

Prioritising Coastal Adaptation Development Options for Local Government



2nd
Edition

A Guide to Monitoring and Evaluating Coastal Adaptation



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Introduction

Local Government is at the forefront of adaptation to climate change. As Councils continue to develop adaptation plans and related strategies, there is a need for guidance to promote consistency and best practice across the sector. This Guide provides a framework for monitoring and evaluating the climate change adaptation strategies and practices of Local Government in coastal areas. It focuses on three key areas – best practice planning, adaptive capacity and monitoring outcomes.

When it comes to monitoring and evaluation, the focus is typically on measuring the *outcomes* of particular actions (e.g. increased resilience of built structures following a change in the local building code). However, outcomes are very much influenced by the planning processes behind those actions and the resources and capital (capacity) used to execute them. Without an understanding of the way these factors are influencing outcomes, it is hard to fully appreciate how effective or ineffective those actions are. As a result, this Guide has been developed to promote assessment of adaptation planning, adaptive capacity *and* outcomes in the context of coastal adaptation within Local Government.

The Guide was originally developed as part of a related SCCG project on [Prioritising Coastal Adaptation Development Options for Local Government](#). This project was undertaken as part of the Australian Government's [Coastal Adaptation Decision Pathways Program](#) and focused on evaluating coastal adaptation options using multi-criteria analysis. One of the findings to emerge from this project was that, although adaptation efforts are widespread in Local Government, there is limited evidence of appropriate monitoring and evaluation. This Guide is designed to help address that shortfall by providing tools for Local Government staff to evaluate adaptation practice at various stages of development.

The Guide is based on a literature review of relevant publications, as well as an online survey and workshops with the 15 Member Councils of the Sydney Coastal Councils Group, the Sunshine Coast Council, and Bega Valley Shire Council.

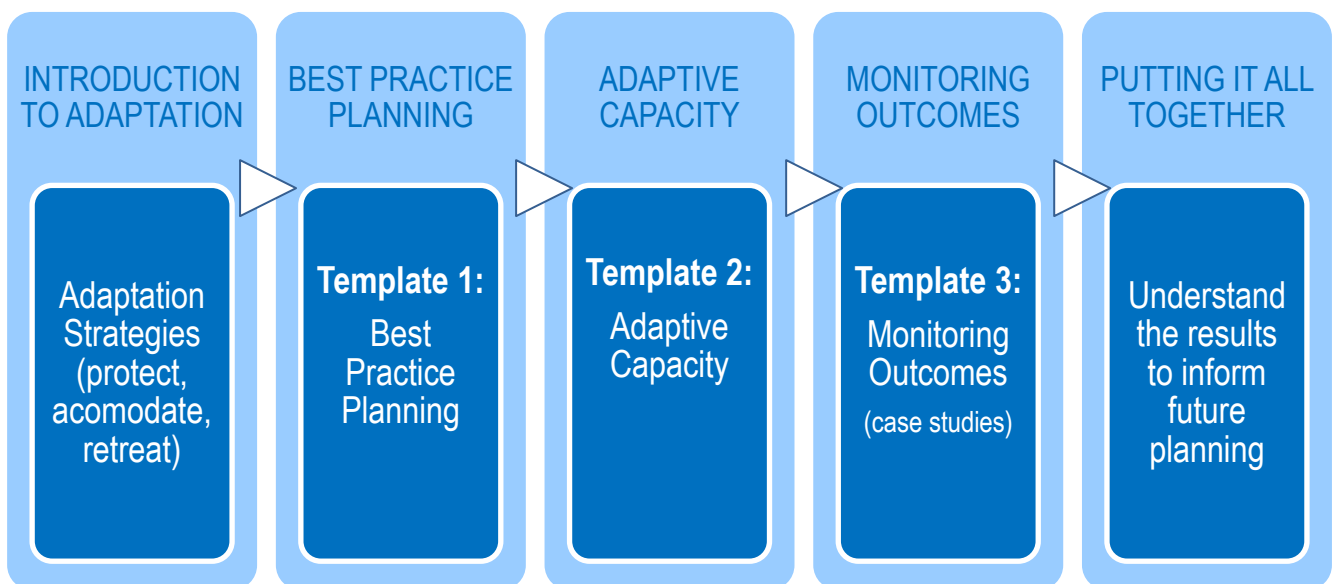
The original Guide, published in 2012, has been further refined based on outcomes from a Pilot Workshop Series with Council representatives from Bega Valley Shire Council, Leichhardt City Council, Rockdale City Council, Sunshine Coast Council and Sutherland Shire Council.

Overview of the Guide

This Guide provides a framework for evaluating adaptation practice in Local Government, focusing on three key areas – best practice planning, adaptive capacity and monitoring outcomes. These three areas help to build a picture of the sustainability, feasibility and efficacy of adaptation initiatives in the following ways:

- good planning will enhance the quality and long-term prospects of adaptation initiatives, and thus their **sustainability**
- adaptive capacity is a measure of an organisation’s ability and potential to implement adaptation and therefore provides a good measure of the **feasibility** of adaptation initiatives, and
- monitoring outcomes is key to understanding the **efficacy** of adaptation initiatives.

The Guide begins with a brief overview of different adaptation strategies, based on the ‘protect-accommodate-retreat’ framework. It then proceeds into more focused consideration of the three key areas of planning, capacity and outcomes, drawing on best practice principles and standards. A series of templates and case studies take users through an evaluation of their own adaptation plans against these best practice principles and standards. The Guide concludes with a discussion on analysing results from the templates and applying learnings, to ensure continuous improvement in adaptation practice.



Although the Guide is focused on climate change adaptation, the principles and tools contained herein can be applied to planning processes generally. Indeed, climate change adaptation cuts across all functional areas of Local Government and should ultimately be embedded in all planning processes.



Note: References throughout the Guide to adaptation plans and strategies refer collectively to the initiatives and mechanisms Council has in place to respond to climate change impacts, whether these be encapsulated in a single plan or policy (such as a ‘Climate Change Adaptation Strategy’), or implicit in various other Council processes (such as asset management plans, community strategic plans, coastal zone management plans or floodplain management plans).

Using the Guide

Who	<p>The Guide is designed to be used as an aid to collaborative planning in Local Government. Climate change adaptation cuts across all functional areas of Local Government and it is important that all relevant staff are engaged in planning, implementing and monitoring adaptation initiatives. As a precursor to using the Guide, users are encouraged to identify staff with a stake in climate change adaptation in Council and ensure they are engaged in the process. This may include staff from engineering, asset management (parks and waterways, roads and pavements, stormwater, buildings), community engagement, environment and sustainability, strategic planning, finance, governance, health, land use planning and so on.</p>
When	<p>This Guide can be used as a formative tool (at the planning stage) <i>and</i> as a reflective tool (during or post-implementation). As a formative tool, the Guide is designed to draw attention to important considerations in relation to (i) planning for adaptation, (ii) assessing capacity and (iii) monitoring outcomes. As a reflective tool, the Guide will assist users to evaluate whether and to what extent Council's adaptation efforts meet best practice principles in these three areas. Depending on where Council is in their adaptation program, users are encouraged to modify the templates to meet their needs.</p> <p>The templates contained in the Guide should be revisited on a regular basis to ensure Council's adaptation program remains on track. Adaptation is a long-term and dynamic process and adaptation plans and processes should be responsive to changing conditions, whether they are environmental, organisational, political or social. Users should consider implementing a yearly review program where past and current responses to the templates are compared, to identify trends or changes. Used in this way, the Guide can assist with identifying pathways and/or transition points between different adaptation strategies.</p>
How	<p>The templates contained in the Guide present a number of best practice principles for adaptation planning, adaptive capacity and monitoring outcomes. They are intentionally pitched at a high level, so that they can be applied across a range of contexts. Users may want to adapt the templates to incorporate specific considerations relevant to Council.</p> <p>The templates should be completed through a collaborative process involving all relevant Council areas with a stake in climate change adaptation (as identified above). The templates are designed to promote discussion (and debate) about Council's performance against the various best practice principles presented. There are no right or wrong answers and ratings should be reached by consensus (as far as possible) amongst staff. For this reason it is recommended that users convene a round table meeting or workshop where various staff members have the opportunity to interact with one another as they progress through the templates.</p>



Note: The critical thing to remember is that there are no right or wrong answers. The templates are intentionally designed to elicit subjective responses from users (i.e. strongly agree, neutral, disagree) as it is recognised that there are many variables that will affect how a particular Council prioritises adaptation and the way they go about adapting to climate change impacts.

