” climate change and the scale and severity of the impacts now experienced and predicted is novel and creates added impetus to focus on adaptation efforts (Adger et al. 2007). Furthermore, Adger et al. (2007) highlight that multi-sectoral assessments of the costs and benefits of adaptation at the global scale are limited. Hence, in a globalized world, how should adaptation efforts be judged? Which parameters should guide our approaches? Is adapting to climate change enough, or will this singular focus ultimately undermine the systems that sustain life?

Literature to inform societal response to climate change comes primarily from three different, but often overlapping, discourses: vulnerability, resilience, and sustainability (Turner 2010). The contributions of these discourses to global issues that concern social and ecological interactions, such as climate change, have been demonstrated in detail elsewhere (e.g., Adger 2006, Folke 2006, Kates et al. 2001). The similarities among these discourses suggest that there is potential for the integration of vulnerability and resilience within the broader context of sustainability (Adger 2006,

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Turner 2010). Such integration allows a more critical view of adaptation that takes into account the multifaceted drivers, intentions, and impacts of adaptation. Significantly, the simultaneous consideration of vulnerability, resilience, and sustainability provides an opportunity to consider adaptation in a broader cross-sectoral, and potentially cross-scale, context. It also allows the examination of outcomes of adaptation at the system level rather than as a response to a particular issue. By framing adaptation in this way, it may be possible to avoid unsustainable “adaptation” pathways, such as energy-intensive heating and cooling of dwellings (Adger et al. 2007, Hallegatte 2009).

An example of the broader range of considerations provided by the integration of these discourses can be found in the most recent notions of resilience. With origins in ecological theory and grounded in assumptions regarding the stability of systems, resilience has evolved to encompass human dimensions and more dynamic conceptions of system states (Folke 2006). The most recent definitions do not imply a “return to equilibrium” and instead focus on the ability of systems to transition to alternative states (Duit et al. 2010). Not only does this broader and more dynamic focus involve consideration of social dimensions, such as the role of power and issues of social justice more commonly associated with sustainability discourses, the acceptance of systems transitioning from one state to another provides an opportunity for normative discussions around desirable and undesirable system states (Nelson et al. 2007, Duit et al. 2010). Of significance to adaptation, the focus on transition and desirable system states challenges the validity of the status quo and highlights the need to ensure that proposed initiatives do not further entrench existing inequalities or unsustainable practices and exacerbate processes of dangerous climate change. As Adger et al. (2009) highlight, it is necessary to be aware of underlying values and interests at both individual and societal levels before undertaking adaptation initiatives.

In this article, which is a starting point for further investigations, we draw on the integration of these discourses and earlier analyses of adaptation to discuss: (i) the intentions underlying adaptation; (ii) the focus of adaptation strategies; and (iii) the implications of adaptation at the system level. As this requires a broad theoretical frame, combined with the recognition of complex social–ecological considerations, our approach is also informed by the tenets of systems thinking (Senge 2006). We begin by providing a brief history of adaptation and its relationship to vulnerability, resilience, and sustainability. We then examine three main types of “adaptation” available to communities in the coastal zone to reveal contrasting perceptions of natural system states, differences in who or what adapts, and the implications for system resilience. In so doing, we suggest “manipulation” as an additional theoretical lens with which to more accurately analyze the range of contemporary adaptation responses.

## A BRIEF HISTORY AND CRITIQUE OF ADAPTATION

Adaptation concepts originate from a range of disciplines with differing foci and implications for societal processes and outcomes. For example, Smit et al. (1999) highlight the various origins of adaptation in fields such as ecology, natural hazards, and risk management, and Head (2010) cites its established presence in cultural ecology. Orlove (2009) traces changes in the use of the term and observed that 17th century definitions of adaptation in the English language indicated a process of change, including connotations of “fitting in” or “suited to” in reference to an external issue. From the mid-19th century, he noted more specific uses in science. For example, in 1859, Charles Darwin used the term to describe how organisms and species become progressively more suited to their environment. In particular, John Dewey (1916) drew on Darwin’s description of adaptation to explain how individuals and societies could respond to or modify contexts toward social change and the realization of full potential. Orlove (2009) highlights that Dewey’s definition has led to the common use of the term to describe a person’s ability to adjust to dynamic contexts. Of relevance to climate change, the Intergovernmental Panel on Climate Change (IPCC) defines adaptation in the Third Assessment Report as “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (McCarthy et al. 2001:982).