For these reasons, users are also encouraged to modify the templates to meet their needs - editable versions of the templates can be downloaded at:

www.sydneycoastalcouncils.com.au/Projects/prioritising_coastal_adaptation

An Introduction to Adaptation

Adaptation is defined in the Intergovernmental Panel on Climate Change 5th Assessment Report (2014) as:

The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects.¹

Adaptation Strategies

While there are numerous activities that can be classified as “adaptation”, they can generally be grouped into three main strategies: (i) protect, (ii) accommodate or (iii) retreat.

Protect

‘Protect’ strategies alter land and existing developments to withstand climate change hazards. They are designed so that the impacts of climate change are reduced or negated, often over shorter timescales such as a few decades. In a coastal environment, protect strategies such as beach nourishment, seawalls and breakwaters are implemented to dissipate, absorb and/or reflect wave energy, to protect communities and infrastructure from erosion, storm surge and flooding. While protect measures provide protection they can also create or exacerbate other coastal problems during construction and operation (e.g. erosion of adjacent sites, loss of coastal amenity). In addition, the ability to effectively protect depends on the magnitude and frequency of climatic events.

Accommodate

‘Accommodate’ strategies reduce exposure and vulnerability with ‘non-defensive’ measures, such as building modifications (e.g. raising houses). They are implemented to minimise climate impacts and designed mainly for episodic climatic events (e.g. storm surge and flooding). While accommodate measures allow a degree of ‘business as usual’ and may be the least costly strategy in the short-term, in order to persist they may need to be continually improved or re-engineered and may not be feasible over longer time periods.

Retreat

‘Retreat’ strategies involve changing land use and relocating existing infrastructure that is vulnerable to climate change hazards (e.g. re-zoning land use to restrict or prohibit development). They are implemented to remove communities and infrastructure from the harm of climate impacts (e.g. sea level rise, flooding, and storm surge) over the longer term (e.g. beyond several decades). While retreat measures reduce vulnerability to climatic events they can be costly and potentially have social implications due to changes in community structures and sense of place.

The selection of adaptation strategies will depend on the local environment, community values and priorities, and in many instances a combination of strategies could be implemented simultaneously. A number of factors should be considered in the selection of strategies, including environmental, social, economic and governance factors. Multi-criteria analysis (MCA) can be a useful tool for making decisions when there are multiple considerations such as these. MCA is essentially a structured process for decision-making that takes account of a range of values and interests relevant to the situation at hand. It allows decision-makers to work directly with diverse values as well as both qualitative and quantitative information. The SCCG project [Prioritising Coastal Adaptation Development Options for Local Government](#) and related [report](#) explore the use of MCA for coastal adaptation further.

¹ IPCC (2014), *Climate Change 2014: Impacts, Adaptation, and Vulnerability – Technical Summary*, Working Group II Contribution to the IPCC 5th Assessment Report, p. 3.



Tip: Two key issues should be considered when developing adaptation strategies. Firstly, is there potential for maladaptation (i.e. an adverse impact on another part of the socio-ecological system), and secondly, will the selection of a particular strategy reduce the potential to be able to transition to another more desirable strategy over time (i.e. will it create a path dependency that reduces the ability to adapt when certain environmental, social or economic thresholds are exceeded)? For example, extensive investment in “protect” options over the next decade may limit the ability to transition to alternative adaptation options when the “protect” pathway is deemed unsustainable. More discussion on the implications of the intent of adaptation is provided by Thomsen et al. (2012).

Further Reading

There are many books, journal articles and reports on the subject of ‘adaptation’. The [IPCC Assessment Reports](#) are a useful starting point. Other suggested readings include:

Adger W N (2006), ‘Vulnerability’, *Global Environmental Change*, vol. 16, p. 268-281.

Barnett J & O’Neill S (2010), ‘Maladaptation’, *Global Environmental Change*, vol. 20, p. 211-213.

Foerster A, Macintosh A & McDonald J (2013), ‘Transferrable lessons for climate change adaptation planning? Managing bushfire and coastal climate hazards in Australia’, *Environmental and Planning Law Journal*, vol. 30, p. 469-490.

Smit B & Wandel J (2006), ‘Adaptation, adaptive capacity and vulnerability’, *Global Environmental Change*, vol. 16, p. 282-292.

Thomsen D C, Smith T F and Keys N (2012), ‘Manipulation or adaptation: unpacking climate change response strategies’, *Ecology and Society*, vol. 17, no.3, pp. 20: <http://www.ecologyandsociety.org/vol17/iss3/art20/>

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Part 1: Best Practice Planning

Rationale

Sound planning is critical to successful adaptation. Based on a review of the literature, effective adaptation plans should be:

Integrated	<i>Consistent with other plans/policies and integrative of stakeholders' interests</i>
Equitable	<i>Costs and benefits are identified and distributed equitably</i>
Sustainable	<i>Quadruple bottom line considerations (environmental, social, economic, governance) are taken into account</i>
Informed	<i>Diverse knowledge types and sources are included (e.g. scientific, local and indigenous knowledge)</i>
Responsive	<i>Plans are flexible enough to respond to changing circumstances and accommodate uncertainties</i>

Recognising that it can be difficult to determine whether and to what extent a particular adaptation strategy or plan is integrated, equitable, sustainable, informed and responsive, the Best Practice Planning Template (p. 9) identifies a series of performance criteria that Councils can use to assess their adaptation plans against these five principles.

Application

Ideally, users would review the Best Practice Planning Template *prior to* developing an adaptation plan or strategy so that it can guide the planning process. However it can also be used to identify strengths and weaknesses in adaptation plans that have already been developed. It is also recommended that the Template be revisited as part of any review of Council's planning processes.

The rating criteria for this template are subjective and designed to stimulate discussion between staff as to the level of performance of Council. If staff are unsure about how to rate Council's performance, use the 'Considerations' listed in the final column as prompts for discussion. Remember that there are no right or wrong answers and ratings should be reached by consensus (as far as possible) amongst staff. Users may also wish to include additional guiding principles or adjust performance criteria to suit Council's particular needs and aspirations.



Tip: If a shortfall is identified in an existing plan through the process of completing the template, this may undermine the success of Council's adaptation plan at the point of implementation. Consider how Council might revise the plan or related strategies to address any shortfalls using the 'Considerations' listed in the final column.

Further Reading

Adger W N, Arnell N W, and Tompkins E L (2005), 'Successful adaptation to climate change across scales', *Global Environmental Change-Human and Policy Dimensions*, vol. 15, no. 2, pp. 77-86.

Bulkeley H & Betsill M (2003), *Cities and Climate Change*, Routledge, Oxford.

Gurran N, Hamin E & Norman B (2008), *Planning for climate change: Leading Practice Principles and Models for Sea Change Communities in Coastal Australia*, prepared for the National Sea Change Taskforce, Sydney: <http://www.seachangetaskforce.org.au/Publications/PlanningforClimateChange.pdf>

Lim B, Burton I, Malone E & Huq S (2004), *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*, UNDP and Cambridge University Press.

Mangoyana R, Thomsen D C, Smith T F, Preston B L, Heinz S, Maloney M, Withycombe G and O'Dwyer S (2012), *Literature Review of Adaptation to Climate Change in the Coastal Zone*, report prepared for the Sydney Coastal Councils Group and the Australian Department of Climate Change and Energy Efficiency: <http://www.sydneycoastalcouncils.com.au/sites/default/files/litreview.pdf>

Prutsch A, Grothmann T, Schauser I, Otto S, and McCallum S (2010), *Guiding Principles for adaptation to climate change in Europe: ETC/ACC Technical Paper 2010/6*, Bilthoven: The European Topic Centre on Air and Climate Change: http://acm.eionet.europa.eu/docs/ETCACC_TP_2010_6_guiding_principles_cc_adaptation.pdf

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Template 1: Best Practice Planning

	Performance Criteria	Rating					Considerations
		Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	
INTEGRATED	Policies, plans and actions are consistent across government, communities, and relevant industry sectors						
	Staff from all relevant Council divisions (as appropriate) are engaged in the planning process						<ul style="list-style-type: none"> Were a range of Council staff involved in the development of Council's adaptation plan (e.g. asset management, land use planning, finance, governance, environment and sustainability)?
	Adaptation plans are consistent with Council policies and plans						<ul style="list-style-type: none"> Were other Council policies and plans considered during the development of Council's adaptation plan? Are the objectives in Council's adaptation plan consistent with those of other Council policies and plans?
	Staff from all relevant government agencies (as appropriate) are engaged to ensure consistency						<ul style="list-style-type: none"> Were relevant government agencies consulted in the development of Council's adaptation plan (e.g. environment, planning, infrastructure, Crown lands, water authority, health, emergency services and social services)?
	Adaptation plans are consistent with state and national policies and plans						<ul style="list-style-type: none"> Were relevant state and national policies and plans considered during the development of Council's adaptation plan?
	Representatives from all relevant community sectors are engaged to ensure synergistic strategies						<ul style="list-style-type: none"> Were representatives from relevant community sectors consulted in the development of Council's adaptation plan (e.g. peak community organisations, special interest groups, minority groups, vulnerable community sectors)?
Representatives from all relevant industry and business sectors are engaged to ensure synergistic strategies						<ul style="list-style-type: none"> Were representatives from relevant industry and business sectors consulted in the development of Council's adaptation plan (e.g. property sector, chambers of commerce, local industrial and manufacturing operations, private infrastructure providers)? 	
EQUITABLE	Adaptation strategies recognise the costs and benefits to different community and industry sectors						
	The costs and benefits of adaptation strategies to different community sectors are assessed and distributed equitably						<ul style="list-style-type: none"> Were the costs and benefits of Council's adaptation strategies to different community sectors considered? Has Council considered how to distribute those costs and benefits to ensure an equitable outcome for different sectors? Has Council considered how it will communicate the distribution of those costs and benefits to different sectors?
	The costs and benefits of adaptation strategies to different industry and business sectors are assessed and distributed equitably						<ul style="list-style-type: none"> Were the costs and benefits of Council's adaptation strategies to different industry and business sectors considered? Has Council considered how to distribute those costs and benefits to ensure an equitable outcome for different sectors? Has Council considered how to communicate the distribution of those costs and benefits to different sectors?
SUSTAIN-ABLE	Strategies consider quadruple bottom line impacts (environmental, social, economic and governance)						
	Environmental, social, economic and governance impacts are considered to enhance the long-term sustainability of adaptation strategies						<ul style="list-style-type: none"> Has Council considered the impacts of adaptation strategies across the quadruple bottom line (environmental, social, economic and governance)? Where negative impacts are identified, has Council considered alternative strategies to minimise those? If alternative strategies are unfeasible, are negative impacts in one area offset by positive impacts in another? Has Council considered how these impacts might change over time?
INFORMED	Decisions are based on a range of knowledge sources (e.g. scientific, indigenous and local)						
	A range of evidence is considered and weighted appropriately in the development of adaptation strategies						<ul style="list-style-type: none"> Has Council considered a range of knowledge sources in the development of their adaptation plan (e.g. scientific, organisational, local, expert, indigenous)? Has Council considered how different knowledge sources should be weighted (e.g. should scientific data be prioritised over anecdotal evidence from the community or vice versa)?
RESPONSIVE	Strategies recognise uncertainties and respond to changes in the environment in which they operate						
	Multi-criteria analysis ¹ (or other tools) is used to develop, refine and adjust adaptation strategies						<ul style="list-style-type: none"> Has Council used decision-support tools such as multi-criteria analysis to identify and weigh up the advantages and disadvantages (e.g. environmental, social, economic and governance) of different adaptation strategies?
	Monitoring and evaluation is conducted regularly and at appropriate spatial and temporal scales						<ul style="list-style-type: none"> Has Council developed a monitoring and evaluation plan to assess the impact of adaptation strategies once implemented? Has Council established baselines or benchmarks from which to measure the impacts of adaptation strategies? Has Council considered which spatial (e.g. local, precinct, regional) and temporal (e.g. quarterly, annually, biennially) scales are most suitable for monitoring adaptation strategies?
	Transition / trigger points are identified for switching between adaptation strategies						<ul style="list-style-type: none"> Has Council identified thresholds to guide pathways to different adaptation strategies (e.g. a particular level of sea level rise or number of storm / flood events per year)? How will Council monitor whether those thresholds have been reached? Has Council developed an action plan to transition between strategies if a threshold is reached? How will Council communicate those thresholds to staff and stakeholders?

Users are also encouraged to modify the templates to meet their needs - editable versions of the templates can be downloaded at: www.sydneycoastalcouncils.com.au/Projects/prioritising_coastal_adaptation

¹ Multi-criteria analysis (MCA) is any structured process for decision-making that takes account of a range of values and interests relevant to the situation at hand. It allows decision-makers to work directly with diverse values as well as both qualitative and quantitative information. For an example of MCA in practice, refer to the SCCG Project *Prioritising Coastal Adaptation Development Options for Local Government*: http://www.sydneycoastalcouncils.com.au/Projects/prioritising_coastal_adaptation

Part 2: Adaptive Capacity

Rationale

Adaptive capacity is a measure of Council's ability and potential to implement adaptation. It can be evaluated by assessing a range of capitals within, or accessible to, Council that can be mobilised to implement adaptation plans.

Based on a review of the literature, six key areas of capacity have been identified as necessary for successful adaptation:

Human capital	<i>Staff have the knowledge, skills and time to develop, implement and evaluate adaptation strategies</i>
Organisational capital	<i>Organisational goals, structures and processes facilitate the development, implementation and evaluation of adaptation strategies</i>
Social capital	<i>Connections with all relevant community and industry stakeholders represent supportive networks</i>
Natural capital	<i>Sufficient natural resources (e.g. available land, freshwater supplies, riparian/dunal vegetation, raw materials) are accessible to facilitate adaptation</i>
Built capital	<i>Sufficient infrastructure and capital assets are available to support adaptation</i>
Financial capital	<i>Adequate financial resources have been allocated in council budgets or are accessible through other sources of funding</i>

The Adaptive Capacity Template (p. 12) identifies a series of performance criteria under each of these six capitals, to assist Councils to evaluate their adaptive capacity, identify strengths and weaknesses and opportunities for improvement.

Application

The Adaptive Capacity Template would ideally be completed *before or during* the development of an adaptation plan, since the adaptive capacity of Council will dictate which adaptation strategies are feasible. However if Council has progressed beyond the planning stage, this template will help users identify any capacity constraints that may be limiting the success of Council's adaptation efforts. It is also recommended that the Template is revisited on an annual basis in line with operational planning so that capacity development initiatives can be considered as part of budgets.

Like the previous template, the rating criteria for this template are subjective and designed to stimulate discussion between staff as to the level of capacity within Council. Different staff members may have different views about the ratings. If staff are unsure about how to rate Council's performance, use the 'Considerations' listed in the final column as prompts for discussion. Remember that there are no right or wrong answers and ratings should be reached by consensus amongst staff. Additional capitals or considerations relevant to the capacity of Council may also be added, such as political and legal capital.



Tip: Where capacity constraints are identified, these may be overcome through a variety of means such as training (internal or external) or collaboration with other divisions or agencies. Use the 'Considerations' column for ideas about how Council might enhance capacity. If it is not possible to address a capacity constraint, then revision of adaptation plans or re-consideration of adaptation options may be necessary. This is why it is important to consider adaptive capacity throughout the adaptation process. Also consider how adaptive capacity in each of the key areas might change over time.

Further Reading

Bebbington A (1999), 'Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty', *World Development*, vol. 27, no. 12, pp. 2021-2044.

Bourdieu P (1986), 'The forms of capital', in Richardson J G (ed.), *The Handbook of Theory: Research for the Sociology of Education*, Greenwood Press, New York, pp. 241-258.

Emery M and Flora C (2006), 'Spiraling-up: mapping community transformation with community capitals framework', *Community Development*, vol. 37, no. 1, pp. 19-35.

Nelson R, Kokic P, Crimp S, Meinke H and Howden S M (2010), 'The vulnerability of Australian rural communities to climate variability and change: Part I—Conceptualising and measuring vulnerability', *Environmental Science & Policy*, vol. 13, no. 1, pp. 8-17.

Nelson R, Kokic P, Crimp S, Martin P, Meinke H, Howden S M, de Voil P and Nidumolu U (2010), 'The vulnerability of Australian rural communities to climate variability and change: Part II—Integrating impacts with adaptive capacity', *Environmental Science & Policy*, vol. 13, no. 1, pp.18-27.