In the climate change context, the framework of Smit et al. (1999, 2000) provides an opportunity to clarify the meaning of adaptation—through exploring the intentions, the actors, and the nature and extent of processes and impacts. This framework appears to be an instrumental first step in preparing an adaptation strategy cognizant of the spatial, temporal, and developmental dimensions crucial for sustainability. The importance of these considerations in thinking more broadly about adaptation is reinforced by Adger et al. (2005), who focused on the intentions and impacts of adaptation across scales to highlight the importance of effectiveness, efficiency, equity, and legitimacy in assessing adaptation outcomes. Similarly, Nelson et al. (2007) highlight that adaptation refers to the conceptual decision-making processes and subsequent actions taken to address the impacts of change. Nevertheless, most emphasis in public policy debates has been placed on taking action, with limited emphasis on equitable decision-making processes or the nature and scale of the impacts of adaptation. Adaptation is most often presented as an array of adaptation options in a shopping-list style (e.g., air conditioning, desalinization, insurance, relocation, sea walls), where people are asked to choose among a selection of alternative policies, practices, and/or technologies without deeper consideration of the broader or systemic implications.

We argue that there is a disjuncture, and an opportunity for an entirely different focus for adaptation, between the initial and

Darwinian uses of the term and more recent connotations. Drawing on the analytical frameworks of Smit et al. (1999, 2000) and Adger et al. (2005, 2009), we suggest that the key difference lies in the intention and focus of adaptation. Darwinian conceptions of adaptation as “fitting in” suggest self-directed change with the intent of internal modification to better suit external contexts (i.e., “adaptation to”). Conceptions of adaptation commonly presented in contemporary climate change adaptation literature, however, also allow for options that modify external contexts, permitting externally directed change to better suit the existing predisposition of certain individuals or social groupings with the intention of avoiding change within these entities (i.e., “adaptation of”). Thus, contemporary definitions, which result in “adaptation of,” may be more accurately described as manipulation and have the potential to negate the need for individuals or social groupings to “fit in” (in the short term) and, in many ways, represent Darwin’s theory in reverse. To ensure adaptation efforts are more likely to be sustainable and cognizant of broader social–ecological contexts, we argue that it is important to direct discussions from the external focus of how “life should be” (Duit et al. 2010) to more internally focused discussions of how “should we behave.”

## MANIPULATION

*Manipulation* noun 1. The action of manipulating something in a skilful manner. 2. The action of manipulating someone in a clever or unscrupulous way.

*Manipulate* verb 1. Handle or control in a skilful manner (a tool, mechanism, information, etc.) in a skilful manner. 2. Control or influence (a person or situation) cleverly or unscrupulously. Oxford University Press (2011)

Definitions of “manipulation” and “manipulate” highlight that the main mechanism underpinning manipulation strategies is control of external system elements (i.e., other people or contexts) with the implicit intention of achieving outcomes desired by the manipulator. This approach is likely to be effective, at least from the perspective of the manipulator, in the short term. However, the act of manipulation (with often a single desired outcome) may not recognize the interdependencies inherent in complex social–ecological systems and may lead to an inability to achieve those desired outcomes into the future—through reduced opportunities for authentic learning experiences.

Understanding of complex systems is not well developed (e.g., Underdal 2010) and is likely to remain so into the foreseeable future (Owens 2010), therefore, the actual direct and indirect consequences (i.e., predictability) of adaptation and manipulation initiatives remain difficult to determine over the extended time scales required by sustainability. Certainly, complexity is inherent when dealing with a range of

sustainability challenges; nevertheless, examining the intended focus of actions (i.e., who or what adapts) can help in understanding the potential for a range of both positive and negative system impacts.