Smit B & Wandel J (2006), 'Adaptation, adaptive capacity and vulnerability', *Global Environmental Change*, vol. 16, pp. 282-292.

Smith J B, Klein R J T & Huq S (eds.) (2003), *Climate Change, Adaptive Capacity & Development*, Imperial College Press, London.

Smith T F, Carter R W, Daffara P & Keys N (2010), *An assessment of the nature and utility of adaptive capacity research*, National Climate Change Adaptation Research Facility, Gold Coast:

<http://www.nccarf.edu.au/publications/assessment-nature-and-utility-adaptive-capacity-research>

Smith T F, Brooke C, Measham T G, Preston B, Gorrdard R, Withycombe G, Beveridge B & Morrison C (2008), *Case Studies of Adaptive Capacity: Systems Approach to Regional Climate Change Adaptation Strategies*, Sydney Coastal Councils Group Inc., Sydney:

<http://www.sydneycostalcouncils.com.au/sites/default/files/systapproachphasethreereport.pdf>

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Template 2: Adaptive Capacity

	Performance Criteria	Rating					Considerations
		Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	
HUMAN CAPITAL	Staff have the knowledge, skills and time to develop, implement and evaluate adaptation strategies						
	Staff have (or can acquire) adequate knowledge and skills, or access to appropriate training, to develop and implement adaptation strategies						<ul style="list-style-type: none"> Do relevant staff have the appropriate knowledge and skills to effectively contribute to the development and implementation of Council's adaptation strategies? Has training and capacity building programs been identified to ensure currency in staff knowledge and skills related to climate change adaptation?
	The time allocated to staff is sufficient for the development of adaptation strategies						<ul style="list-style-type: none"> Is sufficient time for developing adaptation strategies included in individual staff work plans?
	The time allocated to staff is sufficient for the implementation of adaptation strategies						<ul style="list-style-type: none"> Is sufficient time for implementing adaptation strategies included in individual staff work plans?
	The time allocated to staff is sufficient for the monitoring and evaluation of adaptation strategies						<ul style="list-style-type: none"> Is sufficient time for monitoring and evaluation of adaptation strategies included in individual staff work plans?
ORGANISATIONAL CAPITAL	Organisational goals, structures and processes facilitate the development, implementation and evaluation of adaptation strategies						
	Organisational strategy and plans are consistent with the goals of adaptation						<ul style="list-style-type: none"> Are Council's other strategies and plans consistent with the goals of Council's adaption plan?
	Senior staff within the organisation champion the need for adaptation						<ul style="list-style-type: none"> What communication channels exist to champion the need for adaptation? Is there a standing agenda item at meetings of senior staff? Is adaptation incorporated into the work plans and reporting programs for senior staff? Who in the executive would be the most relevant / willing person to speak to?
	Communication and coordination between Council divisions is sufficient for the development, implementation and evaluation of adaptation strategies						<ul style="list-style-type: none"> Have the effects of adaptation on different Council divisions been identified? What mechanisms exist to facilitate communication and coordination between Council divisions? Are different Council divisions engaged in the development, implementation and evaluation of adaptation strategies? Has an appropriate person been allocated responsibility for maintaining communication and coordination between divisions?
SOCIAL CAPITAL	Connections with all relevant community and industry stakeholders represent supportive networks						
	Processes have been developed and are used effectively to engage relevant community sectors during planning, implementation and evaluation						<ul style="list-style-type: none"> Does Council report on the progress of adaptation strategies to the community? Are there opportunities for community participation in the implementation and review of Council's adaptation strategies? How is community feedback considered in the implementation, monitoring and review of Council's adaptation strategies?
	Processes have been developed to engage relevant industry sectors during planning, implementation and evaluation						<ul style="list-style-type: none"> Does Council report on the progress of adaptation strategies to relevant industry sectors? Are there opportunities for relevant industry sectors to participate in the implementation and review of adaptation strategies? How is industry feedback considered in the implementation, monitoring and review of Council's adaptation strategies?
NATURAL CAPITAL	Sufficient natural resources (e.g. available land, freshwater supplies, riparian/dunal vegetation, raw materials) are accessible to facilitate adaptation						
	Natural resources necessary for adaptation are present in the local area or region						<ul style="list-style-type: none"> Has Council identified and recorded the extent and condition of natural resources in the local area or region? Are there systems in place for monitoring the condition of natural resources in the local area or region?
	Initiatives are in place to protect and enhance natural resources in the local area and region						<ul style="list-style-type: none"> Are there programs in place for maintaining and enhancing the condition of natural resources in the local area or region?
	The value of natural resources in adapting to climate change impacts is acknowledged and quantified in relevant plans (for e.g. asset management plans)						<ul style="list-style-type: none"> Has Council evaluated the role of natural resources in mitigating and adapting to the effects of climate change (e.g. dunal vegetation provides a natural buffer to storm surge, trees help to mitigate urban heat island effects)? Is the value of natural resources in adapting to climate change impacts considered in Council planning decisions?
BUILT CAPITAL	Sufficient infrastructure and capital assets are available to support adaptation						
	Infrastructure and capital assets necessary for adaptation are present (or will be when necessary) in the relevant local area						<ul style="list-style-type: none"> Has Council undertaken an assessment of the role of infrastructure and capital assets in adapting to climate change impacts (e.g. sea walls for protection against storm surge and sea level rise; fire retardant building materials in bushfire-prone areas; insulation and cooling systems to mitigate heat wave effects etc)? Is adaptation considered in relevant asset management plans?
	The condition/state of infrastructure and capital assets is sufficient for the purposes identified in adaptation plans						<ul style="list-style-type: none"> Has Council considered how climate change impacts may affect the condition/state of infrastructure and capital assets (both existing assets and planned development)? Are climate change thresholds (i.e. frequency of extreme weather events; sea level rise benchmarks etc) considered in the maintenance of assets?
FINANCIAL CAPITAL	Adequate financial resources have been allocated in council budgets or are accessible through other sources of funding						
	Sufficient financial resources for adaptation planning, implementation and evaluation are included in relevant Council budgets or can be sourced externally or are planned for future expenditure						<ul style="list-style-type: none"> Is climate change adaptation incorporated into Council's Community Strategic Plan and associated resourcing strategy? Has Council undertaken an assessment of the financial costs associated with climate change impacts? Has a cost-benefit analysis been undertaken to inform adaptation planning and response? Are sufficient resources allocated to address the operational costs of projects and or works associated with the plan, including any additional research required, and funding for monitoring and evaluating the outcomes of those activities?

Users are also encouraged to modify the templates to meet their needs - editable versions of the templates can be downloaded at: www.sydneycoastalcouncils.com.au/Projects/prioritising_coastal_adaptation

Part 3: Monitoring Outcomes

Rationale

Monitoring outcomes is a critical step in helping to identify the effectiveness of adaptation activities. It can aid in assessing conditions and changes, comparing the effectiveness of actions across places, and determining trends in relation to the achievement of adaptation aims and objectives.

In cases where uncertainty exists (e.g. climate impacts), managers also need to learn as they go through an adaptive management approach. Monitoring and evaluation processes can help to generate a shared understanding about the outcomes Councils seek from adaptation, and how best to achieve those outcomes.

Ecological contexts for climate change adaptation vary greatly (e.g. extent of coastal area, estuarine and wetland areas etc), as do the risks posed by climate change (e.g. infrastructure and housing vulnerability, spread of weeds and pests). This variation affects adaptation aims and objectives, and means that no one set of outcome indicators is likely to suit all activities in all areas. Outcome indicators therefore need to be context specific.



Tip: For each of your adaptation objectives, it is useful to develop criteria, indicators, measures and targets:

- **Criteria** describe assessable outcomes (e.g. dune system protection)
- **Indicators** reflect how that outcome will be assessed (e.g. local vegetation condition)
- **Measures** reflect what will be assessed (e.g. extent and quality of vegetation)
- **Targets** reflect the desired level of an indicator (e.g. 50%+ of dune vegetation is intact)

Developing Indicators

Indicators are things that we can measure. They help us determine whether we have achieved objectives for a specific plan or program of work. Indicators of change in the ecological and social systems that constitute a local government area or region are required to identify the causes, consequences and responses to change.

Effectively communicating these elements of change requires the selection of indicators that reliably measure the matter of interest, are based on accessible and easily updateable sources of data, and resonate with the interests of those influential in decision-making, including local community members, relevant business and industry entities, and governing bodies.

SMART Indicators

So what makes a good indicator? Consider the following points:

Simple: Indicators should be easily understood and meaningful to those who seek to use the information they provide. There is little point in collecting complex information if there is no capacity to analyse it or no intent to use it in the review of adaptation plans.

Measurable: Indicators should be measurable, with consideration given to the repeatability of assessment, the precision required for measurement and the resources (funding, time) needed for measurement.

Action-oriented: Councils should consider how indicators are likely to be used, and adjust the scope of monitoring appropriately. Additional depth and scope of measurement may be useful in situations where management sensitivities exist. For example, a Council may consider the level beach usage as well as business activity in beach-side areas when deciding whether to undertake a beach nourishment program. In this situation, monitoring visitor numbers at different times of the year and related business activity may be necessary, in addition to monitoring changes in sand extent and condition.

Relevant: Indicators and associated measures need to be relevant to the objectives, strategies and performance criteria at hand. They also need to adequately reflect progress towards desired long-term outcomes.

Time sensitive: Indicators need to be time sensitive to change. Some variables are slow changing and highly variable across years (e.g. climate), meaning that progress towards outcomes can be difficult to assess over the short to medium term. In these situations, it is helpful to identify intermediate outcomes that lead towards longer-term outcomes.

Pressure-State-Response

It can sometimes be difficult to identify what is causing an outcome to change in a particular direction over time. Frameworks such as 'Pressure-State-Response' (PSR) can assist Councils to develop indicators that are not only SMART, but also assist in understanding the drivers behind changes in the environment. The PSR framework is perhaps the best known indicator framework, used by the OECD and in State of the Environment reporting. It distinguishes between indicators that assess:

- *Pressure:* assessment of changes to threats to values (e.g. weeds)
- *State:* assessment of the condition and extent of values (e.g. wetlands)
- *Response:* assessment of the extent of management activity undertaken (e.g. weed control over 30% of wetland).



Note: In addition to the development of indicators, Councils should be clear about who is responsible for their assessment, the timing and frequency of assessment, and how data will be stored and analysed. A recent review of monitoring conducted by coastal agencies in Australia (Jacobson et al. 2014) identified that only 46 per cent of agencies use monitoring to adapt management, but the extent of monitoring information collected was not correlated with its influence on decision making. Being clear about monitoring purpose and thinking carefully about whether frameworks, indicators, measures and data collected will achieve purposes within a given budget and capability set are therefore critical before embarking on a detailed monitoring program.

Application

The Monitoring Outcomes Template (p. 16) is designed to assess the performance of adaptation activities by individual Councils or collectively across a number of Councils. It prompts users to link adaptation objectives and strategies with performance indicators across four dimensions - environmental, social, economic and governance. This 'quadruple bottom line' framework assists Council to consider the full range of outcomes and potential impacts of their adaptation actions.

The Monitoring Outcomes Template is also designed to monitor performance *over time*, so that trends and changes are identified. This will help users determine whether adaptation strategies are appropriate for realising Council's objectives, or whether Council needs to consider changing strategies. The Monitoring Outcomes Template is specifically designed to be repeatable, but the period of iteration depends on how frequently indicators are measured.

If Council is not yet at the implementation stage, the Monitoring Outcomes Template can be used as a framework for developing suitable adaptation strategies. Using the Template in this way will help to ensure:

- alignment between objectives and implementation strategies
- prior consideration of the range of potential impacts according to the quadruple bottom line dimensions of sustainability
- adequate allocation of resources for monitoring and evaluation as part of implementation.

The Template should also be used at these early stages to establish a baseline of current conditions, from which users can measure the impact of adaptation strategies in the future. Users should consider what data is needed and can be accessed to establish this baseline.

Monitoring is an essential element of adaptation. A regular monitoring regime is recommended based on the anticipated frequency of changes and response to episodic events. Consideration should also be given to the robustness of monitoring efforts, such as whether data is collected and analysed in a standardised way and how the effectiveness of adaptation actions will be discerned.

In the following section, a series of case studies are included to illustrate the use of the Monitoring Outcomes Template across different scenarios.

Further Reading

Allen W J, Fenemor A, Wood D (2012), *Effective indicators for freshwater management: attributes and frameworks for development*, Landcare Research New Zealand:

http://www.learningforsustainability.net/pubs/developing-effective_indicators.pdf

Bours D, McGinn C & Pringle P (2014), *Twelve reasons why climate change adaptation M&E is challenging*,

SeaChange and UKCIP: <http://www.ukcip.org.uk/wordpress/wp-content/PDFs/MandE-Guidance-Note1.pdf>

Fletcher C S, Taylor B M, Rambaldi A N, Harman B P, Heyenga S, Ganegodage K R, Lipkin F, McAllister R R J (2013), *Costs and coasts: an empirical assessment of physical and institutional climate adaptation pathways*, National Climate Change Adaptation Research Facility, Gold Coast:

<http://www.nccarf.edu.au/publications/costs-and-coasts-climate-adaptation>

Hansen A (2010), *Environment, media and communication*, Routledge, Oxford.

Hockings M, Stolton S, Leverington F, Dudley N, Courrau J & Valentine P (2006), *Evaluating effectiveness: a framework for assessing management effectiveness, 2nd edn.*, International Union for Conservation of Nature, Gland:

<https://portals.iucn.org/library/efiles/documents/PAG-014.pdf>

Jacobson C, Carter RW, Thomsen D & Smith T (2014), 'Monitoring and evaluation for adaptive coastal management', *Ocean and Coastal Management*, vol. 89, p. 51-57.

Olsen P (2003), 'Frameworks and indicators for assessing progress in integrated coastal management initiatives', *Ocean and Coastal Management*, vol. 46, p. 347-361.

Visit the SCCG Projects Page for other related projects: <http://www.sydneycoastalcouncils.com.au/Projects>

Template 3: Monitoring Outcomes

Adaptation Objectives	Strategies	Indicators	Performance Rating		
			Time 1	Time 2	Time 3
ENVIRONMENTAL					
SOCIAL					
ECONOMIC					
GOVERNANCE					

Step 1: Insert Council's adaptation objectives here.

Step 2: Insert Council's adaptation strategies here. These are the specific actions to meet your objectives.

Step 3: Insert Council's indicators here. These should be linked to your strategies.

Step 4: Use a rating system to track progress over time and to identify trends.

Performance Rating Key:

- Meeting or exceeding desired outcome/trend
- Moving towards a desired outcome/trend
- Limited to no changes towards a desired outcome
- Not meeting desired trend and showing signs of decline
- Data unavailable in reporting period

A range of case studies are included in the following pages that provide worked examples of the Monitoring Outcomes Template

Case studies

The following hypothetical examples are provided to illustrate the use of the Monitoring Outcomes Template. These case studies are based on three different adaptation strategies: protect, accommodate and retreat. It should be noted that each case is represented in a simplistic manner for illustrative purposes only. Some actions and strategies may not be appropriate in some Council areas given different state policy constraints and the diversity that exists within Council areas (size, resources etc). Furthermore, in many instances a combination of adaptation strategies (protect, accommodate and retreat) would be implemented simultaneously.

Case Study 1: Erodeville (Protect Measures)

The 'Erodeville' case provides an illustrative example of key monitoring and evaluation issues associated with 'protect' strategies.

'Protect' strategies (e.g. beach nourishment, seawalls and breakwaters) are implemented to dissipate, absorb and/or reflect wave energy to protect communities and infrastructure from erosion, storm surge and flooding. While 'protect' measures provide protection they can also create or exacerbate other coastal problems during construction and operation (e.g. erosion of adjacent sites, loss of coastal amenity). In addition, the ability to protect also depends on the magnitude and frequency of extreme events.

Since 1950, Erodeville has experienced an average 1.4 cyclones per year, leading to serious problems with coastal erosion. In response, the Council implemented a number of protection measures including rock walls and beach nourishment. As erosion continued, the rock wall at Erodeville became exposed to wave attack leading to a narrower beach and declining popularity of the area as a recreational destination. There was loss of beach amenity and deteriorating wave conditions for surfers.