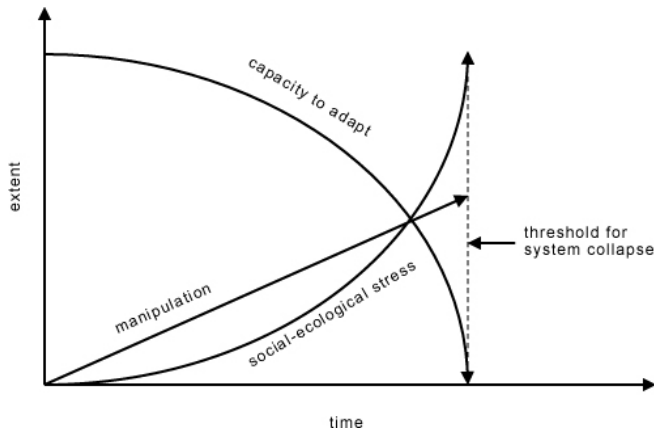
Manipulation through externally directed interventions reflects a reductionist approach as it separates system elements from one another and disconnects those initiating interventions from the systems they are attempting to influence, leading to defensive rather than reflective management strategies (Senge 2006, Smith 2009). Senge (2006) argues that reductionist processes are established early in western learning approaches and make it difficult to see the connections between actions and effects, or the nature and extent of interventions and outcomes. Predictability of outcomes aside, the main mechanism by which manipulative strategies undermine sustainable futures is by limiting adaptive learning (see Smith and Smith 2006, Smith et al. 2009) opportunities through the avoidance of authentic experiences of system dynamics (i.e., social–ecological change). Indeed, the underlying assumption of control over a system or, at least, part of a system may not be explicit in such decision-making processes and has the potential to limit imaginative abilities (Senge 2006). The negative impact of this on adaptation and adaptive capacity is demonstrated in a recent study of past adaptations that found imaginative resources to be a significant determining factor in the success or failure of past societies (Bussey et al. 2011).

Adaptation and manipulation strategies are generally dynamic and continuous in some form—being shaped by a series of adaptive or manipulative actions over time. When viewed from a systems perspective, a manipulation trajectory increases social–ecological stress and decreases the capacity to adapt over time (Fig. 1), leading to the heightened potential for system collapse. These influences on the system being manipulated and the ability to adapt may also create manipulation path dependencies, whereby each manipulative action increases social–ecological stress, reduces adaptive capacity, and necessitates continued manipulative actions in order to avoid changing the dominant social paradigm. This need for continued response is primarily driven by the desire to maintain a system state, rather than adapt to system dynamics. Furthermore, a manipulation pathway enhances the potential for additional negative feedback loops, where manipulation increases at the expense of learning and adaptation. This, in turn, further diminishes adaptive capacity through the inability to develop transformative learning skills.

The combination of externally directed change, skilled actors, narrowly conceived systems scope, and limited adaptive learning appears a potent mix, with significant potential for unsustainable processes and outcomes that increase vulnerability and decrease resilience. In this way, manipulative actions may be categorized as “short-term fixes”

(Senge 2006) that address symptoms rather than causes such that issues keep reoccurring or are exacerbated.

**Fig. 1.** Relationship among manipulation, adaptive capacity, and social–ecological stress.



### Manipulation and Maladaptation

Understanding the intention of proposed adaptations and the scale of impacts has important implications for judging the success of adaptation initiatives (Adger et al. 2005) and for distinguishing manipulation from maladaptation. As adaptation outcomes traverse spatial and temporal boundaries they may become less relevant, ineffective or even inappropriate (Adger et al. 2005). In the third assessment report, the IPCC defined such inappropriate outcomes as maladaptation. Specifically, the IPCC defined maladaptation as “any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead” (McCarthy et al. 2001:990). In the context of climate change, Barnett and O’Neill (2010) indicate that references to maladaptation began to occur in the literature in the early 1990s and cover a range of sectors and various geographic and temporal scales. They describe five distinct types of maladaptation to climate change, including options that, to varying degrees, increase emissions, unfairly burden vulnerable communities, have high opportunity costs, decrease adaptation incentives, and result in path dependencies that limit options for future generations (Barnett and O’Neill 2010). At first glance, such maladaptations appear synonymous with manipulation. However, all maladaptations commence as adaptations and are deemed unintentional in “inadvertently” increasing vulnerability. Consequently, a fundamental difference between manipulation and maladaptation relates to intent—whereby an intention to adapt that leads to adverse consequences can be defined as maladaptation; however, where there is no intention to adapt (i.e., undertake internal regulation), then we argue that such actions are better defined as manipulation.