To address this, various schemes were investigated by Erodeville Council using multi-criteria analysis. Key issues for consideration included a range of social, governance, economic and environmental objectives, including:

- improve structural stability and durability of protective measures to stabilise the beach and dunes from erosion associated with climatic impacts
- enhance habitat restoration and recreational amenities
- limit negative environmental impacts on adjacent sites (e.g. erosion)
- ensure cost efficiency
- stimulate new economic activities, and
- avoid litigation.

Consideration of these issues led to the recommendation of continued beach nourishment and the construction of an artificial reef. This would limit down drift erosion and enhance surfing amenities to attract tourists to Erodeville beach. Specific strategies, indicators and measures were then developed to monitor and evaluate progress towards achieving positive social, economic and environmental outcomes (see Case Study 1 Template on p. 18).

Case Study 1 - Erodeville: An example of monitoring and evaluating the performance of a protective adaptation strategy

Adaptation Objectives	Strategies	Indicators	Performance Rating		
			Time 1	Time 2	Time 3
ENVIRONMENTAL					
<i>Protection of beach and dunes from erosion associated with sea level rise and storm surge</i>	Construction of a submerged reef to reduce wave velocity and retain sand by reducing longshore drift	Measure of wave velocity and longshore drift	●	●	●
	Beach nourishment	Volume of sand on beach and in dunes	●	●	●
<i>Create and maintain habitat and food sources for marine fauna</i>	Placement of geotextile containers on reef to encourage habitat development	Change in species abundance and composition	●	●	●
	Forbid anchoring along the reef zone to avoid damage to habitat and the structure	Extent of reef zone damage caused by anchoring	●	●	●
<i>Limit negative impacts of adaptation strategies on associated sites</i>	Periodic monitoring of impacts on adjacent sites	Adjacent beach width	●	●	●
		Change in species abundance and composition in adjacent sites	●	●	●
SOCIAL					
<i>Maintain or enhance recreational amenity</i>	Enhance beach access	Change in number of overall visits	●	●	●
	Enhance beach usability/utility	Change in number of recreational uses	●	●	●
	Design reef to enhance surfing conditions	Change in number of surfers using the site	●	●	●
ECONOMIC					
<i>Ensure affordability of adaptive measures</i>	Ensure benefits of construction and on-going maintenance outweigh costs	Change in cost/benefit ratio (benefit may be measured by reduced expenditure on emergency response and repairs following extreme weather events)	●	●	●
<i>Maintain or enhance local economy associated with the coastal zone</i>	Incorporate landscape design principles that increase visitation through the provision of enhanced amenity	Change in number of businesses associated with the coastal zone	●	●	●
GOVERNANCE					
<i>Development and maintenance of responsive governance processes</i>	Adaptation strategies are widely communicated across council	Change in number of council divisions incorporating adaptation in decision-making processes	●	●	●
<i>Council staff learn from challenges and opportunities of adaptation</i>	Ensure all relevant staff use a systematic process for reflecting on activities	Extent of lessons learned incorporated into future plans	●	●	●

- Meeting or exceeding desired outcome/trend
- Moving towards a desired outcome/trend
- Limited to no changes towards a desired outcome
- Not meeting desired trend and showing signs of decline
- Data unavailable in reporting period

Case Study 2: Splash City (Accommodate Measures)

The 'Splash City' case provides an illustrative example of key monitoring and evaluation issues associated with accommodate strategies.

'Accommodate' strategies (e.g. raising houses) are implemented to accommodate for storm surge and flooding events that are episodic. While 'accommodate' strategies allow a degree of 'business as usual' and may be less costly in the short-term, in order to persist they may need to be continually improved or re-engineered and may not be feasible over longer time periods.

Splash City is a predominately urban area with significant assets and infrastructure developed progressively over the last 200 years. There are a number of protection measures that have already been implemented including rock walls and flood protection structures. However, several independent and credible studies have concluded that these protection measures will not be satisfactory to alleviate climate change impacts over the next 100 years.

To address this, various schemes were investigated by Splash City Council using multi-criteria analysis. Key issues for consideration included a range of social, governance, economic and environmental issues to:

- allow for the continued use of existing housing, infrastructure and assets
- ensure cost efficiency
- ensure minimal disruption to businesses and residents, and
- allow time to consider alternative strategies.

Consideration of these issues led to the recommendation of 'accommodate' measures to retrofit existing residences, infrastructure and other assets at risk. Specific strategies, indicators and measures were then developed to monitor and evaluate progress towards achieving positive social, economic and environmental outcomes (see Case Study 2 Template on p. 20).

Case Study 2 - Splashville: An example of monitoring and evaluating the performance of an accommodate adaptation strategy

Adaptation Objectives	Strategies	Indicators	Performance Rating		
			Time 1	Time 2	Time 3
ENVIRONMENTAL					
<i>Protection of biodiversity</i>	Update Council's biodiversity strategy to take into account climate change impacts (e.g. potential ecosystem fragmentation)	Change in species abundance and composition	●	●	●
SOCIAL					
<i>Maintain communities</i>	Provide advice on retrofitting existing buildings to cope with increasing exposure to climate change events	Change in number of buildings retrofitted to cope with increasing exposure to climate change events	●	●	●
<i>Reduce vulnerability of new residents</i>	Introduce sustainable building design requirements for new developments (in accordance with State policy provisions)	Change in number of new buildings complying with sustainable building design requirements	●	●	●
	Ensure new developments in 'at-risk' areas are constructed to withstand potential climate change impacts (in accordance with State policy provisions) e.g. develop a sea level rise factor to determine floor levels for habitable areas of dwellings	Change in number of new buildings in 'at-risk' areas that are constructed to withstand climate change impacts	●	●	●
<i>Raise awareness of climate change issues among residents</i>	Develop communication and education campaigns to raise awareness of climate change issues in the coastal zone and survey community awareness levels	Change in number of residents who understand climate change impacts	●	●	●
ECONOMIC					
<i>Maintain economic structure and activity</i>	Provide advice on retrofitting existing businesses to cope with increasing exposure to climate change events	Change in number of businesses retrofitted to cope with increasing exposure to climate change events	●	●	●
GOVERNANCE					
<i>Development and maintenance of responsive governance processes</i>	Adaptation strategies are widely communicated across Council	Change in number of council divisions incorporating adaptation in decision-making processes	●	●	●
<i>Council staff learn from challenges and opportunities of adaptation</i>	Ensure all relevant staff use a systematic process for reflecting on activities	Extent of lessons learned incorporated into future plans	●	●	●

- Meeting or exceeding desired outcome/trend
- Moving towards a desired outcome/trend
- Limited to no changes towards a desired outcome
- Not meeting desired trend and showing signs of decline
- Data unavailable in reporting period

Case Study 3: Tide Town (Retreat Measures)

The 'Tide Town' case provides an illustrative example of key monitoring and evaluation issues associated with retreat strategies.

'Retreat' strategies (e.g. re-zoning of land use) are implemented to remove communities and infrastructure from erosion, storm surge and flooding risks. While 'retreat' measures reduce vulnerability to climatic events they can be costly and potentially have social implications due to changes in community structures and sense of place.

Tide Town had implemented a number of protection measures including rock walls after erosion threatened the main area of the town. A few kilometres along the coast there are a number of residences built on the fore dune, which were approved several decades ago during a period of calmer weather conditions and when a more extensive beach profile existed. Over recent years the combined impacts of sea level rise and storm surge associated with more intense weather events has led to severe erosion that threatens the structural integrity of the homes and the safety of residents. Several independent and credible studies have concluded that the erosion of the properties will continue and worsen.

To address this, Tide Town Council investigated various schemes using multi-criteria analysis. Key issues for consideration included a range of social, governance, economic and environmental issues to:

- reduce exposure of properties to storm surge and sea level rise and protect the safety of residents
- develop high amenity new residential areas
- enhance habitat restoration, and
- ensure long-term cost efficiency through reduced onus on the broader ratepayers of the Local Government area to pay for the ongoing protection of only a few residents.

Consideration of these issues led to the recommendation of 'planned retreat' involving the relocation of some residents to a less exposed location. Tide Town Council then developed specific strategies, indicators and measures to monitor and evaluate progress towards achieving positive social, economic and environmental outcomes (see Case Study 3 Template on p. 22).

Case Study 3 – Tide Town: An example of monitoring and evaluating the performance of a retreat adaptation strategy

Adaptation Objectives	Strategies	Indicators	Performance Rating		
			Time 1	Time 2	Time 3
ENVIRONMENTAL					
<i>Allow ecosystems to adapt autonomously to climate change impacts</i>	Re-zone highly exposed coastal residential land to conservation areas	Change in area of coastal land zoned as conservation areas	●	●	●
SOCIAL					
<i>Relocate buildings in highly exposed coastal areas</i>	Condemn buildings in highly exposed coastal areas	Change in number of buildings in highly exposed coastal areas	●	●	●
<i>Ensure equitable long-term distribution of costs and benefits to all residents in the Local Government Area (LGA)</i>	Ensure appropriate Council expenditure across coastal and non-coastal residential areas in the LGA	Ratio of Council expenditure across coastal and non-coastal residential areas in the LGA	●	●	●
	Ensure expenditure on risk reduction is distributed equitably to benefit the broader community (i.e. not just acutely affected areas)	Change in risk exposure of the broader community	●	●	●
	Ensure the costs and benefits for the LGA as a whole are considered when determining allocation of funding for climate-related initiatives	Allocations of funding for climate-related initiatives are based on an assessment of the costs and benefits across the LGA	●	●	●
<i>Raise awareness of climate change issues among residents</i>	Develop communication and education campaigns to raise awareness of climate change issues in the coastal zone and survey community awareness levels	Change in number of residents who understand climate change impacts	●	●	●
ECONOMIC					
<i>Ensure affordability of adaptive measures</i>	Ensure benefits of land re-zoning outweigh costs of on-going protective measures	Change in cost/benefit ratio (benefit may be measured by reduced expenditure on emergency response and repairs following extreme weather events)	●	●	●
GOVERNANCE					
<i>Development and maintenance of responsive governance processes</i>	Adaptation strategies are widely communicated across council	Change in number of Council divisions incorporating adaptation in decision-making processes	●	●	●
<i>Council staff learn from challenges and opportunities of adaptation</i>	Ensure all relevant staff use a systematic process for reflecting on activities	Extent of lessons learned incorporated into future plans	●	●	●

- Meeting or exceeding desired outcome/trend
- Moving towards a desired outcome/trend
- Limited to no changes towards a desired outcome
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- Data unavailable in reporting period

Putting it all together

The tools in this Guide are designed to be used in multiple ways. The foremost aim is to promote reflection among Council teams on the strengths and weaknesses of adaptation planning, on the capacities required to implement plans, and on the progress in delivering on planned objectives and strategies. These elements are closely interrelated and by analysing results from the templates, Councils can identify linkages between them to guide ongoing adaptation initiatives. The following section offers some guidance on analysing results.

Weighing up priorities

After completing the Best Practice Planning and Adaptive Capacity Templates, users will be presented with a range of results prompting a number of important management considerations. At this stage it is important to weigh up priorities in order to determine where Council should target its resources. Consider discussing the following:

- For any components scored 'do not know' – are we concerned about this? Should we have involved others in the assessment process?
- What were our relative strengths and weaknesses in relation to planning and capacity?
- Should we worry about the relatively lower performing criteria, or just those below a particular score?
- Why might some scores be lower, and how might we address these moving forward?
 - e.g. if we scored lower for engagement, could we address this in the plan implementation phase?
 - e.g. if we scored low for responsiveness, should we invest in enhanced technical training?
 - e.g. do we need to invest greater human capital in plan implementation, or is this a matter related to the number of champions for adaptation activities?
- In the future, should we reallocate resources in areas where we have scored ourselves highly to areas that are performing less well?
- Does our organisation have the knowledge, skills and resources to improve on our planning processes in the future? If not, should we invest in them?
- Does our organisation have the capital it needs in the future? If not, should we invest in it, and over what time horizon?

Identifying linkages

Once priorities have been determined, further analysis of results can help to guide appropriate responses. Users are encouraged to consider the relationships between planning and capacity by looking for linkages between the two Templates. Some examples of how this can be done are provided below.

Example 1: Exploring the relationship between engagement and social capital

Consider how scores for the engagement criteria (integrated principle) in the Best Practice Planning Template, and social capital criteria in the Adaptive Capacity Template compare:

- If they are high for engagement, but low for social capital, this may suggest that more resources will be needed to maintain engagement throughout implementation. Also be mindful that high levels of engagement in the planning stage might build an expectation from the community and industry for ongoing engagement during implementation.
- Alternatively, if scores are low for engagement during planning, but high for social capital, Council might want to consider how to better engage community and industry in future planning processes.
- If scores are low for both planning and capital, Council should consider whether this will affect the successful implementation of the plan, and how this might be addressed if it is a concern.

Example 2: Exploring the relationship between planning and capacity for monitoring and evaluation

Comparisons could also be drawn between the results for 'monitoring and evaluation is planned to be conducted regularly' (responsive principle, Best Practice Planning Template) and 'the time allocated to staff is sufficient for the monitoring and evaluation of adaptation strategies' (human capital, Adaptive Capacity Template):

- If scores for planning are high, but capacity is low, consider whether more resources need to be allocated for this task, or whether the plan will need adjustment in the future.
- Conversely, if scores for planning are low but capacity is high, consider whether clearer guidelines about monitoring and evaluation should be included in future planning processes.

Comparisons such as this can be drawn between any number of criteria from the Best Practice Planning and Adaptive Capacity Templates. This type of analysis is useful for understanding how planning and capacity might impact on adaptation outcomes during implementation. It can aid also in building a common understanding about investments that will improve the effectiveness of adaptation planning in the future.

Comparisons can also be a means of identifying and sharing best practice between Council units or across a number of Councils. Where planning contexts are similar, it can be useful to identify what others have done to achieve a particular rating, and whether this could be applied in other contexts. Likewise where planning contexts are different, assessment criteria can be used to develop realistic expectations about plan scope and processes. For example, contexts where there are clear local government regulations about permissible activities may negate the need for equity or strong engagement of some industry or community groups.

Analysing Outcomes

While it is important to understand the linkages between planning, capacity and outcomes, correlation between these elements may not necessarily mean causation. Caution should be taken in interpreting the reasons for underperforming criteria for a number of reasons: firstly, targets or desired outcomes may be unrealistic; secondly, strategies (actions) may be insufficient or ineffective in achieving desired outcomes; thirdly, a lack of capital may be hindering the attainment of outcomes; and fourthly, the quality of planning for achieving the desired outcomes may have been inadequate or unrealistic.

The need to better understand outcomes has led to the development of several evaluation frameworks in use in coastal and environmental management globally. Many of these share common characteristics and the templates contained in this Guide can be adapted to form part of such frameworks. The discussion below provides a brief overview of two common frameworks – 'theory of change' and 'management effectiveness evaluation'.

'Theory of change' (of which 'Orders of Outcomes' is a variant) is a framework that helps in coping with the slow-change nature of some desired outcomes. It was developed for the coastal context and is particularly promoted for assessing climate change adaptation. It involves assessment against a series of indicators relating to:

- **Enabling conditions:** these are first order changes, including broad policy, strategic, capacity and funding activities that aid in achieving outcomes (e.g. the development of an adaptation plan). The Best Practice Planning and Adaptive Capacity Templates are designed to help you reflect on and assess these.
- **Changes in behaviour:** these involve intermediate changes that occur through the implementation of objectives and strategies, including human behaviour and physical changes (e.g. waste water infrastructure development to cope with storm surge, or the allocation of areas for housing development on higher land to support a retreat strategy). This

is similar to *Responses* indicators in the PSR framework. These can be assessed using the Monitoring Outcomes Template.

- **Changes in outcomes:** these involve longer-term change (e.g. as population shift from low lying areas at risk of inundation to higher areas set-back from the coast). These can also be assessed using the Monitoring Outcomes Template.

'Management effectiveness evaluation' is another type of framework used extensively in natural resource management. It involves indicators related to different components of the management cycle and is particularly helpful in adaptive management across multiple sites. It involves the assessment of a series of indicators relating to:

- **Context:** assessment of knowledge of values and threats (setting the context for further assessment components).
- **Planning:** assessment of the extent and quality of planning (e.g. the extent that plans are used to guide management). This is similar to *Enabling conditions* and aligns with the Best Practice Planning Template.
- **Inputs:** assessment of the appropriateness of information, capability and resources for implementing planned activities (e.g. sufficiency of information and resources to implement plans). This is similar to *Enabling conditions* and aligns with Adaptive Capacity Template.
- **Processes:** assessment of processes required to achieve desired outcomes (e.g. raising awareness of an adaptation plan with community, or intergovernmental actions aligned with plan implementation). This is similar to *Changes in behaviour* and could be incorporated into the Monitoring Outcomes Template.
- **Outputs:** assessment of the extent of management activity undertaken (e.g. cubic metres of sand provided for beach nourishment). This is similar to *Changes in behaviour* and could be incorporated into the Monitoring Outcomes Template.
- **Outcomes:** assessment of outcomes involves the actual outcomes achieved, and is similar to *Changes in outcomes* noted above.