### ADAPTATION AND MANIPULATION IN COASTAL SYSTEMS

To illustrate the contrasting intentions, initiatives, and outcomes of adaptation and manipulation, we review climate change response strategies in coastal systems. The coastal zone has been selected to explore the manipulation concept in more detail, as coastal zones are particularly dynamic and transitional systems that support significant and increasing human populations and associated infrastructure (Nicholls et al. 2007). Coastal zones are also particularly vulnerable to the impacts of climate change (e.g., sea-level rise and storm surge) that are likely to reduce the timescale once anticipated for transitional processes in these systems. As Hopkins et al. (2011) highlight, local coastal zones provide a microcosm of larger scale and stressed complex systems. Therefore, analysis of human–environment interactions in the coastal zone provides an instructive account of the transitions likely to be experienced in other communities over much reduced temporal and spatial scales.

The following analysis of adaptation options and practices in the coastal zone is used to examine perceptions of “natural” system states, who or what adapts, and general trends in adaptation in order to explore the manipulation concept and the implications for resilience in context rather than as an empirical test. Adaptation options available to coastal communities can be broadly classified as “protect,” “accommodate,” or “retreat,” following the report of the Coastal Zone Management Subgroup (CZMS) within the First Assessment Report of the IPCC (Misdorp et al. 1990). A more recent review of how these have evolved illustrates that protect options remain largely defensive—being represented by phrases such as “advance the line” or “hold the line” and include hard (e.g., sea walls and groynes) and/or soft (e.g., dune rehabilitation) interventions (Nicholls et al. 2007). Accommodate options seek to increase the flexibility of coastal communities so they may cope with change and continue using the land through interventions, such as anticipatory building codes or insurance (CZMS 1990). Retreat options involve the movement of people and associated infrastructure away from coastal areas into less exposed areas, with significant potential for the long-term resilience of communities. However, retreat also has significant potential for disruption to communities, especially in nations with low levels of adaptive capacity (Nicholls et al. 2007). Nevertheless, as the resilience of coastal systems is increasingly being tested following repeated disasters, the costs of adaptation in vulnerable coastal communities are generally considered less than the costs of inaction (Nicholls et al. 2007). In particular, Klein et al. (2001) identified increased recognition of the advantages of soft protection, accommodate and retreat strategies, and the need for adaptations tailored to local social–ecological contexts. The review of Klein et al. (2001) suggests the need for coastal areas to transition from hard protective strategies toward the

accommodate and retreat end of the adaptation spectrum. Indeed, protect and accommodate options are well established in many coastal areas. Retreat, however, although on the agenda for particularly vulnerable coastal communities, is only just beginning to be considered more widely. The following case study of Noosa Main Beach is presented to offer an insight into the mechanisms underpinning transition between adaptation options.

### Noosa Main Beach, Queensland, Australia

Noosa Main Beach is an iconic tourist destination within Queensland, Australia and has been selected as a case study as it is a vulnerable coastal community located in South East Queensland, an area noted by the IPCC as particularly vulnerable to the impacts of climate change (Parry et al. 2007). In addition, Noosa has experienced several cycles of significant investment and infrastructure development, with strategies for the management of Main Beach transitioning from retreat and accommodate to protect.