These frameworks can assist users to interpret the results from the three templates in order to gain a better understanding of outcomes and inform future directions.

This discussion has touched upon different ways that the information gathered through this Guide can be analysed and used to inform ongoing adaptation practice. Carrying out the evaluations contained in the three templates is only one step in what should be an ongoing and iterative process of adaptive management. The subsequent processes of weighing up priorities, identifying linkages and analysing outcomes are critical steps in determining the best course of action for Council.

Conclusion

The process of climate change adaptation is an ongoing iterative process that itself needs to be adaptive. Not only is the magnitude and extent of climate change impacts uncertain, the interactions that contribute to climate change and the way they manifest in terms of impacts are complex. Uncertainty is further compounded by dynamic socio-ecological conditions (such as changes in population size and characteristics) that influence both sensitivity to climate change and the adaptive capacity of communities. As such, adaptation is not a one-off activity. Adaptation plans and strategies need to be continually evolving and allow for transitions to alternative adaptation pathways over time.

Transitions may be triggered when certain environmental, social or economic thresholds are exceeded. Determining such thresholds is a question for communities to debate on a case-by-case basis and will depend on perceptions of desirable conditions and the levels of risk that communities are willing to accept or have capacity to cope with. The dialogue facilitated by working through the templates in this Guide provides an opportunity to understand the ongoing effects of particular strategies on future capacity and to avoid path dependencies or maladaptation.

Ongoing and systematic monitoring and evaluation is crucial to ensure adaptation strategies remain feasible and effective, now and into the future. The authors hope that this Guide can assist Councils to realise this. We welcome any feedback on elements of the Guide and will continue to work collaboratively with Councils to ensure successful adaptation to a changing coastal environment.

References

- Adger W N (2006), 'Vulnerability', *Global Environmental Change*, vol. 16, pp. 268-281.
- Adger W N, Arnell N W, and Tompkins E L (2005), 'Successful adaptation to climate change across scales', *Global Environmental Change-Human and Policy Dimensions*, vol. 15, no. 2, pp. 77-86.
- Allen W J, Fenemor A, Wood D (2012), *Effective indicators for freshwater management: attributes and frameworks for development*, Landcare Research New Zealand:
http://www.learningforsustainability.net/pubs/developing-effective_indicators.pdf
- Barnett J & O'Neill S (2010), 'Maladaptation', *Global Environmental Change*, vol. 20, pp. 211-213.
- Bebbington A (1999), 'Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty', *World Development*, vol. 27, no. 12, pp. 2021-2044.
- Bourdieu P (1986), 'The forms of capital', in Richardson J G (ed.), *The Handbook of Theory: Research for the Sociology of Education*, Greenwood Press, New York, pp. 241-258.
- Bours D, McGinn C & Pringle P (2014), *Twelve reasons why climate change adaptation M&E is challenging*, SeaChange and UKCIP: <http://www.ukcip.org.uk/wordpress/wp-content/PDFs/MandE-Guidance-Note1.pdf>
- Emery M and Flora C (2006), 'Spiraling-up: mapping community transformation with community capitals framework', *Community Development*, vol. 37, no. 1, pp. 19-35.
- Fletcher C S, Taylor B M, Rambaldi A N, Harman B P, Heyenga S, Ganegodage K R, Lipkin F, McAllister R R J (2013), *Costs and coasts: an empirical assessment of physical and institutional climate adaptation pathways*, National Climate Change Adaptation Research Facility, Gold Coast: <http://www.nccarf.edu.au/publications/costs-and-coasts-climate-adaptation>
- Foerster A, Macintosh A & McDonald J (2013), 'Transferrable lessons for climate change adaptation planning? Managing bushfire and coastal climate hazards in Australia', *Environmental and Planning Law Journal*, vol. 30, pp. 469-490.
- Guba E G and Lincoln Y S (1989), *Fourth generation evaluation*, Newbury Park, Sage.
- Gurran N, Hamin E & Norman B (2008), *Planning for climate change: Leading Practice Principles and Models for Sea Change Communities in Coastal Australia*, prepared for the National Sea Change Taskforce, Sydney:
<http://www.seachangetaskforce.org.au/Publications/PlanningforClimateChange.pdf>
- Hansen A (2010), *Environment, media and communication*, Routledge, Oxford.
- Hockings M, Stolton S, Leverington F, Dudley N, Courrau J & Valentine P (2006), *Evaluating effectiveness: a framework for assessing management effectiveness, 2nd edn.*, International Union for Conservation of Nature, Gland: <https://portals.iucn.org/library/efiles/documents/PAG-014.pdf>
- Jacobson C, Carter RW, Thomsen D & Smith T (2014), 'Monitoring and evaluation for adaptive coastal management', *Ocean and Coastal Management*, vol. 89, pp. 51-57.
- Lim B, Burton I, Malone E & Huq S (2004), *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*, UNDP and Cambridge University Press.
- Mangoyana R, Thomsen D C, Smith T F, Preston B L, Heinz S, Maloney M, Withycombe G and O'Dwyer S (2012), *Literature Review of Adaptation to Climate Change in the Coastal Zone*, report prepared for the Sydney Coastal Councils Group and the Australian Department of

Climate Change and Energy Efficiency:

<http://www.sydneycoastalcouncils.com.au/sites/default/files/litreview.pdf>

Nelson R, Kocic P, Crimp S, Meinke H and Howden S M (2010), 'The vulnerability of Australian rural communities to climate variability and change: Part I—Conceptualising and measuring vulnerability', *Environmental Science & Policy*, vol. 13, no. 1, pp. 8-17.

Nelson R, Kocic P, Crimp S, Martin P, Meinke H, Howden S M, de Voil P and Nidumolu U (2010), 'The vulnerability of Australian rural communities to climate variability and change: Part II—Integrating impacts with adaptive capacity', *Environmental Science & Policy*, vol. 13, no. 1, pp.18-27.

Olsen P (2003), 'Frameworks and indicators for assessing progress in integrated coastal management initiatives', *Ocean and Coastal Management*, vol. 46, pp. 347-361.

O'Sullivan R G (2004), *Practicing Evaluation: A Collaborative Approach*, Thousand Oaks, Sage.

Prutsch A, Grothmann T, Schauser I, Otto S, and McCallum S (2010), *Guiding Principles for adaptation to climate change in Europe*: ETC/ACC Technical Paper 2010/6, Bilthoven: The European Topic Centre on Air and Climate Change:
http://acm.eionet.europa.eu/docs/ETCACC_TP_2010_6_guiding_principles_cc_adaptation.pdf

Smit B & Wandel J (2006), 'Adaptation, adaptive capacity and vulnerability', *Global Environmental Change*, vol. 16, pp. 282-292.

Smith J B, Klein R J T & Huq S (eds.) (2003), *Climate Change, Adaptive Capacity & Development*, Imperial College Press, London.

Smith T F, Carter R W, Daffara P & Keys N (2010), *An assessment of the nature and utility of adaptive capacity research*, National Climate Change Adaptation Research Facility, Gold Coast: <http://www.nccarf.edu.au/publications/assessment-nature-and-utility-adaptive-capacity-research>

Smith T F, Brooke C, Measham T G, Preston B, Gorddard R, Withycombe G, Beveridge B & Morrison C (2008), *Case Studies of Adaptive Capacity: Systems Approach to Regional Climate Change Adaptation Strategies*, Sydney Coastal Councils Group Inc., Sydney:
<http://www.sydneycoastalcouncils.com.au/sites/default/files/systapproachphasethreereport.pdf>

Thomsen D C, Smith T F and Keys N (2012), 'Manipulation or adaptation: unpacking climate change response strategies', *Ecology and Society*, vol. 17, no.3, pp. 20:
<http://www.ecologyandsociety.org/vol17/iss3/art20/>

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