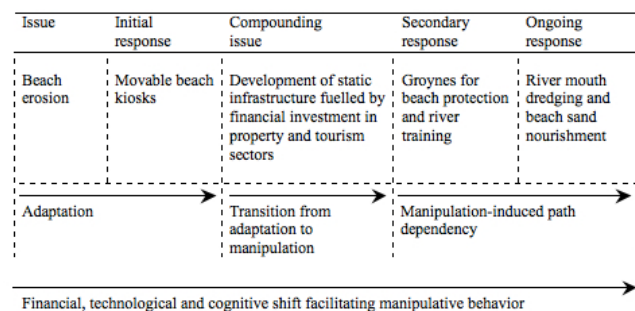
Early in Noosa's history as a tourist destination, the types of development reflected a combination of the retreat and accommodate responses to the natural coastal processes experienced in all undeveloped beaches (e.g., cycles of erosion and deposition). For example, in the 1920s, there was minimal development of the coastline, with beach kiosks built on sleds so they could be moved inland during storms (Tomlinson 2002). Since this time, however, there has been substantial economic investment and an increase in the built environment consistent with that of the Australian coastline generally—over 85% of Australians live within 50 km of the coastline (Australian Bureau of Statistics 2004). The short-term perspective and misunderstanding or misrepresentation of the coastal zone associated with the intensification of such coastal development are highlighted by Tomlinson (2002), who noted that periods of coastal development often coincided with calmer weather conditions, with some developments being damaged or completely destroyed in later storms.

In Noosa, initial recognition of the coastline as a transitional system characterized by cycles of erosion, depletion, and deposition has been replaced with the preference for enduring sandy beaches of sufficient width to protect expensive coastal developments and maintain consistency with images depicted as part of tourism sales campaigns. Significant development within Noosa's coastal zone commenced in the mid 1960s and led to the installation of rock seawalls and groynes and training of the river mouth (Chamberlain and Tomlinson 2006). The subsequent development of the Main Beach fore dunes into the tourist precinct of Hastings Street has added further impetus for the ongoing use of a range of engineering works to maintain a static coastline that now includes beach nourishment (Smith et al. 2011). Approximately, 40,000 m<sup>3</sup> of sand is pumped onto the beach each year (Chamberlain and Tomlinson 2006). In combination, these protective strategies

have resulted in the development of a new system equilibrium and the need for ongoing beach management (Tomlinson 2002). This approach is consistent with the preference for engineered coastal protection works to protect private property along Australia's coastline generally (Thom 2004).

The situation in Noosa reflects that of much of the developed Australian coastline and reveals the dominant contemporary expectation of wide sandy beaches that alter little in width. As Tomlinson (2002:19) argues, "the community's perception of what is natural or desirable often is contrary to the reality of the system." To this end, actors in the social system dimension have progressively engaged in protective strategies and manipulated ecological system dimensions (e.g., through engineering works) to reduce exposure to storm surge and other processes of coastal erosion (Fig. 2). Changes have been imposed upon the ecological dimension by the social dimension to protect static perceptions of natural system state and associated socioeconomic investments. In this scenario, minimal disturbance is experienced within the social dimension of the system in the short to medium term—depending on the scale and frequency of climatic disturbance and the manipulative capacity of the community. However, the effects on other system elements may be significant and not apparent in the short term. For example, restrictions have been placed on dredging in some areas for beach nourishment by the Environmental Protection Agency due to concerns regarding fish habitat (Chamberlain and Tomlinson 2006).

**Fig. 2.** Response shift from adaptation to manipulation, Noosa Main Beach.



It is important to note that the case of Noosa is not unique and there are numerous examples of actions with the intent of modifying external system characteristics to achieve preferred anthropogenic system experiences in the short term. In fact, the case of Noosa Main Beach highlights that a range of strategies may exist for any given location, and manipulations occur even within communities that embrace sustainability principles and have a history of regulating development to be mindful of conservation and sustainability ideals.

**Table 1.** Comparison of protect, accommodate, and retreat options

"Adaptation" option	Dominant perception of the "natural" system state	Who and what adapts to achieve desired system state	Longer term implications for resilience
Protect	Static or minimal dynamism (e.g., consistent sand coverage, stable river entrances).	The social dimension of the system defends itself from change by manipulating the ecological dimension, often through a sociotechnical regime (e.g., a reduction in exposure through sand mining, beach wall, and/or groyne construction).	Significant ongoing management and investment required, with the potential to impact negatively upon other system components.
Accommodate	Dynamic system including periods of inundation and erosion with some degree of predictability and perceived high likelihood of system resilience.	The social dimension of the system reacts to or anticipates changes in the ecological dimension and copes by making adjustments in socioeconomic and/or sociotechnical system components (e.g., elevating buildings, insurance).	Resilience may be ensured in the short to medium term, depending on the context, the severity of climatic impacts, and the adaptive capacity of local communities. Longer term resilience is unlikely.
Retreat	Increasingly dynamic system including less predictable disturbance regimes and perceived negative impacts on system resilience, particularly affecting the social dimension.	The social dimension of the system adapts by reducing exposure to the impacts of climate change through the migration of communities and associated infrastructure.	Significant initial investment with decreasing costs and increased resilience over time if issues associated with migration are anticipated and resourced (e.g., revised settlement patterns, socioeconomic transition strategies, and cultural needs assessment).

## DISCUSSION OF ADAPTATION AND MANIPULATION PATHWAYS

Distinctions among the protect, accommodate, and retreat options according to dominant perception of natural system states, who or what adapts, and the implications for resilience (Table 1) indicate that protective strategies are driven by static perceptions of natural system states and externally directed, such that interventions are imposed upon other system components. As such, protective strategies may be better defined as manipulative rather than adaptive. Accommodate and retreat options, however, are based upon much more dynamic perceptions of natural system states and a much greater tendency to make changes to the social dimensions of systems. We argue that these internally directed strategies are more consistent with notions of adaptation as their intention to respond to dynamic external contexts is through internal regulation.

The relevance to coastal communities is that protect options based upon manipulative strategies are likely to be short term in effect, reduce the long-term resilience of social–ecological systems, and are expensive in the longer term. For example, hard protective structures can limit the impact upon socioeconomic systems in the short to medium term, but negatively impact upon ecological system components, such as salt marshes and wetlands, as these are progressively limited in extent or “squeezed” (e.g., Knogge et al. 2004, Nicholls et al. 2007).

Although intent can change over time, it is increasingly difficult to shift from manipulation to adaptation, rather than from adaptation to manipulation, due to path dependencies

and influences on adaptive capacity. Similarly, as Smith and Stirling (2010) note, some sociotechnical systems become deeply embedded and self-reinforcing through such features as significant institutional and political support, economic significance, and integration within the broader social fabric of a particular locale. Significantly, manipulative strategies disconnect communities from system dynamics, lessen opportunities for learning about transitional systems in context, and have the potential to undermine adaptive capacity. Often, changes to ecological system components continue or intensify as interventions affect the overall system function—frequently exacerbating the very processes they were meant to overcome (e.g., beach walls enhancing erosion) and creating unforeseen or additional vulnerabilities.

## CONCLUSION

Adaptation and maladaptation are currently used to describe existing climate change response strategies. As a starting point for further investigation, we suggest manipulation as an additional and more critical lens for reflection on such strategies to facilitate a more accurate evaluation of resilience. Risks associated with manipulative strategies are underpinned by the tendency to limit or obscure opportunities for learning about transitional systems such that long-term adaptive capacity is reduced.

Literature and conversations around adaptation are often posed as if adaptation is an option that societies are considering. Yet, there is nothing to suggest that societies are at such a crossroads. Individuals, communities, and institutions make such decisions constantly and are most likely

in the midst of an adaptation, maladaptation or manipulation cycle—cognizant of it or not. Furthermore, the example reviewed in this article suggests that once a path of manipulation begins then path dependency is likely, as the outcomes of manipulation tend to create a self-reinforcing cycle. The lure of manipulative approaches is highlighted through the case study of Noosa, where a path of adaptation was initially embarked upon through movable beach kiosks; however, with increasing development pressure and the desire to maintain a static natural environment, the response rapidly became a self-reinforcing activity of persistent manipulation. In addition, it is difficult to revert to a path of adaptation because of the engrained sociocultural norms and system expectations created. Indeed, with every manipulation, the actors are further removed from the system they are manipulating, and the concept of adaptation becomes increasingly unfamiliar and less tangible.

In summary, social–ecological systems are extremely complex and dynamic, and understanding of them is always likely to be limited (Owens 2010, Underdal 2010); therefore, we are unlikely to anticipate with accuracy over spatial, temporal, and cultural scales all of the impacts of our interventions. However, we can choose to respond to social–ecological dynamics by making internal adjustments (i.e., adaptations) in human systems (at either individual or societal scales as appropriate) or external adjustments (i.e., manipulations). The external focus of manipulation (i.e., who or what changes) provides an essential distinction from adaptation. We argue that internal adjustments cognizant of both the social and ecological dimensions of social–ecological systems present much greater learning opportunities and prospects for building adaptive capacity and ensuring a sustainable future.

Responses to this article can be read online at:  
<http://www.ecologyandsociety.org/vol17/iss3/art20/responses/>

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## **Appendix 4: Examples of conference abstracts by PhD students**

# Co-learning and stakeholders' participation and in marine protected area management

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Presented at the Queensland Coastal Conference 2011, Cairns, Queensland, Australia,  
19-21 October 2011

## Abstract

Marine protected area (MPA) management is the management of ecosystems not only for conserving marine resources but also for human purposes. While there is often detailed knowledge of specific research subjects and sites, and knowledge of broad scale processes, there are significant challenges in integrating current knowledge across the range of scales needed for effective management of MPA. Most agencies dealing with MPAs are beginning to learn how to design and conduct an effective participatory process for MPAs, to gain understanding of the implications of increased stakeholder involvement to improve the process. While there is growing awareness of the need for involvement, there is a lack of understanding of the implications of co-learning as an essential element in the process of stakeholder involvement. As policy-making continues to evolve, it is critical to understand the role of stakeholder involvement and, in particular, how participatory decision-making processes can be improved through mutual learning improvement. Significant stakeholder participation occurs in MPA when they see that their contributions to the process have helped shape a meaningful decision. Such participation can be fostered by enhancing stakeholders' participation in the generation and application of knowledge, providing opportunities to exchange their learning, and strengthening their ability to deal with changes throughout the process. This study aims to understand the influences of planning and management instruments fostering or hindering the co-learning systems using Moreton Bay Marine Park as a case study.

## Co-learning in marine protected area for integrated coastal zone management

Siddique, M.A.L.<sup>a\*</sup>, S. Zafrin<sup>a</sup>, S. Myers<sup>a</sup>, T. Smith<sup>a</sup>, R. Babcock<sup>b</sup>, and R.W. Carter<sup>a</sup>

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Poster presentation at the 2<sup>nd</sup> International Symposium on Integrated Coastal Zone Management, Arendal, Norway, 3-7 July 2011.

### Abstract

The nature of marine systems and the multiple stakeholders directly (and indirectly) exploiting marine ecosystem services demands a stewardship and co-management approach to conserving marine resources. At the heart of co-management and stewardship is co-learning. The Moreton Bay Marine Park is one of the most biologically diverse coastal and marine regions in South East Queensland, Australia. It is in management's interest to determine the optimal approach in conserving this diversity. There is also a need to instill public confidence that the best management approach is applied and that stakeholders are involved in the decision-making process. Little research has focused on shared or co-learning for improving management outcomes. This study aims to understand the mechanisms of sustainability learning systems and processes to improve on existing management strategies. The study is based on a desk-top analysis of planning instruments and participatory methodologies in the context of adaptive learning through the case of the Moreton Bay Marine Park. The paper identifies approaches to identifying pathways and barriers to developing a co-learning approach to management to achieve Integrated Coastal Zone Management (ICZM) through creating a resilient management stakeholder society.

## Social Adaptation: The influence of perceptions of risk and adaptive capacity within a high risk community

Tunbridge, A. and Baldwin, C.

Presented at the 'Early Career Researchers Ninth National Forum & Workshop',  
Australian Climate Change Adaptation Research Network for Settlements and Infrastructure,  
Sydney, 11-13 March 2013.

### Abstract

Climate change adaptation research has primarily been concerned with biophysical impacts focusing on assessing system vulnerability to climate change and adaptation options such as: avoid; retreat; accommodate; or protect and defend strategies for the built environment. Although these options can be assessed through economic cost-benefit analysis and through technological, financial, social and institutional constraints, the cognitive constraints of these options are largely under-researched (Grothmann and Patt 2005).

Uncertainties relating to the scale and scope of impacts and a lack of prior experience associated with projected changes in climate may contribute to psychological distress (Reser et al. 2012). The perception of risk and the perceived adaptive capacity of an individual, incorporated within a social construction of risk, can influence behavioural responses and provide a powerful motivator to respond (Harvett et al 2011, Slovic and Weber 2002). However, little is understood about the psychological factors that contribute to adaptive capacity.

This research will use an innovative visualisation technology (GroupMap) in a participatory group setting within a canal estate community, to document residents' perceptions of risk to climate change and their perceived adaptive capacities. This research aims to progress understanding of the psychological dimensions of adaptation through a case study using a socio-cognitive model of adaptation and adaptive capacity (Grothmann and Patt 2005), focusing on building a social construction of risk and development of attainable adaptation options for the community.

Grothmann, T. and Patt, A. (2005) Adaptive capacity and human cognition: The process of individual adaptation to climate change. **Global Environmental Change** 15, pp. 199-213.

Harvett, J., Petts, J. and Chilvers, J. (2011) Understanding householder responses to natural hazards: flooding and sea-level rise comparisons. **Journal of Risk Research** 14:1, pp. 63-83.

Reser, J.P., Bradley, G.L., Glendon, A., Ellul, M.C. and Callaghan, R. (2012) [\*\*Public Risk Perceptions, Understandings, and Responses to Climate Change and Natural Disasters in Australia and Great Britain- Final Report\*\*](#), National Climate Change Adaptation Research Facility, Gold Coast, 297pp.

Slovic, P. and Weber, E.U. (2002) Perception of risk posed by extreme events. **'Risk Management Strategies in an Uncertain World' Conference**, New York, April 12-13, 2002.

# Queensland's coastal management: indicators to measure coastal governance outcomes

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Presented at the Queensland Coastal Conference 2011 held in Cairns, QLD, 19-21 October 2011

## Abstract

Using South East Queensland (SEQ) as a case-study, this paper examines the transition in Queensland's coastal governance system, evaluate its' performance against a set of internationally derived Integrated Coastal Zone Management (ICZM) governance indicators. In the SEQ case-study, the plans and policies will be analysed against indicators to assess governance performance in the area of participation – a challenge for coastal managers seeking to measure success of the progression through the ICZM cycle, rather than simply measuring input-based results. The indicators enable success to be measured 'on the ground' as outcomes and impacts on the environment, industry and communities. The results should reveal the strengths and weaknesses of participation methods used in the preparation of available planning instruments modifications needed to achieve best practice. The issues faced by Queensland are similar to those being experienced in many countries as we experience a major shift in philosophy – moving from government to governance in managing environmental or common pool resources, applying new modes of policy implementation in which government manages in partnerships with industry and communities. This paper focuses only the document analysis of the scope and extent of public participation in Queensland's coastal planning process as a demonstration of how indicators are applied to evaluate Queensland's performance against ICZM governance principles.

# Queensland's Coastal Planning Regime: challenges, strengths and weaknesses

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Presented at the Coast 2 Coast 2012 Conference held in Brisbane, QLD on 17-21 September, 2012

## Abstract

Integrated coastal zone management (ICZM) is about governance as it deals with complex, dynamic and multi-jurisdictional coastal systems and various levels of government are only a few of many actors. Queensland's coastal planning regime is going through a significant with the commencement of the new Queensland Coastal Plan (QCP) in February 2012. To be effective, changes have also been made to the Coastal Protection and Management Act 1995 (CPMA) and Sustainable Planning Act 2009 (SPA). As a result of the statutory review of the State Coastal Management Plan (SCMP) in 2008-09, the new Queensland Coastal Plan (QCP) replaces the SCMP and regional coastal management plans. The review termed previous coastal plan as 'a significant stumbling block for the progression of the ICM in Queensland' because of its ambiguity to guide local planning schemes and powerlessness to prevent inappropriate development. This paper analyses the transition of Queensland's coastal planning process using South East Queensland (SEQ) as a case study to understand the complexity of the coastal governance. The study will also examine the relationship between different level of government engaged in Queensland's coastal planning including the strengths and weaknesses of the new planning regime.